APPENDIX

H-6 HERITAGE

HERITAGE IMPACT ASSESSMENT:
PROPOSED MUKONDELELI WIND ENERGY FACILITY NEAR SECUNDA, MPUMALANGA

Required under Section 38(8) of the National Heritage Resources Act (No. 25 of 1999)

SAHRA Case ID: 20226

Report for:

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SUMMARY

ASHA Consulting (Pty) Ltd was appointed by ENERTRAG South Africa (Pty) Ltd to assess the potential impacts to heritage resources that might occur through the proposed construction of the Mukondeleli Wind Energy Facility (WEF) on a site of some 3600 ha in extent just south of Secunda, Mpumalanga (Figures 1 & 2). The project would have a maximum export capacity of up to 300 MW. An approximate mid-point for the study area is S26° 37' 34.04" E29° 10' 24.53". The project is proposed across twenty-three farm portions as shown in Table 1.

The proposed project would include up to 54 wind turbines, access roads, electrical cabling, a substation and a battery energy storage system.

The survey revealed some historical ruins, a graveyard and two possible graves. Although farmsteads were not visited, a number of houses in the area are expected to be older than 60 years. None will be directly affected though. The landscape is a heritage resources but has been heavily compromised by the presence of the Sasol facility to the north of the site and various coal mines in the surrounding area.

A significant shortcoming in the assessment was the lack of a layout for roads, hardstands, laydown areas and other ancillary infrastructure for the project. As such, a worst-case scenario was adopted for the assessment. No known archaeological sites are impacted on by the provided turbine locations, but one likely graveyard would be impacted by turbine MK-24. Additionally, it is expected that very little of the final layout will have actually been covered in the field. For this reason a pre-construction survey will be important. It is expected that the likely graveyard at MD015 will be avoided by the final layout and that any remaining impacts discovered during a pre-construction survey can be dealt with through micrositing of infrastructure during the final EMPr approval stage.

There is no difference between the two substation alternatives from a heritage point of view, although the Alternative 1 location is marginally favoured due to its being further from the public road.

It is recommended that the proposed Mukondeleli WEF be authorised with either substation alternative, but subject to the following recommendations which should be included as conditions of authorisation:

- A pre-construction survey needs to be undertaken on all unploughed sections of the final layout;
- The likely graveyard alongside turbine MK-24 must be buffered by a minimum of 50 m unless the site is checked and confirmed not to be a graveyard;
- No stones may be removed from any archaeological site; and
- If any archaeological material or human burials are uncovered during the course of development then work in the immediate area should be halted. The find would need to be reported to the heritage authorities and may require inspection by an archaeologist. Such heritage is the property of the state and may require excavation and curation in an approved institution.

Glossary

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

Hominid: a group consisting of all modern and extinct great apes (i.e. gorillas, chimpanzees, orangutans and humans) and their ancestors.

Iron Age: Period post-dating about AD 200 and occurring in Eastern South Africa and featuring farming communities who practised iron smelting. It is split into the Early Iron Age (AD 200 to AD 900), the Middle Iron Age (AD 900 to AD 1300) and the Late Iron Age (AD 1300 to AD 1840.

Later Stone Age: Period of the Stone Age extending over the last approximately 20 000 years.

Middle Stone Age: Period of the Stone Age extending approximately between 200 000 and 20 000 years ago.

Abbreviations

APHP: Association of Professional Heritage Practitioners

ASAPA: Association of Southern African Professional Archaeologists

BA: Basic Assessment

CRM: Cultural Resources Management

EA: Environmental Authorisation

ECO: Environmental Control Officer

EGI: Electricity Grid Infrastructure

EIA: Environmental Impact Assessment

EMPr: Environmental Management Program

ESA: Early Stone Age

GP: General Protection

GPS: global positioning system

HIA: Heritage Impact Assessment

LSA: Later Stone Age

MSA: Middle Stone Age

NEMA: National Environmental Management Act (No. 107 of 1998)

NHRA: National Heritage Resources Act (No. 25) of 1999

PPP: Public Participation Process

REDZ: Renewable Energy Development Zone

SAHRA: South African Heritage Resources Agency

SAHRIS: South African Heritage Resources Information System

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1. INTRODUCTION

ASHA Consulting (Pty) Ltd was appointed by ENERTRAG South Africa (Pty) Ltd to assess the potential impacts to heritage resources that might occur through the proposed construction of the Mukondeleli Wind Energy Facility (WEF) on a site of some 3600 ha in extent just south of Secunda, Mpumalanga (Figures 1 & 2). The project would have a maximum export capacity of up to 300 MW. An approximate mid-point for the study area is S26° 37' 34.04" E29° 10' 24.53". The project is proposed across twenty-three farm portions as shown in Table 1.

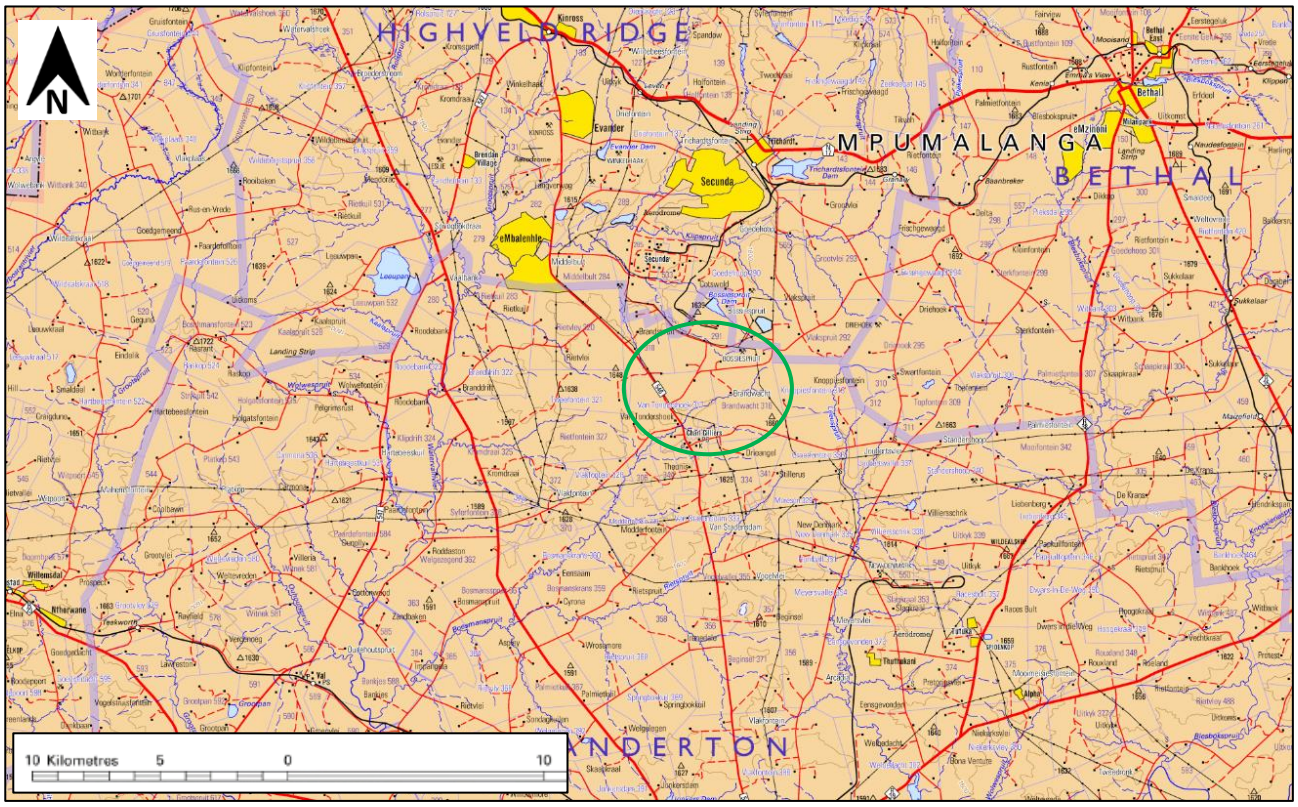

Figure 1: *Extract from 1:50 000 topographic map 2628 showing the location of the site (within green oval). Source of basemap: Chief Directorate: National Geo-Spatial Information. Website: www.ngi.gov.za.*

Table 1: *List of farm portions affected by the proposed project.*

Portion Number	Farm Number	Farm Name
2	291	Bosjesspruit
6	291	Bosjesspruit
8	291	Bosjesspruit
9	291	Bosjesspruit
10	291	Bosjesspruit
11	291	Bosjesspruit
12	291	Bosjesspruit
13	291	Bosjesspruit
14	291	Bosjesspruit

Portion Number	Farm Number	Farm Name
9	313	Knoppiesfontein
0	314	Knoppies
2	316	Brandwacht
3	316	Brandwacht
4	316	Brandwacht
5	316	Brandwacht
13	316	Brandwacht
1	317	van Tondershoek
2	317	van Tondershoek
7	317	van Tondershoek
8	317	van Tondershoek
11	317	van Tondershoek
12	317	van Tondershoek
5	321	Tweefontein

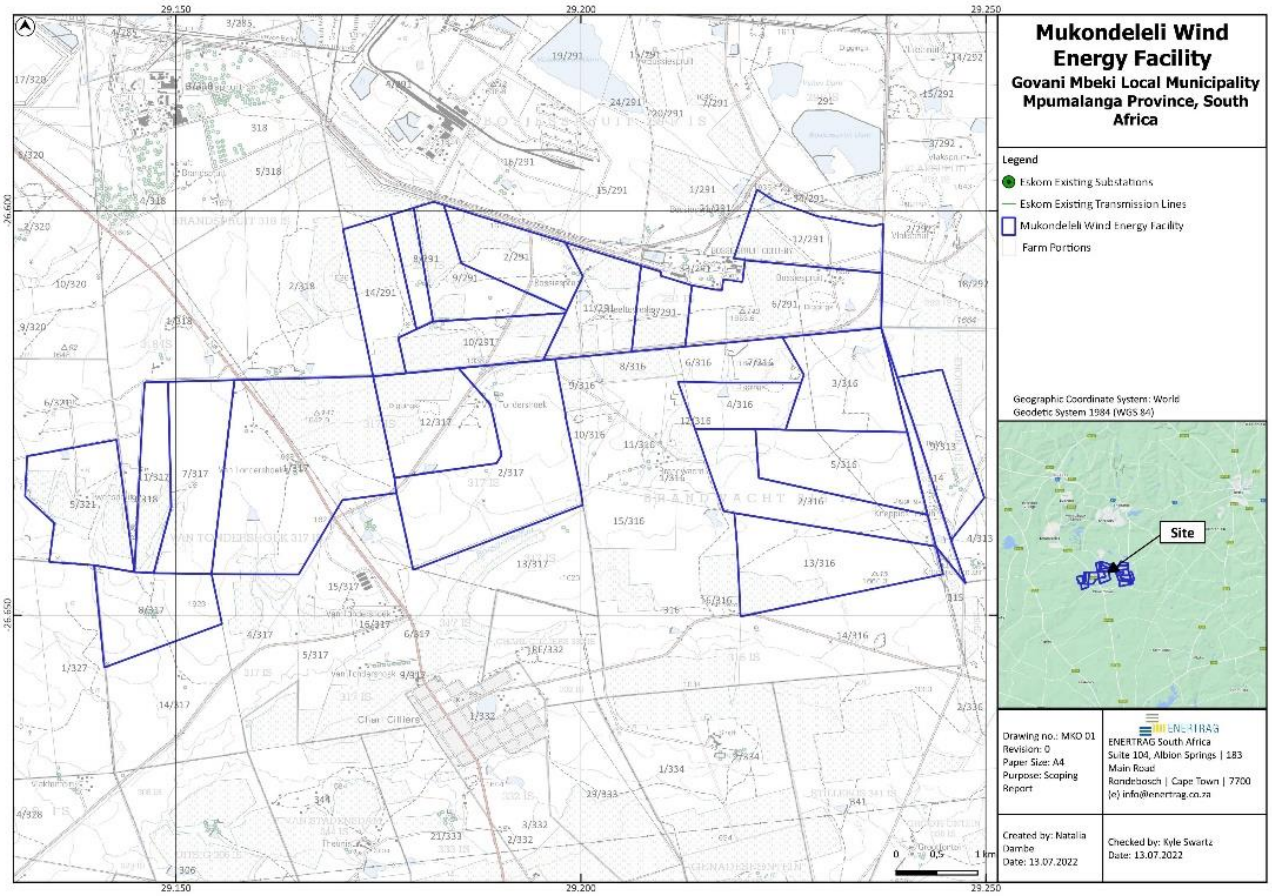

Figure 2: *Extract from 1:50 000 topographic map 2629CA showing the location of the site (blue polygons indicate farm portions involved).*

1.1. The proposed project

1.1.1. Project description

The proposed Mukondeleli WEF and associated infrastructure include the following components (see also Table 2 and Figure 3):

1. Up to 54 wind turbine generators (WTGs) with a maximum export capacity of up to 300 MW.
2. Turbines with a hub height of up to 200m and a rotor diameter of up to 200 m.
3. Hardstand areas of approximately 1 500m^2 per turbine.
4. Temporary construction laydown and storage area of approximately 4 500m^2 per turbine.
5. Medium voltage cabling connecting the turbines will be laid underground.
6. A Battery Energy Storage System (BESS) comprising of several utility scale battery modules within shipping containers or an applicable housing structure on a concrete foundation. Lithium-Ion Phosphate, Lithium Nickel Manganese Cobalt oxides or Vanadium Redox flow technologies will be considered as the preferred battery technology, however, the specific technology will only be determined following EPC procurement. The BESS will be adjacent to the on-site substation (point 9 below).
7. Internal roads with a width of up to 10m providing access to each turbine, the BESS, on-site substation (SS), step-down substation and laydown area. The roads will accommodate cable trenches and stormwater channels (as required) and will include turning circle/bypass areas of up to 20 m at some sections during the construction phase. As such, the roads and cables will be positioned within a 20 m wide corridor. Existing roads will be upgraded wherever possible, although new roads will be constructed where necessary.
8. A temporary construction laydown/staging area of approximately 4.5 hectares (ha) which will also accommodate the operation and maintenance (O&M) buildings.
9. A 33/132kV on-site SS to feed electricity generated by the proposed Mukondeleli WEF into the step-down substation at the Sasol facility. The on-site SS will accommodate 1 x 132 kV incoming feeder bay, 1 x 132 kV outgoing feeder bay and a motorised isolator with protection and metering.

Table 2: *Key technical details for the Mukondeleli WEF.*

Component	**Description / Dimensions**
Application site area	Approximately 3600 ha
Total project footprint area (including the internal roads, but excluding access roads leading to the site)	Approximately 100 ha
Total WEF export capacity	Up to 300 MW
BESS capacity	Up to 300 MW/1200 MWh

Proposed technology	Wind turbines and associated infrastructure, including a BESS
BESS technology	Lithium-Ion Phosphate, Lithium Nickel Manganese Cobalt oxides or Vanadium Redox flow technologies will be considered as the preferred battery technology, however, the specific technology will only be determined following EPC procurement.
Number of turbines	Up to 42 turbines
Turbine hub height from ground	Up to 200 m
Turbine rotor diameter	Up to 200 m
Turbine blade length	Up to 100 m
Height of BESS	Approximately 5-10 m
Height of the on-site Substation	Approximately 7 – 10 m Up to 22 m (including lighting)
On-site SS and BESS complex area	Up to 4ha
Construction laydown area	Up to 3ha
Concrete tower manufacturing	Part of the construction laydown area. The applicability of a concrete tower manufacturing facility will only be confirmed following EPC procurement.
Temporary laydown area	Up to 2ha
O&M building area	Part of the substation and BESS complex
Turbine hardstand area	Approximately 1 500m² per turbine
Width of internal access roads	Up to 10m, including turning circle/bypass areas of up to 20m. The roads and cables will be positioned within a 20m wide corridor.
Length of internal access roads	To be determined based on the final layout.
Site access	R546

Height of substation fencing	Up to 3 m high
Type of fencing around substation	Galvanized steel / nonelectric diamond mesh (clearVu)

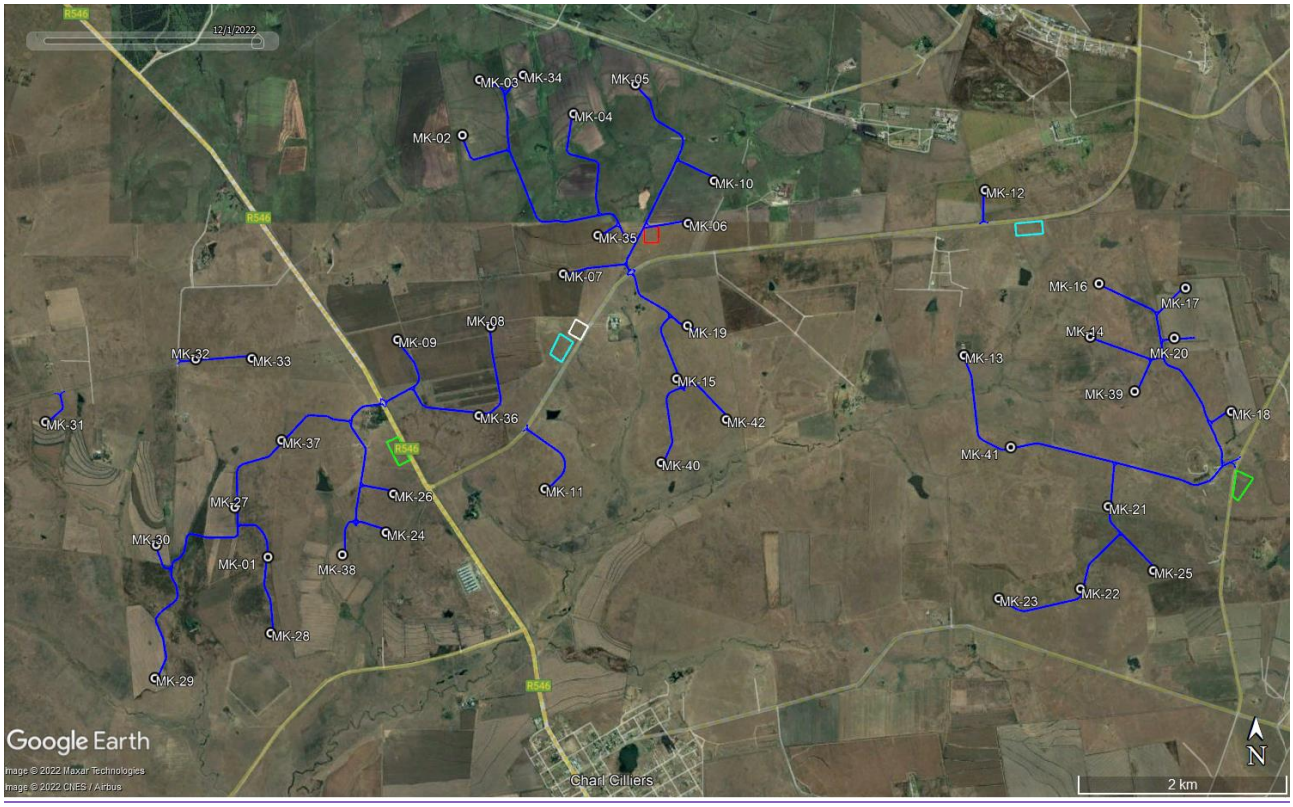

Figure 3: *Proposed project layout. Black and white dots = turbines, red square = Alternative 1 substation, white square = Alternative 2 substation, turquoise rectangles = preferred laydown areas, green rectangles = alternative laydown areas.*

1.1.2. Identification of alternatives

No alternative locations for the project have been identified. However, the WEF layout has been designed iteratively within the project site in order to minimise impacts to the environment. As such, alternative locations for the proposed infrastructure have already been explored.

There are two alternative locations for the on-site substation, both of which are located centrally within the project area. Alternative 1 is the applicant's preferred option. There are also two alternatives for the laydown areas with the two located closer to the centre of the study area being preferred by the applicant.

1.1.3. Aspects of the project relevant to the heritage study

All aspects of the proposed development are relevant, since excavations for foundations and/or services may impact on archaeological and/or palaeontological remains, while all above-ground aspects create potential visual (contextual) impacts to the cultural landscape and any significant heritage sites that might be visually sensitive.

1.2. Terms of reference

ASHA Consulting was asked to:

- Describe regional and local features of the receiving environment;
- Conduct a field survey to search for sensitive areas and sites of heritage significance;
- Map sensitive features and provide spatial data to inform the final project layout;
- Assess the potential impacts on identified heritage resources;
- Identify relevant legislation and legal requirements; and
- Provide recommendations on possible mitigation measures and management guidelines.

1.3. Scope and purpose of the report

A heritage impact assessment (HIA) is a means of identifying any significant heritage resources before development begins so that these can be managed in such a way as to allow the development to proceed (if appropriate) without undue impacts to the fragile heritage of South Africa. This HIA report aims to fulfil the requirements of the heritage authorities such that a comment can be issued by them for consideration by the Mpumalanga Department of Environmental Affairs (DARDLEA) who will review the Environmental Impact Assessment (EIA) and grant or refuse authorisation. The HIA report will outline any management and/or mitigation requirements that will need to be complied with from a heritage point of view and that should be included in the conditions of authorisation should this be granted.

1.4. The authors

Dr Jayson Orton has an MA (UCT, 2004) and a D.Phil (Oxford, UK, 2013), both in archaeology, and has been conducting Heritage Impact Assessments and archaeological specialist studies in South Africa (primarily in the Western Cape and Northern Cape provinces) since 2004 (please see curriculum vitae included as Appendix 1). He has also conducted research on aspects of the Later Stone Age in these provinces and published widely on the topic. He is an accredited heritage practitioner with the Association of Professional Heritage Practitioners (APHP; Member #43) and also holds archaeological accreditation with the Association of Southern African Professional Archaeologists (ASAPA) CRM section (Member #233) as follows:

- Principal Investigator: Stone Age, Shell Middens & Grave Relocation; and
- Field Director: Colonial Period & Rock Art.

Jaco van der Walt has been practising as a CRM archaeologist for 20 years. He obtained an MA degree in Archaeology from the University of the Witwatersrand focussing on the Iron Age in 2012 and is a PhD candidate at the University of Johannesburg focusing on Stone Age Archaeology with specific interest in the Middle Stone Age (MSA) and Later Stone Age (LSA). Jaco is an accredited member of ASAPA (#159) and APHP (#114) and has conducted more than 500 impact assessments in Limpopo, Mpumalanga, North West, Free State, Gauteng, KZN as well as the Northern and Eastern Cape Provinces in South Africa.

Jaco has worked on various international projects in Zimbabwe, Botswana, Mozambique, Lesotho, DRC, Zambia, Guinea, Tanzania as well as Afghanistan. Through this, he has a sound understanding

of the IFC Performance Standard requirements, with specific reference to Performance Standard 8 – Cultural Heritage.

1.5. Declaration of independence

ASHA Consulting (Pty) Ltd and its consultants have no financial or other interest in the proposed development and will derive no benefits other than fair remuneration for consulting services provided.

2. LEGISLATIVE CONTEXT

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

The NHRA protects a variety of heritage resources as follows:

- Section 34: structures older than 60 years;
- Section 35: prehistoric and historical material (including ruins) more than 100 years old as well as military remains more than 75 years old, palaeontological material and meteorites;
- Section 36: graves and human remains older than 60 years and located outside of a formal cemetery administered by a local authority; and
- Section 37: public monuments and memorials.

Following Section 2, the definitions applicable to the above protections are as follows:

- Structures: “any building, works, device or other facility made by people and which is fixed to land, and includes any fixtures, fittings and equipment associated therewith”;
- Palaeontological material: “any fossilised remains or fossil trace of animals or plants which lived in the geological past, other than fossil fuels or fossiliferous rock intended for industrial use, and any site which contains such fossilised remains or trace”;
- Archaeological material: a) “material remains resulting from human activity which are in a state of disuse and are in or on land and which are older than 100 years, including artefacts, human and hominid remains and artificial features and structures”; b) “rock art, being any form of painting, engraving or other graphic representation on a fixed rock surface or loose rock or stone, which was executed by human agency and which is older than 100 years, including any area within 10m of such representation”; c) “wrecks, being any vessel or aircraft, or any part thereof, which was wrecked in South Africa, whether on land, in the internal waters, the territorial waters or in the maritime culture zone of the Republic, as defined respectively in sections 3, 4 and 6 of the Maritime Zones Act, 1994 (Act No. 15 of 1994), and any cargo, debris or artefacts found or associated therewith, which is older than 60 years or which SAHRA considers to be worthy of conservation”; and d) “features, structures and artefacts associated with military history which are older than 75 years and the sites on which they are found”;
- Grave: “means a place of interment and includes the contents, headstone or other marker of such a place and any other structure on or associated with such place”; and
- Public monuments and memorials: “all monuments and memorials a) “erected on land belonging to any branch of central, provincial or local government, or on land belonging to any organisation funded by or established in terms of the legislation of such a branch of

government"; or b) "which were paid for by public subscription, government funds, or a public-spirited or military organisation, and are on land belonging to any private individual."

Section 3(3) describes the types of cultural significance that a place or object might have in order to be considered part of the national estate. These are as follows:

a) its importance in the community, or pattern of South Africa's history;
b) its possession of uncommon, rare or endangered aspects of South Africa's natural or cultural heritage;
c) its potential to yield information that will contribute to an understanding of South Africa's natural or cultural heritage;
d) its importance in demonstrating the principal characteristics of a particular class of South Africa's natural or cultural places or objects;
e) its importance in exhibiting particular aesthetic characteristics valued by a community or cultural group;
f) its importance in demonstrating a high degree of creative or technical achievement at a particular period;
g) its strong or special association with a particular community or cultural group for social, cultural or spiritual reasons;
h) its strong or special association with the life or work of a person, group or organisation of importance in the history of South Africa; and
i) sites of significance relating to the history of slavery in South Africa.

While landscapes with cultural significance do not have a dedicated Section in the NHRA, they are protected under the definition of the National Estate (Section 3). Section 3(2)(c) and (d) list "historical settlements and townscapes" and "landscapes and natural features of cultural significance" as part of the National Estate. Furthermore, some of the points in Section 3(3) speak directly to cultural landscapes.

2.2. Approvals and permits

2.2.1. Assessment Phase

Section 38(8) of the NHRA states that if an impact assessment is required under any legislation other than the NHRA then it must include a heritage component that satisfies the requirements of S.38(3). Furthermore, the comments of the relevant heritage authority must be sought and considered by the consenting authority prior to the issuing of a decision. Under the National Environmental Management Act (No. 107 of 1998; NEMA), as amended, the project is subject to an EIA. The present report provides the heritage component. Mpumalanga Provincial Heritage Resource Authority (MPHRA; for built environment and cultural landscapes) and the South African Heritage Resources Agency (SAHRA; for archaeology and palaeontology) are required to provide comment on the proposed project in order to facilitate final decision making by the DARDLEA.

2.2.2. Construction Phase

If archaeological or palaeontological mitigation is required prior to construction, then the appointed archaeologist or palaeontologist would need to obtain a permit from SAHRA. This would be issued in their name. This is so that the heritage authority can ensure that the appointed practitioner has

proposed an appropriate methodology that will result in the mitigation being done properly. A built environment permit, if required, would need to be obtained from the PHRA.

2.3. Guidelines

SAHRA have issued minimum standards documents for archaeological and palaeontological specialist studies. There is also a Western Cape Provincial guideline for heritage specialists working in an EIA context and which is generally useful. The reporting has been prepared in accordance with these guidelines. The relevant documents are as follows:

- Winter, S. & Baumann, N. 2005. Guideline for involving heritage specialists in EIA processes: Edition 1. CSIR Report No ENV-S-C 2005 053 E. Republic of South Africa, Provincial Government of the Western Cape, Department of Environmental Affairs & Development Planning, Cape Town.
- SAHRA. 2007. Minimum Standards: archaeological and palaeontological components of impact assessment reports. Document produced by the South African Heritage Resources Agency, May 2007.

3. METHODS

3.1. Literature survey and information sources

A survey of available literature was carried out to assess the general heritage context into which the development would be set. The information sources used in this report are presented in Table 3 with relevant dates of each source referenced in the text as needed. Data were also collected via a field survey. The data quality is suitable for the purpose of informing this report.

Table 3: *Information sources used in this assessment.*

Data / Information	Source	Date	Type	Description
Maps	Chief Directorate: National Geo-Spatial Information	Various	Spatial	Historical and current 1:50 000 topographic maps of the study area and immediate surrounds
Aerial photographs	Chief Directorate: National Geo-Spatial Information	Various	Spatial	Historical aerial photography of the study area and immediate surrounds
Aerial photographs	Google Earth	Various	Spatial	Recent and historical aerial photography of the study area and immediate surrounds
Cadastral data	Chief Directorate: National Geo-Spatial Information	Various	Survey diagrams	Historical and current survey diagrams, property survey and registration dates
Background data	South African Heritage Resources	Various	Reports	Previous impact assessments for any developments in the vicinity of the study area

	Information System (SAHRIS)			
Palaeontological sensitivity	South African Heritage Resources Information System (SAHRIS)	Current	Spatial	Map showing palaeontological sensitivity and required actions based on the sensitivity.
Background data	Books, journals, websites	Various	Books, journals, websites	Historical and current literature describing the study area and any relevant aspects of cultural heritage.

3.2. Field survey

The site was surveyed on 24 and 25 March and 01 April 2022. This was during late summer and, being a summer rainfall area, the grass was dense which negatively affected the ground visibility for the archaeological survey. Other heritage resources are not affected by seasonality. During the survey the positions of finds and survey tracks were recorded on a hand-held Garmin Global Positioning System (GPS) receiver set to the WGS84 datum (Figure 4). Photographs were taken at times in order to capture representative samples of both the affected heritage and the landscape setting of the proposed development. The survey was based on the original turbine layout which is why many have not been visited in the field.

It should be noted that the amount of time between the dates of the field inspection and final report do not materially affect the outcome of the report.

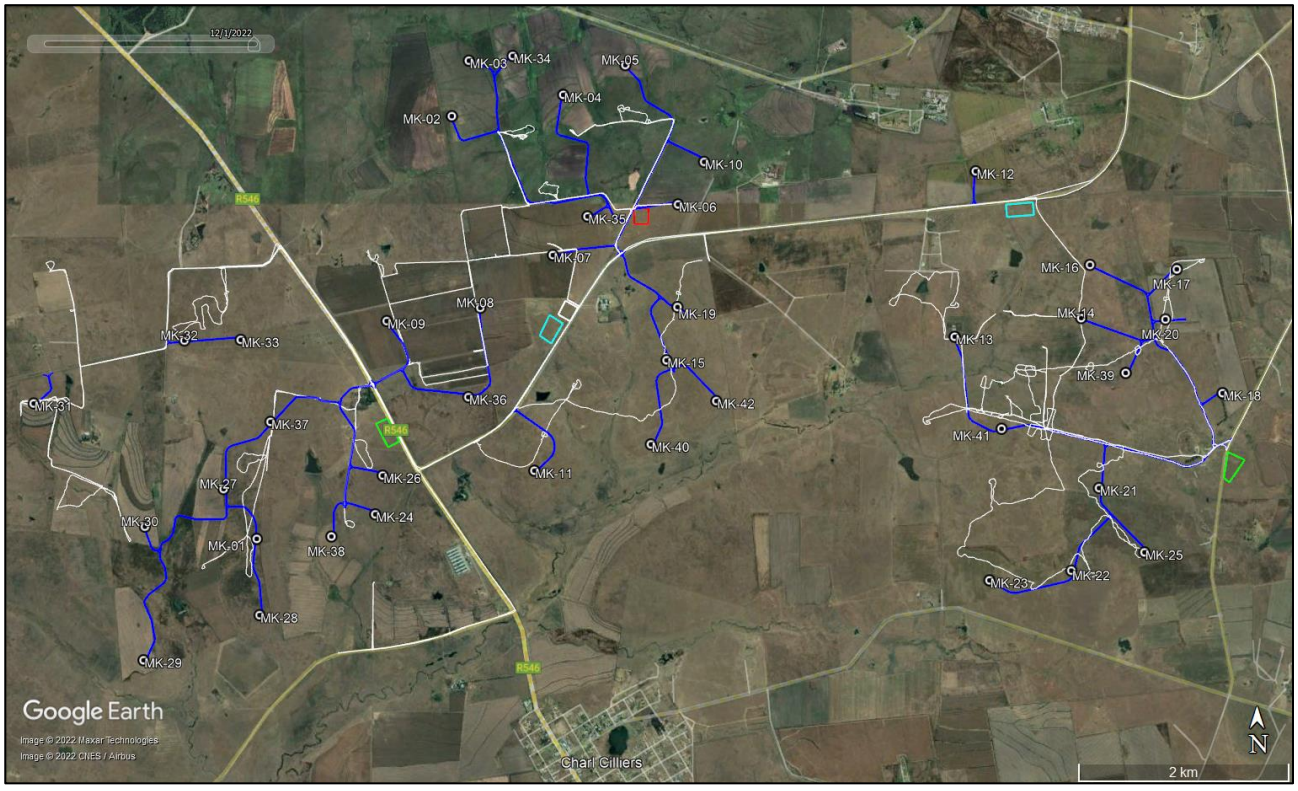

Figure 4: *Aerial view of the study area (key as per Figure 3) showing the survey tracks (turquoise lines).*

3.3. Specialist studies

A separate palaeontological specialist study has been compiled by Prof. Marion Bamford and is submitted separately with this HIA.

3.4. Impact assessment

For consistency among specialist studies, the impact assessment was conducted through application of a methodology supplied by WSP.

3.5. Grading

It is intended under S.7(2) that the various provincial authorities formulate a system for the further detailed grading of heritage resources of local significance but this is generally yet to happen. SAHRA (2007) has formulated its own system[1] for use in provinces where it has commenting authority. In this system sites of high local significance are given Grade IIIA (with the implication that the site should be preserved in its entirety) and Grade IIIB (with the implication that part of the site could be mitigated and part preserved as appropriate) while sites of lesser significance are referred to as having 'General Protection' (GP) and rated as GP A (high/medium significance, requires mitigation), GP B (medium significance, requires recording) or GP C (low significance, requires no further action).

3.6. Consultation

The NHRA requires consultation as part of an HIA but, since the present study falls within the context of an EIA which includes a public participation process (PPP), no dedicated consultation was undertaken as part of the HIA. Interested and affected parties would have the opportunity to provide comment on the heritage aspects of the project during the PPP.

3.7. Assumptions and limitations

The field study was carried out at the surface only and hence any completely buried archaeological sites would not be readily located. Similarly, it is not always possible to determine the depth of archaeological material visible at the surface. The survey was based on a preliminary layout and not all turbine locations were checked due to planted fields. However, being in ploughed lands, it is assumed that intact archaeological features will not be present in those locations. In some non-planted areas the vegetation was also very dense which greatly reduced ground visibility. It is assumed that stone features would, however, generally be protruding from the grass but due to the height of the grass it is easily possible to miss small features and/or graves located more than a few meters away. No road layout was available for consideration in the field and the final turbine positions are now different which means that very little of the final layout has actually been surveyed. Nonetheless, aerial photography was scrutinised to locate any further obvious sites.

Cumulative impacts are difficult to assess due to the variable site conditions that would have been experienced in different areas and in different seasons. Survey quality is thus likely to be variable.

[1] The system is intended for use on archaeological and palaeontological sites only.

As such, some assumptions need to be made in terms of what and how much heritage might be impacted by other developments in the broader area.

4. PHYSICAL ENVIRONMENTAL CONTEXT

4.1. Site context

The study area is situated about 5 km south of the Sasol Secunda plant and about 2 km north of Charl Cilliers. The study area covers multiple farms that are used for various farming activities such as cattle and crop farming. The Zeus Substation lies 7 km to the southwest and many high voltage powerlines connect there.

Existing infrastructure in the study area includes the R546 and another public road, various gravel farm roads, and large underground pipelines and overhead powerlines that traverse the landscape from and towards the Secunda Sasol plant.

4.2. Site description

The study area is a relatively flat landscape characterised by open fields with dense grass cover and scattered thickets of small trees. Large, cultivated fields with maize, sunflower and beans are scattered across the study area with the open fields in between used for cattle grazing and the baling of cultivated grasses. Figures 5 to 14 shows the physical appearance of the study area.

Figure 5: *Vegetation obscuring the surface of the study area.*

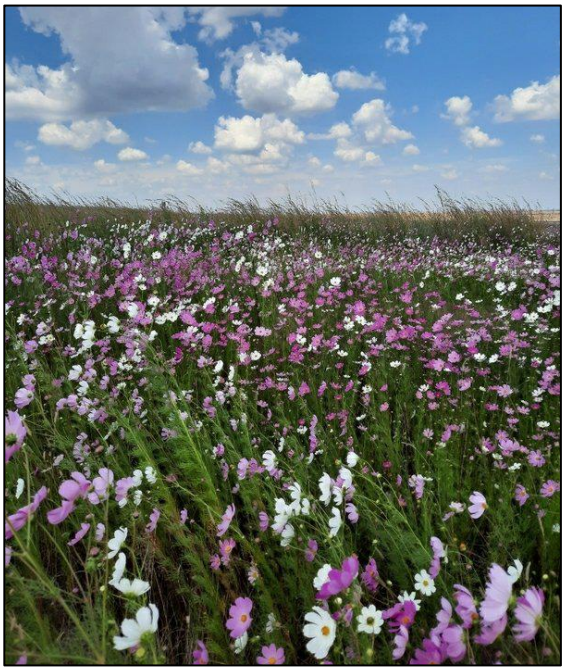

Figure 6: *Vegetation obscuring the surface of the study area.*

Figure 7: *Vegetation obscuring the surface of the study area.*

Figure 8: *Vegetation obscuring the surface of the study area.*

Figure 9: *Crops obscuring the surface of the study area.*

Figure 10: *Crops obscuring the surface of the study area.*

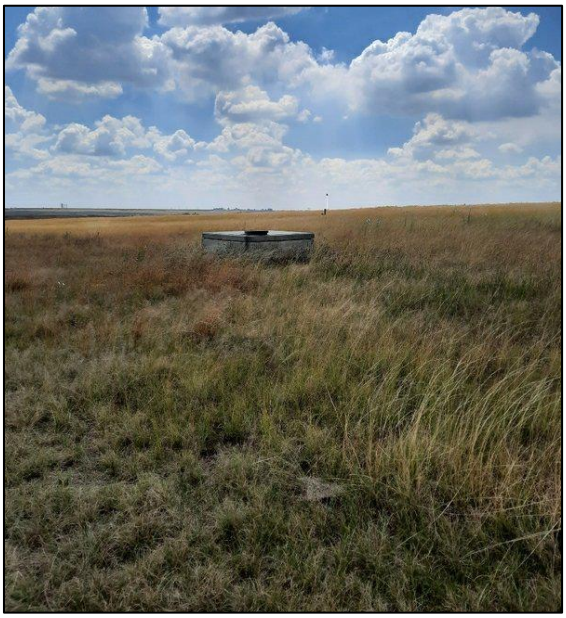

Figure 11: *Vegetation and a pipeline inspection cover in the study area.*

Figure 12: *Farm gravel roads, fences and gates.*

Figure 13: *Vegetation and existing electrical infrastructure in the study area.*

Figure 14: *Vegetation and existing electrical infrastructure in the study area.*

5. FINDINGS OF THE HERITAGE STUDY

This section describes the heritage resources recorded in the study area during the course of the project.

5.1. Palaeontology

The SAHRIS Palaeosensitivity Map shows the site to be of largely zero palaeontological sensitivity (Figure 15). However, a few small areas of very high sensitivity do occur and some turbines do fall within these areas. Due to the sandy substrate and generally dense vegetation covering throughout the study area, a desktop palaeontological study was carried out. This has been submitted separately with this HIA.

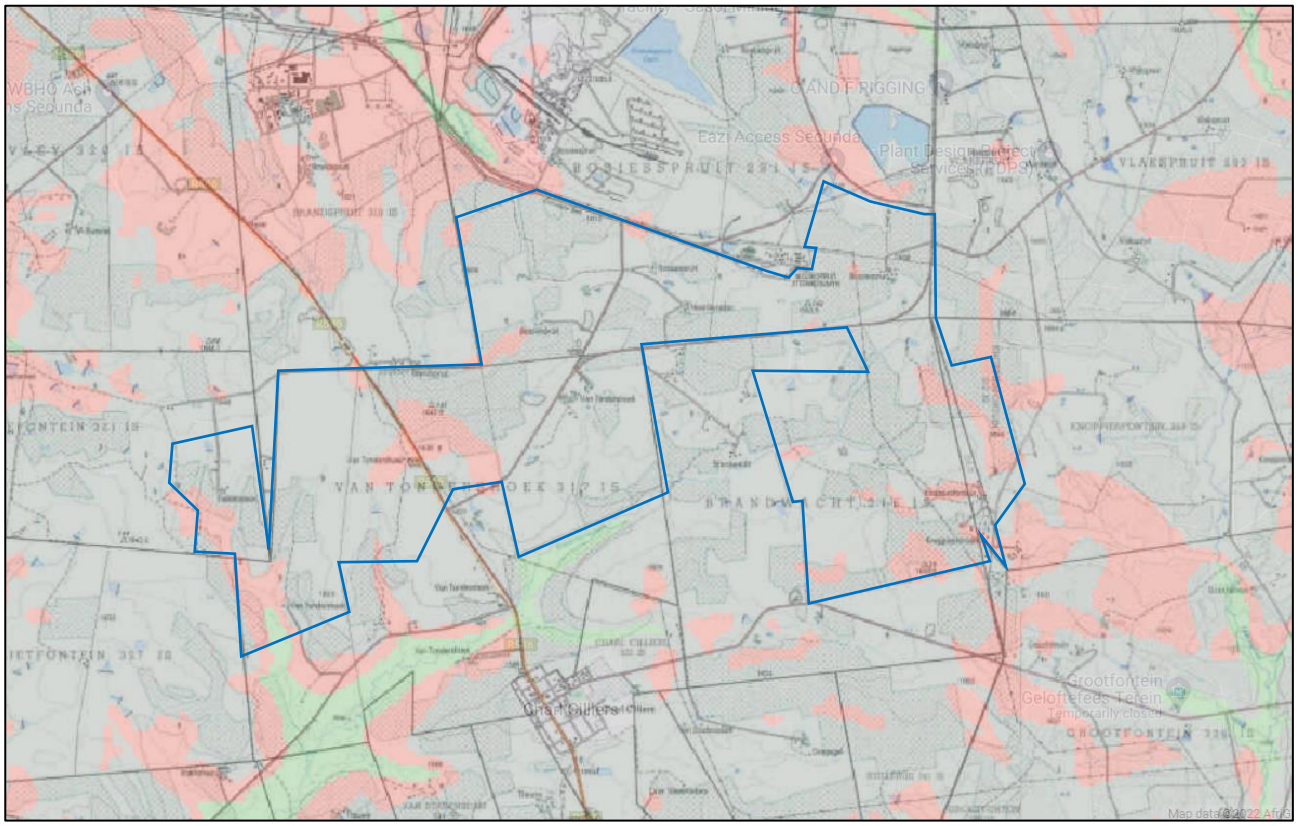

Figure 15: *Extract from the SAHRIS Palaeosensitivity Map showing the site (blue polygon) to be of largely zero palaeontological sensitivity (grey shading). A few small areas are rated as of very high sensitivity (red shading).*

5.2. Archaeology

5.2.1. Desktop study

Mpumalanga does not include an extensive Early Stone Age record (Esterhuysen & Smith 2007). Although the Middle and Late Stone Age periods have not yet been comprehensively studied, evidence for these periods has been excavated from Bushman Rock Shelter in the Ohrigstad District (Esterhuysen & Smith 2007) and it is known that San communities lived near Lake Chrissie as recently as the 1950s (e.g. Schlebusch *et al*. 2016).

The archaeological remains of Iron Age settlements are more frequently found in the province. The archaeology of farming communities of southern Africa encompasses three phases. The Early Iron Age (200-900 AD) represents the arrival of Bantu-speaking farmers in southern Africa. Living in sedentary settlements often located next to rivers, these farmers cultivated sorghum, beans, and cowpeas, and kept livestock. The Middle Iron Age (900-1300 AD) is mostly confined to the Limpopo Province with the most notable site in southern Africa located in the Limpopo Valley; Mapungubwe Hill probably represents the earliest 'state' in this region. The Late Iron Age (1300-1840s AD) marks the arrival and spread of ancestral Eastern Bantu-speaking Nguni and Sotho-Tswana communities into southern Africa. The location of Late Iron Age settlements is usually on or near hilltops for defensive purposes. The Late Iron Age as an archaeological period ended by 1840 AD, when the Mfecane caused major socio-political disruptions in southern Africa (Mitchell 2002; Huffman 2007).

Dates from Early Iron Age sites indicated that by the beginning of the 5th century AD Bantu-speaking farmers had settled in the Mpumalanga lowveld. Subsequently, farmers continued to move into and between the lowveld and highveld of Mpumalanga. By 1500 AD the escarpment was populated by chiefdoms, including Pedi and Bokoni communities. These chiefdoms would have had trade relations with Ndundza, Swazi and Zulu kingdoms, exchanging salt, cattle and metals as evidenced by the archaeological record (Esterhuysen & Smith 2007; Delius *et al.* 2012).

Other CRM surveys that have taken place in the vicinity of the present study area reveal the variety of heritage resources commonly encountered in the area. These are listed in Table 4.

Table 4: *CRM reports compiled for other projects close to the present study area.*

Author	Year	Project	Findings
Van Schalkwyk, J.A.	1998	A Survey of Cultural Resources for Secunda Collieries Block 5 and Syferfontein Mining Area Highveld Ridge District, Mpumalanga	Informal cemeteries Farmstead ruins Historical farmstead Labourer homestead ruins Middens (modern) Stone walling Circular stone structures Stone cairns (possibly graves) Lower grinding stone
Pistorius, C.C. J	2008	A Phase I Heritage Impact Assessment (HIA) study for Sasol's proposed new gas and liquid pipelines (along a corridor) from Sasol Synfuels in Secunda (Mpumalanga) to Sasol Infrachem and Natref in Sasolburg (Free State) on the Highveld in the Republic of South Africa. Unpublished report for Nature and Business Alliance Africa (Pty) Ltd	Historic farmstead complexes Historic houses Graveyards Individual graves
Van Vollenhoven, A.C. & Pelser, A.J.	2010	A Report on a Heritage Impact Assessment the Proposed Secunda X 52 Industrial Township, Mpumalanga Province	Graveyard

Küsel, S.	2011	Cultural Heritage Resources Impact Assessment for proposed Sasol Electricity Generation from Raw Gas Cooling Erf 8488 Govan Mbeki Local Municipality Gert Sibande District Municipality Mpumalanga Province. Report prepared for SSI Engineers and Environmental Consultants	No finds
Beater, J.	2017	Mulalo Main Transmission Substation and Associated Power Lines Project, Secunda, Mpumalanga Province	Graveyard Historic homestead ruins Labourer homestead ruins
Hardwick, S., Bamford, M. & Du Piesanie, J.	2019	Environmental Regulatory Process to Decommission a Conveyer Belt Servitude, Road and Quarry at Twistdraai East Colliery, Secunda, Mpumalanga Province. N.I.D. Unpublished report Digby Wells Environmental.	Graveyards
Pistorius, C.C.J.	2020	A Phase I Heritage Impact Assessment Study for The Shondoni and Middelbult Mining Areas Near Secunda in the Mpumalanga Province	Historic farmstead complexes Graveyards Individual graves Commemorative beacons

5.2.2. Site visit

A number of archaeological resources were recorded in the study area. These are listed in Table 5 and then individually described and illustrated below. Mapping is presented in Appendix 3.

Table 5: *List of heritage finds recorded during the field survey.*

Waypoint	Location	Nature	Grade
MD001	26° 38' 00.2292" S 29° 13' 27.1487" E	Graves	IIIA
MD002	26° 37' 59.8224" S 29° 13' 32.7181" E	Archaeological – stone feature	GPA
MD003	26° 37' 50.0880" S 29° 13' 30.5941" E	Archaeological – stone feature	GPC
MD004	26° 37' 54.6888" S 29° 13' 32.7827" E	Archaeological – stone feature	GPA
MD005	26° 37' 52.0262" S 29° 11' 04.3514" E	Archaeological – stone feature	GPC
MD006	26° 37' 31.2203" S 29° 11' 38.3388" E	Not heritage	---
MD007	26° 36' 53.2908" S 29° 10' 57.9253" E	Archaeological – stone features	GPA
MD008	26° 36' 34.8805" S 29° 10' 44.8319" E	Possible grave	IIIA
MD009	26° 36' 35.2692" S 29° 10' 45.5449" E	Archaeological – stone features	GPB
MD010	26° 38' 27.7655" S 29° 08' 26.9880" E	Possible grave	IIIA

Waypoint	Location	Nature	Grade
MD011	26° 38' 37.7592" S 29° 08' 30.6383" E	Archaeological – stone feature	GPC
MD012	26° 37' 13.5985" S 29° 09' 56.4911" E	Archaeological – stone features	GPA
MD013	26° 37' 07.9300" S 29° 14' 03.0000" E	Archaeological – stone features	GPA
MD014	26° 37' 22.7600" S 29° 11' 22.8600" E	Archaeological – stone features	GPA
MD015	26° 38' 29.8400" S 29° 09' 55.7800" E	Possible graveyard	IIIA

The sites recorded are all stone-walled sites assumed to be the dwellings and associated structures of white farmers. Most of them likely have their roots in the 19th century but would have fallen into disuse during the 20th century. Historical buildings were often purposefully demolished so that the stones could be reused elsewhere on the farms and this may explain the very limited rubble at most of the sites. It is possible that abandoned houses may have been used by farm labourers before their eventual demolition and, as such, the possibility of still-born babies having been buried there must be considered. The chances of this happening are, however, very small and such remains would likely not be found during earthmoving.

Site Number:	Description:	Period:
MD002 – 004	The site is associated with the graves at MD001 and consists of various stone walled ruins, some which are completely overgrown with thickets of trees. At MD002 are the remains of a packed stone structure that is completely degraded and overgrown. A small section of one wall of the original structure is still standing. The thicket of trees at MD003 contains large amounts of stone blocks that are assumed to originate from a demolished structure. MD004 is a very degraded stone kraal measuring 11 m by 21 m and located in grassland between the two thickets. The three features are roughly in a straight line stretching over a distance of some 320 m. .	Historic, recent

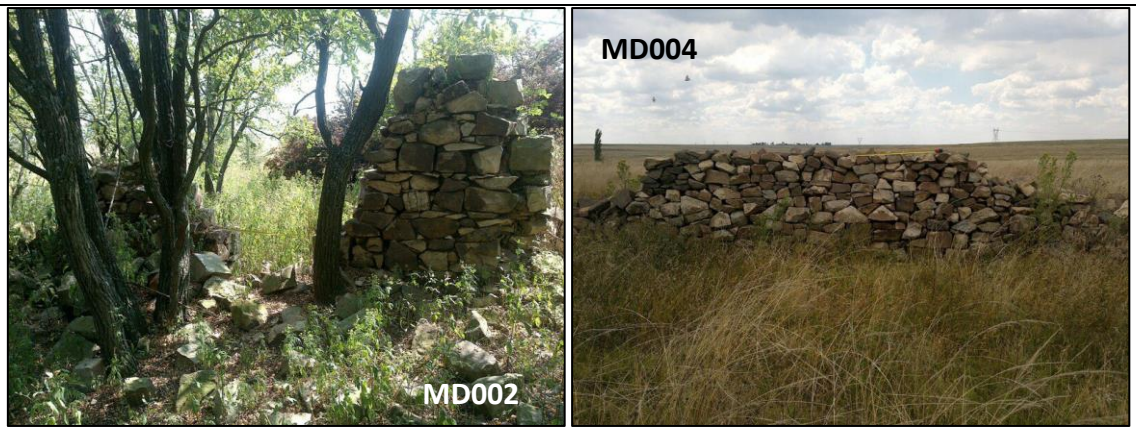

Figure 16: *Remains of stone walled features.*

Figure 17: *1953 (326_004_03645) and modern (Google Earth) aerial views showing sites MD001 to MD004.*

Significance and Grade:
MD002, MD004: Medium – GPA. Could contain graves of still borns which, if older than 60 years, would be IIIA.
MD003: Very low - GPC

Recommendations:
Unlikely to be directly impacted on by current layout. Should be mapped on layout plans and avoided by roads and ancillary infrastructure.

Site Number:	Description:	Period:
MD005	Remnants of a packed stone foundation of a demolished structure measuring some 10 m by 10 m and with some pieces of building rubble located nearby. The rubble includes modern bricks and cement.	Historic, recent

Figure 18: *Foundation remains of demolished structure and example of modern rubble scattered in the area.*

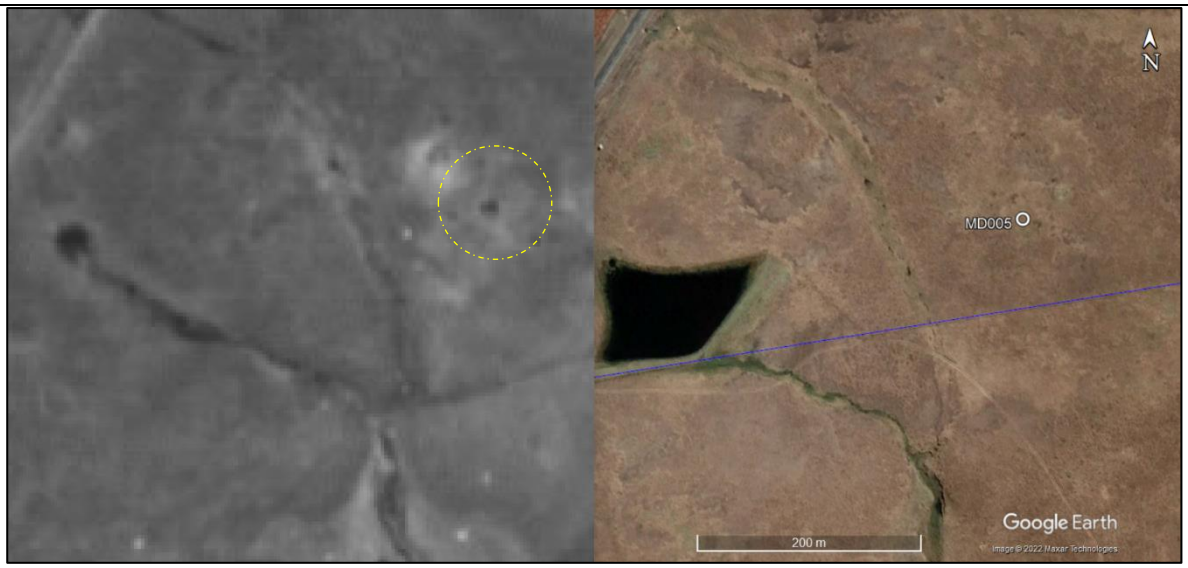

Figure 19: *1953 (326_004_03643) and modern (Google Earth) aerial views showing site MD005. it Although is not possible to tell whether the original building was still in use, the dark spot suggests that there was more standing fabric in 1953. It is evident that what appears to be a spring to the west has been turned into a dam.*

Significance and Grade:
Low – GPC. Could contain graves of still borns which, if older than 60 years, would be IIIA.

Recommendations:
Will be directly impacted on by current layout. Implementation of chance finds procedure.

Site Number:	Description:	Period:
MD007	Large ruined historical farmstead complex. The complex includes multiple degraded structures such as the farmhouse, a small rondavel, a small brick structure and a broken-down cattle handling area. The main farmhouse is built from stone and cement and includes multiple rooms with brick and cement garage that seems to be a recent addition to the main house ruin. The rondavel is also built from red bricks. The main house is about 20 by 30 m in size, while the overall farm complex measures some 100 m by 100 m.	Historic, recent

Figure 20: *Stone farmhouse ruin with brick garage addition.*

Figure 21: *1953 (326_004_03643) and modern (Google Earth) aerial views showing site MD007. The inset shows the main house ruin in 2003; it is evident that substantial loss of fabric has occurred since then.*

Significance and Grade:
Medium - GPA

Recommendations:
Unlikely to be directly impacted on by current layout. Should be mapped on layout plans and avoided by roads and ancillary infrastructure.

Site Number:	Description:	Period:
MD009	Remains of a demolished sandstone ruin. Various small foundations and demolished features are situated within close proximity of the main ruin. The main ruin is about 11 m by 6 m, while the larger area encompassing all demolished features is about 50 m by 50 m.	Recent past

Figure 22: *Remnants of structures that have been demolished.*

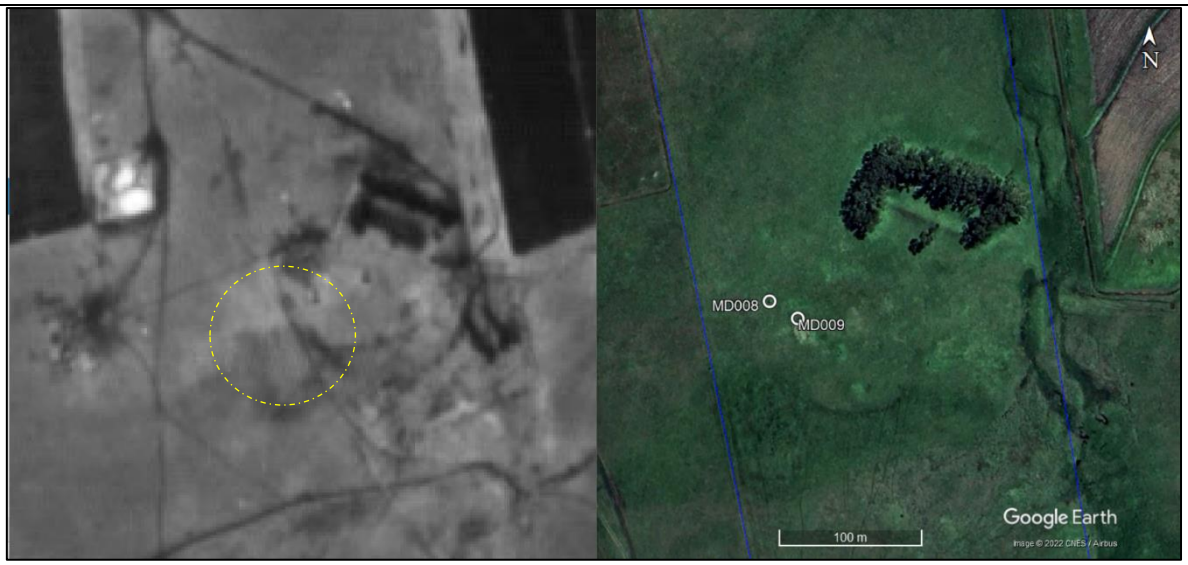

Figure 23: *1953 (326_004_03643) and modern (Google Earth) aerial views showing site MD009. The ruins are not specifically visible in 1953 suggesting they were already largely demolished at that time. It is evident from the many desire lines, however, that there was far more activity in the area in 1953 than there is today.*

Significance and Grade:
Low - GPB

Recommendations:
Unlikely to be directly impacted on by current layout. Should be mapped on layout plans and avoided by roads and ancillary infrastructure.

Site Number:	Description:	Period
MD011	Remains of a demolished stone structure measuring about 4 m by 4 m.	Historic, recent.

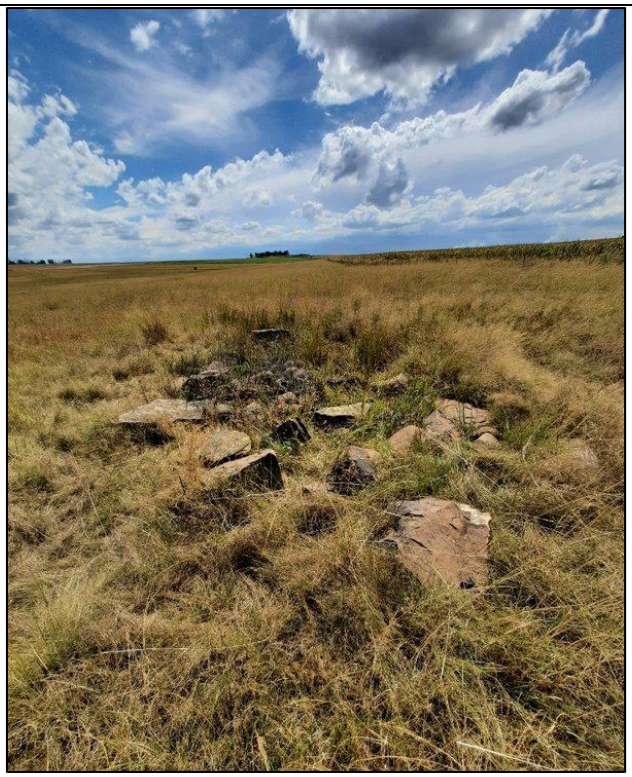

Figure 24: *General site conditions.*

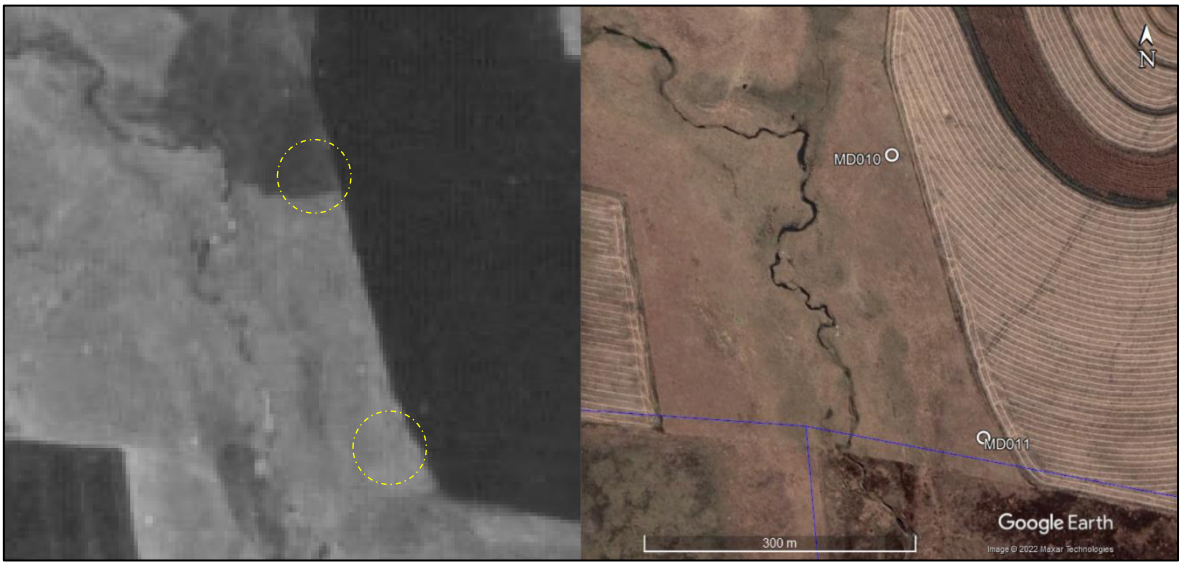

Figure 25: *1955 (201_009_04320) aerial view showing site MD010 and MD011. There is no sign of either, but it is evident that the ploughed field was already in use at that time suggesting that the stones of MD010 could have been cleared from that field.*

Significance and Grade:
Very low - GPC

Recommendations:
Will be directly impacted on by current layout. Implementation of chance finds procedure.

Site Number:	Description:	Period
MD012	Large, ruined historical farmstead containing multiple partially demolished or collapsed structures built mostly of stone blocks. Modern additions were added in recent times and built from brick. The various structures include a large farmhouse built mostly from stone blocks but with some modern brick elements, various smaller stone structures relating to the main farmhouse, a large stone kraal or walled field situated just north of the main farmstead and measuring about 110 m by 130 m and with smaller enclosures inside its western end, several other outbuildings to the west of the house. Most of the structures are fairly degraded. Most of the walling is still standing, but all roofs and joinery have been removed. The structures are all within an area of about 200 m by 200 m and the site lies outside the study area but very close to the boundary.	Historic, recent.

Figure 26: *The various ruins on site and a very large Eucalyptus near the house.*

Figure 27: *1953 (326_004_03643) and modern (Google Earth) aerial views showing site MD012. The dark patches corresponding with today's ruins show that the structures were still roofed at that time*

Significance and Grade:
Medium - GPA

Recommendations:
Outside study area.

In addition, two other sites have been identified from aerial photography. Both are stone-walled sites with one appearing to be an abandoned farmstead and the other a kraal. Although they were not visited and are not illustrated here, they are included in the mapping that follows. In line with other similar sites that were visited, both have been graded GPA.

Figure 28: *Aerial view of the abandoned and ruined farm complex identified from aerial photography.*

Figure 29: *Aerial view of the stone-walled kraal located from aerial photography.*

5.3. Graves

Site Number:	Description:	Period:
MD001	Small cemetery measuring some 10 m by 4 m and located about 140 m west of the stone ruin at MD002 and with which it is assumed to be associated. One grave has a rectangular granite headstone bearing the date 29-9-63. A second grave as a cement surround but no visible headstone, while the third is covered by a packed stone mound. The cemetery is situated next to a fence line and, from some remaining poles, seems to have been fenced off at some stage. The dated grave is 59 years old (i.e. not heritage) but the others are likely older, and the site is therefore assumed to be heritage.	Historic, Recent Past

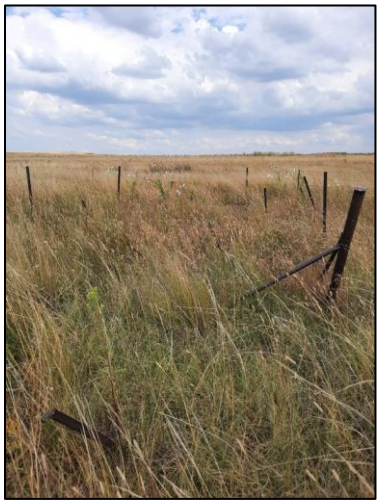


Figure 30: *Graves and site conditions.*

Significance and Grade:
High social significance

Recommendations:
Retain *in situ* with buffer zone

Site Number:	Description:	Period:
MD006	Three oval shaped piles of stones, each measuring approximately 1.5 m by 2 m. The area encompassing the three mounds is about 10 m by 3 m in dimension. The site is located near a fence line in an area used for grazing. Although unlikely given their informal appearance, they could be stone grave dressings marking graves. However, historical aerial photography shows that a ploughed field extended right up to this location in the past	Historic, recent

	and shows that the rocks were indeed cleared from that field. The site is thus not considered a heritage resource.	

Figure 31: *Possible stone packed grave and general site condition.*

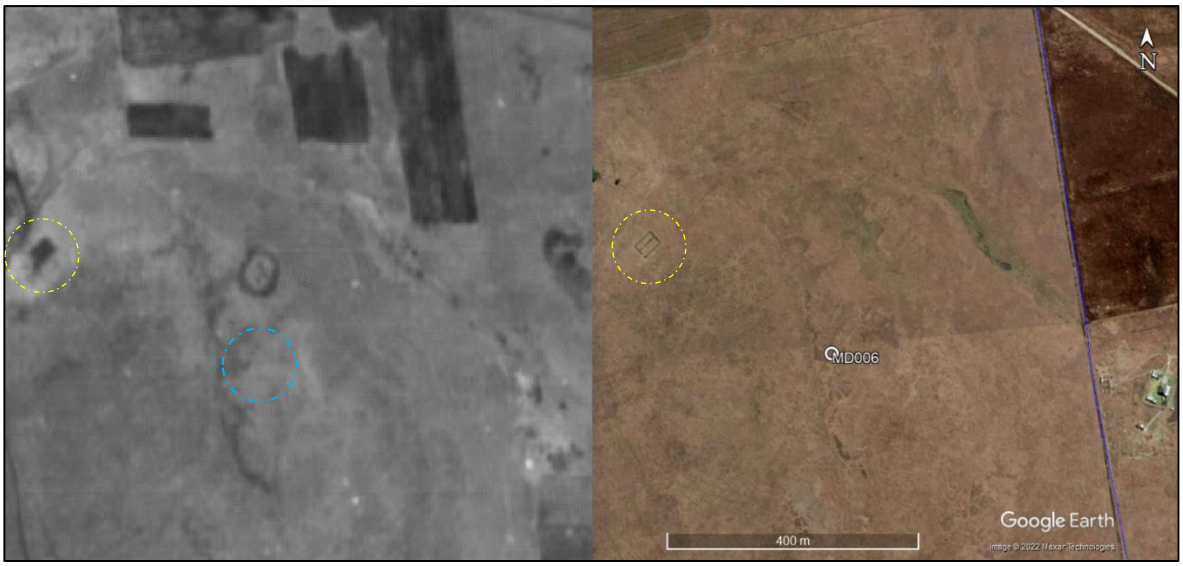

Figure 32: *1953 (326_004_03643) and modern (Google Earth) aerial views showing site MD006 right on the edge of an ephemeral seep (blue circle). It does not appear to be associated with anything and the oval feature to its north is not identifiable today. A kraal (presumably stone-walled) lies to the northwest close to a farmstead (yellow circles).*

Figure 33: *1953 (326_004_03643) aerial view showing site MD006 (in blue circle) with a ploughed field located to the west and coming right to the edge of the seep. This supports the stone piles being rocks cleared from the field. The kraal is just visible at the north-western edge of this field.*

Significance and Grade:
Not heritage

Site Number:	Description:	Period:
MD008	Two possible stone packed graves lying about 25 m northwest of the ruins at MD009. The features are very degraded and difficult to define. Sisal bush growing on top of the site. The two mounds lie in an area of about 4 m by 4 m. There is no interpretive evidence to be gained from the historical aerial photography shown under MD009. Therefore, for precautionary reasons they are given a grading of IIIA.	Historic, recent

Figure 34: *Stone packed features.*

Significance and Grade:
High - IIIA

Recommendations:
Unlikely to be directly impacted on by current layout. Should be mapped on layout plans and avoided by roads and ancillary infrastructure with an adequate buffer zone.

Site Number:	Description:	Period:
MD010	Possible stone packed grave situated some 90 m from a small stream and about 20 m from the edge of a ploughed field. The area is used for grazing. The stone feature as visible is about 1 m by 1.5 m in size. Although possibly representing stones cleared from the adjacent field, it is further than expected from the field. It is a low mound with a fairly distinctive grave-like shape and, for precautionary reasons, the site is considered a possible grave.	Historic, Recent

Figure 35: *Possible Stone packed grave.*

Statement of Significance:
High - IIIA

Recommendations:
Preserve *in situ* with an adequate buffer zone

In addition, one further possible graveyard has been identified from aerial photography. The site was not visited but an aerial view is shown in Figure 36. There is a strongly likelihood that this is a graveyard and it has been allocated a grade of IIIA for precautionary reasons.

Figure 36: *Aerial view of the likely graveyard at MD015 located from aerial photography.*

5.4. Historical aspects and the Built environment

5.4.1. Desktop study

During the mid-17th century, the Dutch East India Company established a trading post at modern-day Cape Town. Simultaneously, the Portuguese colonised Lourenço Marques (Maputo), Mozambique. As such, the Mpumalanga landscape became a thoroughfare for local and foreign traders. However, the increasing intensity of interaction among indigenous peoples and European merchants led to intensified competition over control of trade routes and accumulating wealth. Consequently, political centralisation led to warfare and population displacement (Derricourt & Evers 1973; Esterhuysen & Smith 2007; Delius *et al.* 2012).

By the 1830s, Dutch-speaking farmers started to migrate from modern-day Cape Town towards the interior regions of South Africa. Dutch-speaking migrants entering the region were confronted with existing tension between local groups due to the ongoing Mfecane, trade conflicts, and pressure from foreign merchants. Motivated to improve their own economic position within the area, more conflict between the Dutch, Sotho-Tswana and Nguni speaking communities started to take place (Giliomee & Mbenga 2007). Ultimately, Dutch-speaking farmers did settle in Mpumalanga and neighbouring provinces.

During the 1850s coalfields were already being exploited. Coal served a variety of purposes, as it still does today. From powering steam trains, ships, furnaces for smelting metals, it was also utilised within a domestic context, to heat up space and cook food. Since the discovery of diamonds and gold the industrial demand for coal increased significantly. Lucrative mining continued until the onset of the South African War of 1899 -1902 when the workforce joined the war effort, and, as usual during wartime, railways and infrastructure were destroyed. Following the end of the South African War, activities within the South African Union (formed in 1910) were aimed at stabilising the economy by focusing on agriculture and coal mining. However, post-war socio-economic and

political crises, especially after World War I (1914-1918) had a profound economic and political impact on the South African coal industry and mine workers (Giliomee & Mbenga 2007). Due to the relative economic and political stability after World War II (1939-1945), mining towns were established and coal mining continued. Today coal is still an integral part of the South African economy, used for the generation of electricity, synthetic fuels, and petrochemical products (Mathu & Chinomona 2013).

The discovery of coal, gold and diamonds during the mid-19th century led to a variety of socio-economic changes within South Africa. Since the discovery of mineral wealth, the new wage-economy and migrant labour systems contributed to the demise of traditional homestead economies and social organisation. In addition, competition for resources led to conflict, political upheavals and ultimately warfare (e.g., Crush & Soutter 1999; Delius 2014).

The province of Mpumalanga has the most collieries and the largest coalfield. The study area is situated near the town of Secunda within the Govan Mbeki Local Municipality. The town was established in 1976 by Sasol Limited, on the farm Goede Hoop (Schirmer 2007; Mathu & Chinomona 2013). Working a short way to the northeast of the present study area, Hardwick *et al.* (2019) recorded only relatively recent graves with the oldest gravestone dating to 1894 A and indicating colonial use of the landscape to not extend very far back.

The site itself is an agricultural landscape and, as shown on the historical aerial photography in Figure 37 and modern view in Figure 38, its overall character has not changed over the last 67 years. A few specific changes are noticeable, however:

- The cultivated lands have changed slightly with some no longer in use and some new ones;
- Some new farmsteads have been added in the area since 1953 (including some within the study area);
- The Secunda Sasol Refinery has been developed immediately north of the study area; and
- Various small farm dams have been added to the landscape.

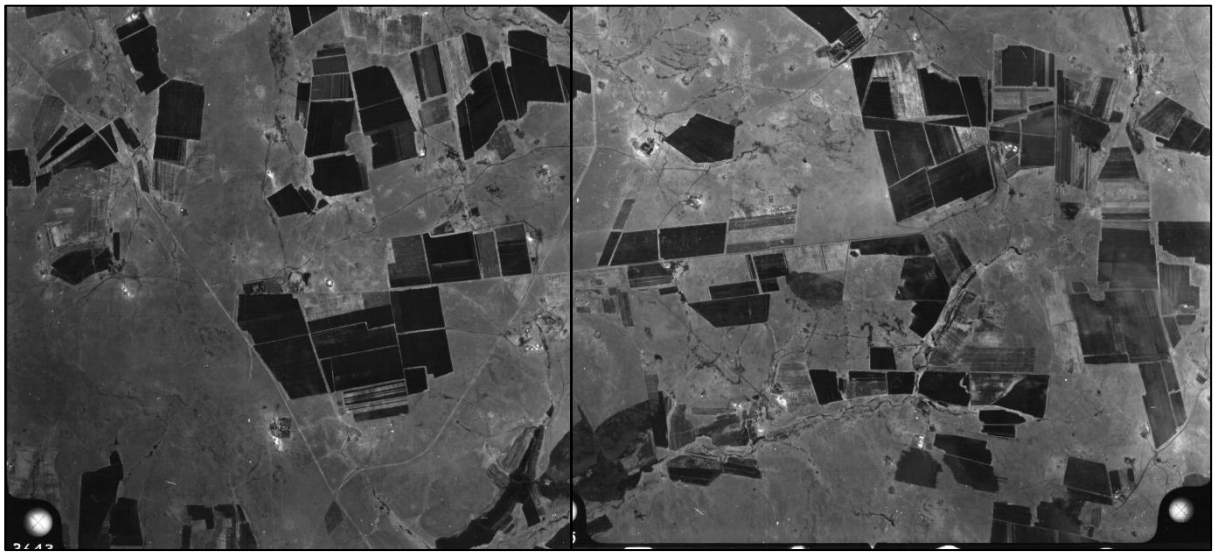

Figure 37: *Aerial view from 1953 (326_004_03643 & 5) showing the landscape as a patchwork of arable lands and grassland.*

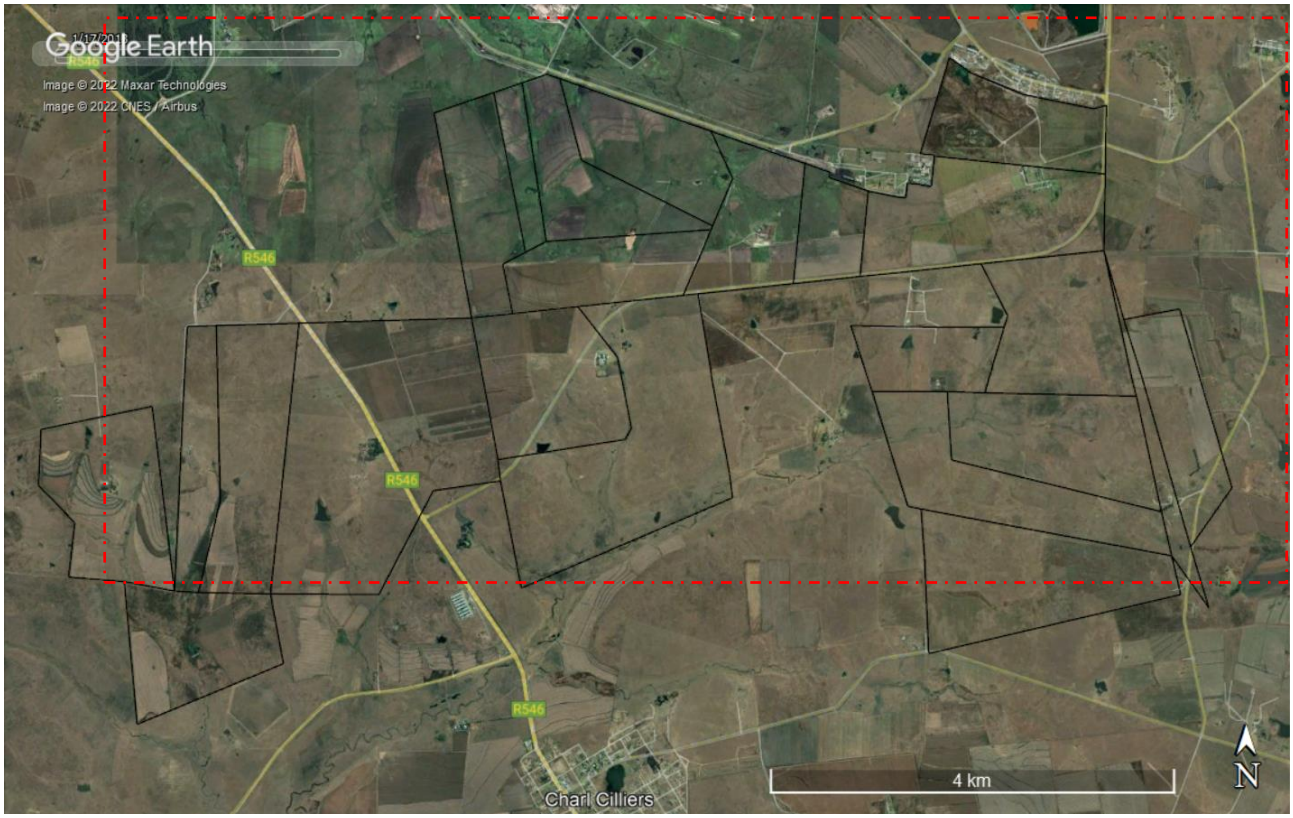

Figure 38: *Modern aerial view (Google Earth) showing a similar patchwork of arable lands and grassland. The red box represents the area covered by Figure 34 above.*

5.4.2. Site visit

It is evident from the historical archaeological finds that the agricultural landscape is historical, but many structures in the area seem to be relatively modern. No doubt a number of existing houses are older than 60 years but, because the survey focused on the then-proposed turbine locations, no houses were not visited. No buildings, historical or otherwise, will be directly impacted and no other historical sites are anticipated to occur in the study area.

5.5. Cultural landscapes and scenic routes

Cultural landscapes are the product of the interactions between humans and nature in a particular area. Sauer (1925) defined them thus: "The cultural landscape is fashioned from a natural landscape by a cultural group. Culture is the agent, the natural area is the medium, the cultural landscape the result".

As shown in Figure 34, the historical landscape is an agricultural one characterised by grazing lands (grass) and arable lands (planted with crops). The landscape is extensive and is punctuated by towns and coal mines. It is not a particularly sensitive cultural landscape with most of its development having taken place during the 20th century. Locally, it is compromised by the very large Sasol facility located 5 km north of the study area, and several coal mines in the surrounding landscape.

There are no scenic routes in the area and the R546 that runs from northwest to southeast through the western part of the study area is a relatively minor road that is highly unlikely to be considered a scenic route.

5.6. Statement of significance and provisional grading

Section 38(3)(b) of the NHRA requires an assessment of the significance of all heritage resources. In terms of Section 2(vi), ‘‘cultural significance’’ means aesthetic, architectural, historical, scientific, social, spiritual, linguistic or technological value or significance. The reasons that a place may have cultural significance are outlined in Section 3(3) of the NHRA (see Section 2 above).

The archaeological resources are deemed to have low to medium cultural significance at the local level for their scientific value and can be variably graded from GPA to GPC.

Graves are deemed to have high cultural significance at the local level for their social value. They are allocated a grade of IIIA. Possible graves are included here for precautionary reasons.

The cultural landscape is largely an agricultural landscape with low aesthetic value due to the visual intrusions from the nearby Sasol facility and coal mines which add an industrial layer. It is rated as having low cultural significance at the local level.

Figure 39 shows a grade map with all currently known heritage resources indicated with 50 m buffers.

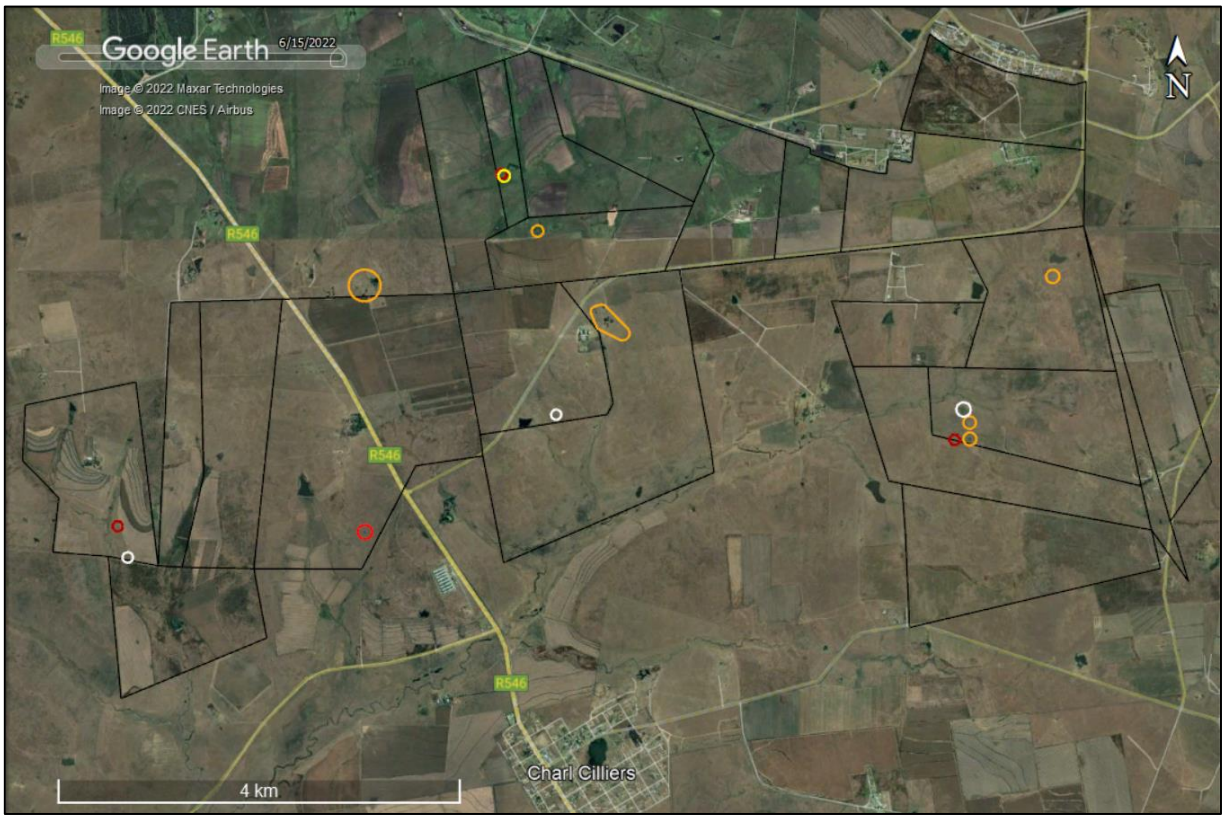

Figure 39: *Grade map of the study area showing the locations of all sites found. They are coloured as follows: Graded IIIA = dark red, GPA = orange, GPB = yellow and GPC = white.*

6. ASSESSMENT OF IMPACTS

The impacts identified for the Mukondleli WEF are as follows:

- *Construction phase:*
  - Impacts to palaeontology
  - Impacts to archaeology
  - Impacts to graves
  - Impacts to the cultural landscape
- *Operation phase:*
  - Impacts to the cultural landscape
- *Decommissioning phase:*
  - Impacts to the cultural landscape

While palaeontological heritage is assessed in the separate specialist study, all the other impacts are considered here. It should be noted that there is no difference between the two substation locations and that the assessments below apply equally to the WEF with the Alternative 1 and the Alternative 2 substations.

6.1. Construction Phase

6.1.1. Impacts to archaeological resources

Direct impacts to archaeological resources would occur during the construction phase when grubbing and construction commence. Culturally significant archaeological sites do not occur close to the turbine locations but, significantly, the locations of roads, laydown areas and other infrastructure is not yet known. For precautionary reasons it is thus assumed that some impacts might occur and the impact significance calculates to **moderate negative**. Mitigation would entail surveying the as yet unsurveyed areas (but arable lands need not be covered), micrositing of infrastructure as required to avoid any impacts as well as reporting any further sites discovered during construction. With mitigation, the significance reduces to **very low negative**.

There are no fatal flaws in terms of construction phase impacts to archaeology.

6.1.2. Impacts to graves

Several graves or possible graves have been recorded in the overall study area but with one possible exception, none occur close to the turbine locations provided. The exception is a likely graveyard that was identified from aerial photography and lies within 10 m of turbine MK-24 and is thus certain to be impacted by the hardstand area. It is assumed here that the site is a graveyard and that it would be impacted. Because of the very high cultural significance of graves the magnitude of impacts to graves is rated high. Because most of the layout remains unsurveyed there is still a chance of impacts occurring elsewhere as well. The resulting impact significance is **high negative**. Mitigation will entail avoiding all graves and potential graves and reporting any chance finds of unmarked graves during construction. A pre-construction survey should also be undertaken to determine whether any graves are visible in the final footprint. With mitigation the significance would reduce to **very low negative**. The calculated ratings are considered one level too low but have been conditioned by the very small extent of the

impacts. Ratings of **very high negative** and **low negative** before and after mitigation might actually be more appropriate.

Impacts to graves would be considered a fatal flaw but if mitigation results in MD015 being avoided then there are no fatal flaws in terms of construction phase impacts to graves.

6.1.3. Impacts to the cultural landscape

The local landscape is already heavily compromised by the nearby Sasol facility and coal mines. As such, the intrusion into this landscape of the construction equipment and solar panels is considered to be of low magnitude. Due to the certainty of an impact occurring, the significance calculates to **moderate negative**. Minimising the construction duration, minimising landscape disturbance in general and ensuring rehabilitation of areas not needed during operation will result in a reduction in the calculated significance numerically, but the rating is still **moderate negative**. A rating of **low negative**, however, is considered a better fit considering the existing impacts to the landscape.

There are no fatal flaws in terms of construction phase impacts to the cultural landscape.

6.2. Operation Phase

6.2.1. Impacts to the cultural landscape

As before, the local landscape is already heavily compromised by the nearby Sasol facility and coal mines. As such, the intrusion into this landscape of the solar panels and related infrastructure is considered to be of only low magnitude. Due to the certainty of an impact occurring, the significance calculates to **moderate negative**. There are no specific mitigation measures that can be applied during operation other than the best practice measure of ensuring that all maintenance work occurs within designated areas. Post-mitigation significance would remain at the **moderate negative** level. A rating of **low negative**, however, is considered a better fit considering the existing impacts to the landscape.

There are no fatal flaws in terms of operation phase impacts to the cultural landscape.

6.3. Decommissioning Phase

Once again, because the local landscape is compromised by the Sasol facility and coal mines, the intrusion into this landscape of the equipment needed for decommissioning is considered to be of low magnitude. The significance calculates to **moderate negative**. Minimising the decommissioning duration and ensuring full rehabilitation post-closure will not result in a change to the calculated significance which remains **moderate negative**. A rating of **low negative**, however, is considered a better fit considering the existing impacts to the landscape.

There are no fatal flaws in terms of operation phase impacts to the cultural landscape.

Table 6: *Assessment of impacts.*

Impact number	Aspect	Description	Stage	Character	Ease of Mitigation	Pre-Mitigation							Post-Mitigation						
						(M+	E+	R+	D)x	P=	S	Rating	(M+	E+	R+	D)x	P=	S	Rating
Impact 1:	Archaeology	Damage to or destruction of archaeological resources	Construction	Negative	High	3	1	5	5	3	**42**	**N3**	1	1	5	5	1	**12**	**N1**
					Significance	**N3 - Moderate**							**N1 - Very Low**						
Impact 2:	Graves	Damage to or destruction of graves	Construction	Negative	High	5	1	5	5	5	**80**	**N4**	1	1	5	5	1	**12**	**N1**
					Significance	**N4 - High**							**N1 - Very Low**						
Impact 3:	Cultural landscape	Visual intrusion into and change of character of the cultural landscape	Construction	Negative	Low	2	2	3	2	5	**45**	**N3**	1	2	3	2	5	**40**	**N3**
					Significance	**N3 - Moderate**							**N3 - Moderate**						
Impact 4:	Cultural landscape	Visual intrusion into and change of character of the cultural landscape	Operation	Negative	Low	2	2	3	4	5	**55**	**N3**	1	2	3	4	5	**50**	**N3**
					Significance	**N3 - Moderate**							**N3 - Moderate**						
Impact 5:	Cultural landscape	Visual intrusion into and change of character of the cultural landscape	Decommis-sioning	Negative	Low	2	2	3	2	5	**45**	**N3**	1	2	3	2	5	**40**	**N3**
					Significance	**N3 - Moderate**							**N3 - Moderate**						

6.4. Cumulative impacts

Various other projects are proposed in the wider area and might impact upon heritage resources. Cumulative impacts would occur through the construction, operation and decommissioning of many projects in the same general area. The projects considered in the assessment of cumulative impacts are listed in Table 7. In terms of archaeology, a known site is under threat from the Mukondeleli powerline which results in a high probability of impacts but mitigation would still bring the significance down from **high negative** to **very low negative** (Table 8). Graves are generally unlikely to be impacted but are present widely in the landscape and one graveyard in the present project is at risk of impacts. Mitigation would reduce the impact significance from **very high negative** to **very low negative**. Cumulative impacts to the landscape are likely to be **moderate negative** both before and after mitigation for all three phases.

Table 7: *Other projects considered for the cumulative impact assessment.*

Project	Relative location
The authorised Tutuka 65.9 MW Solar Photovoltaic (PV) Energy Facility and its associated infrastructure (Ref: 14/12/16/3/3/2/754)	23km to the southeast
The authorised Forzando North Coal Mine Solar PV Facility, 9.5MW, (Ref: 14/12/16/3/3/1/452)	55km to the northeast
The proposed Impumelelo WEF	Approximately 25km to the west
The proposed Vhuvhili Solar Energy Facility (NEAS No. MPP/EIA/0001063/2022)	Approximately 10km to the east

6.5. Evaluation of impacts relative to sustainable social and economic benefits

Section 38(3)(d) of the NHRA requires an evaluation of the impacts on heritage resources relative to the sustainable social and economic benefits to be derived from the development.

The proposed facility will be providing electricity to South Africa which will result in obvious benefits to society at many levels. There will be local job creation during construction and operation but, more widely, an improvement in electricity supply in South Africa will stimulate the economy and result in new job opportunities opening up and quality of life improving. These are clear economic and social benefits and, if mitigation is applied as suggested above, then the socio-economic benefits outweigh the residual impacts.

6.6. Existing impacts to heritage resources

There are currently no obvious threats to heritage resources on the site aside from the natural degradation, weathering and erosion that will affect archaeological materials. Trampling from grazing animals and/or farm/other vehicles could also occur. These impacts would be of **negligible negative** significance. The local landscape, which is generally agricultural in nature, is, as noted above, already impacted by the Sasol facility and coal mines. Although the significance of this impact could be considered as **moderate to high negative**, such facilities are an expected part of the Highveld landscape and have been for many years.

Table 8: *Assessment of cumulative impacts.*

Impact number	Aspect	Description	Stage	Character	Ease of Mitigation	Pre-Mitigation							Post-Mitigation						
						(M+	E+	R+	D)x	P=	S	Rating	(M+	E+	R+	D)x	P=	S	Rating
Impact 1:	Archaeology	Damage to or destruction of archaeological resources	Construction	Negative	High	3	3	5	5	5	**80**	**N4**	1	3	5	5	1	**14**	**N1**
					Significance	**N4 - High**							**N1 - Very Low**						
Impact 2:	Graves	Damage to or destruction of graves	Construction	Negative	High	5	3	5	5	5	**90**	**N5**	1	3	5	5	1	**14**	**N1**
					Significance	**N5 – Very HIgh**							**N1 - Very Low**						
Impact 3:	Cultural landscape	Visual intrusion into and change of character of the cultural landscape	Construction	Negative	Low	2	3	3	2	5	**50**	**N3**	1	3	3	2	5	**45**	**N3**
					Significance	**N3 - Moderate**							**N3 - Moderate**						
Impact 4:	Cultural landscape	Visual intrusion into and change of character of the cultural landscape	Operation	Negative	Low	2	3	3	4	5	**60**	**N3**	1	3	3	4	5	**55**	**N3**
					Significance	**N3 - Moderate**							**N3 - Moderate**						
Impact 5:	Cultural landscape	Visual intrusion into and change of character of the cultural landscape	Decommis-sioning	Negative	Low	2	3	3	2	5	**50**	**N3**	1	3	3	2	5	**45**	**N3**
					Significance	**N3 - Moderate**							**N3 - Moderate**						

6.7. The No-Go alternative

If the project were not implemented then the site would stay as it currently is (impact significance of **neutral**). Although the heritage impacts with implementation would be greater than the existing impacts, the loss of socio-economic benefits is more significant and suggests that the No-Go option is less desirable in heritage terms.

6.8. Levels of acceptable change

Any impact to an archaeological or palaeontological resource or a grave is deemed unacceptable until such time as the resource has been inspected and studied further if necessary. Impacts to the landscape are difficult to quantify but in general a development that visually dominates the landscape from many publicly accessible vantage points is undesirable. Because of the height of the majority of the proposed development and the flatness of the landscape, such an impact to the landscape is envisaged but, because of the existing visual clutter, it is not deemed unacceptable.

7. INPUT TO THE ENVIRONMENTAL MANAGEMENT PROGRAM

The actions recorded in Table 9 should be included in the environmental management program (EMPr) for the project.

Table 9: *Heritage considerations for inclusion in the EMPr.*

Impact	**Mitigation / management objectives & outcomes**	**Mitigation / management actions**	**Monitoring**		
			Methodology	**Frequency**	**Responsibility**
Impacts to archaeology and graves					
Damage or destruction of archaeological sites or graves	Avoid impacts (preferred) or locate and sample or rescue sites/burials before disturbance	Pre-construction survey, micro-siting of infrastructure, make recommendations for mitigation.	Appoint archaeologist to conduct survey well before construction	Once-off	Project developer
Damage or destruction of archaeological sites or graves	Rescue information, artefacts or burials before extensive damage occurs	Reporting chance finds as early as possible, protect in situ and stop work in immediate area.	Inform staff to be vigilant and carry out inspections of new excavations	Ongoing basis	Construction Manager or Contractor
				Whenever on site (at least weekly)	ECO
Impacts to the cultural landscape					
Visible landscape scarring	Minimise landscape scarring	Ensure disturbance is kept to a minimum and does not exceed project requirements. Rehabilitate areas not needed during operation.	Monitoring of surface clearance relative to approved layout	Ongoing basis	Construction Manager or Contractor
				As required	ECO

8. CONCLUSIONS

Although archaeological materials were seen in various places, these were infrequent and are of generally low to medium significance. A few more important sites also occur and have been avoided by the turbine layout. The primary concern for any project in this area is graves and one likely graveyard is under threat from turbine MK-24 (Figure 40). With so little of the layout surveyed there is always a chance that more graves may come to light. Aside from this one likely graveyard, there are no significant concerns for this project based on current knowledge, but a pre-construction survey will be very important to minimise potential impacts, especially considering that the full layout is as yet unknown. A good number of turbines are within ploughed lands and these are considered as being of very low sensitivity and would not need to be checked by the pre-construction survey.

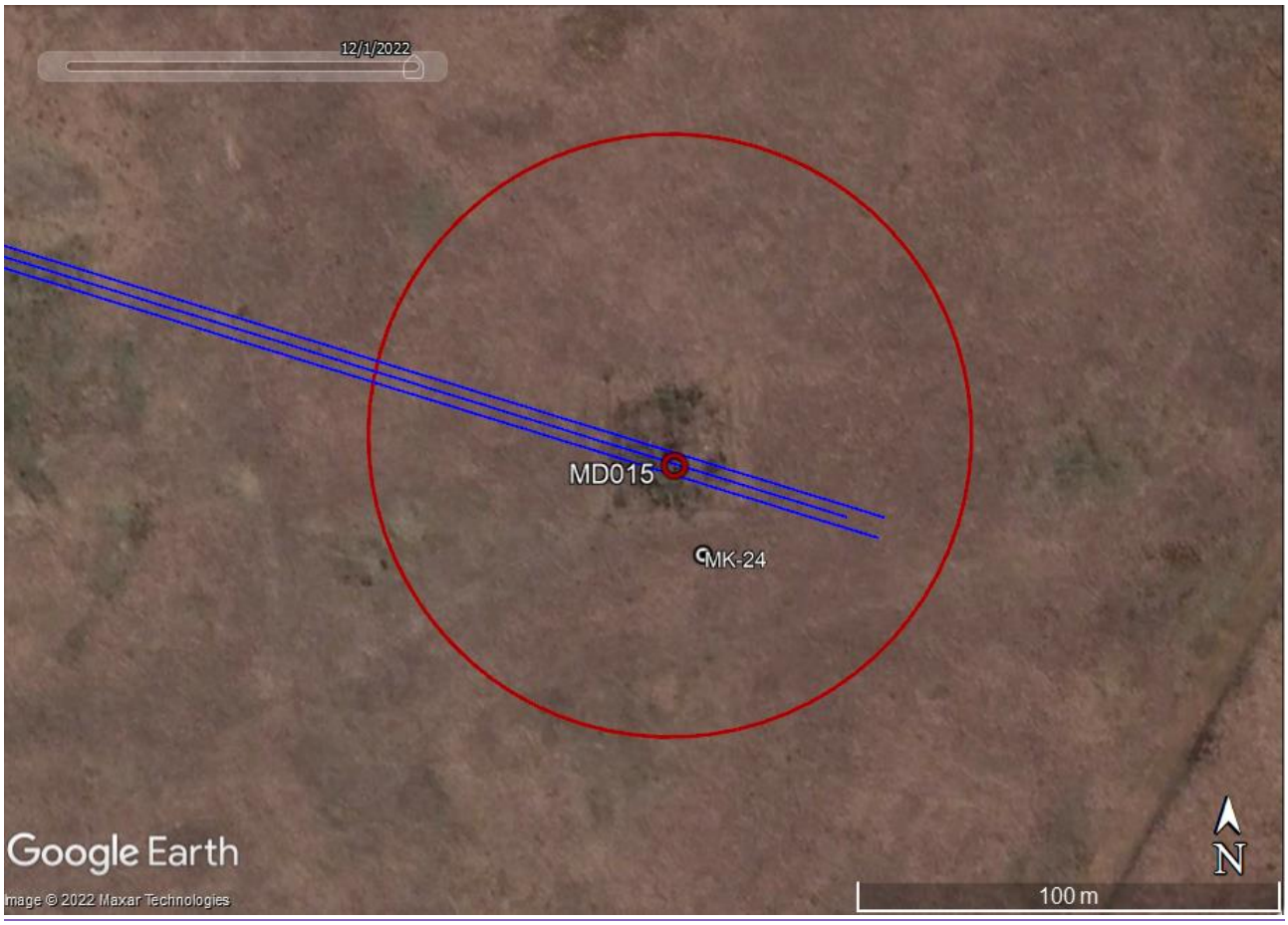

Figure 40: *Potential graveyard close to Turbine MK-24 and crossed by its access road. The red circle is a 50 m buffer around what looks like a fenced area and is assumed to be a graveyard.*

Although the expected impacts are the same for both substation alternatives, Alternative 1 is marginally preferred simply because it is located slightly further from the public road.

8.1. Reasoned opinion of the specialist

The vast majority of the study area is, or is likely to be, of low sensitivity. Micro-siting of infrastructure during the final EMPr approval stage is likely to be able to deal with any further

impacts that might be discovered during a pre-construction survey. There is only one significant concern – the likely graveyard at MK-24 – but this should be easily avoided through micro-siting of infrastructure. As such, and so long as the MK-24 site is avoided, there are no significant heritage concerns for this project and it is the opinion of the heritage consultant that the proposed Mukondeleli WEF may be authorised in full with either of the substation alternatives.

9. RECOMMENDATIONS

It is recommended that the proposed Mukondeleli WEF be authorised with either substation alternative, but subject to the following recommendations which should be included as conditions of authorisation:

- A pre-construction survey needs to be undertaken on all unploughed sections of the final layout;
- The likely graveyard alongside turbine MK-24 must be buffered by a minimum of 50 m unless the site is checked and confirmed not to be a graveyard;
- No stones may be removed from any archaeological site; and
- If any archaeological material or human burials are uncovered during the course of development then work in the immediate area should be halted. The find would need to be reported to the heritage authorities and may require inspection by an archaeologist. Such heritage is the property of the state and may require excavation and curation in an approved institution.

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APPENDIX 1 – Curriculum Vitae

Curriculum Vitae

Jayson David John Orton

ARCHAEOLOGIST AND HERITAGE CONSULTANT

Contact Details and personal information:

Address: 23 Dover Road, Muizenberg, 7945
Telephone: (021) 788 1025
Cell Phone: 083 272 3225
Email: jayson@asha-consulting.co.za

Birth date and place: 22 June 1976, Cape Town, South Africa
Citizenship: South African
ID no: 760622 522 4085
Driver's License: Code 08
Marital Status: Married to Carol Orton
Languages spoken: English and Afrikaans

Education:

SA College High School	Matric	1994
University of Cape Town	B.A. (Archaeology, Environmental & Geographical Science)	1997
University of Cape Town	B.A. (Honours) (Archaeology)*	1998
University of Cape Town	M.A. (Archaeology)	2004
University of Oxford	D.Phil. (Archaeology)	2013

*Frank Schweitzer memorial book prize for an outstanding student and the degree in the First Class.

Employment History:

Spatial Archaeology Research Unit, UCT	Research assistant	Jan 1996 – Dec 1998
Department of Archaeology, UCT	Field archaeologist	Jan 1998 – Dec 1998
UCT Archaeology Contracts Office	Field archaeologist	Jan 1999 – May 2004
UCT Archaeology Contracts Office	Heritage & archaeological consultant	Jun 2004 – May 2012
School of Archaeology, University of Oxford	Undergraduate Tutor	Oct 2008 – Dec 2008
ACO Associates cc	Associate, Heritage & archaeological consultant	Jan 2011 – Dec 2013
ASHA Consulting (Pty) Ltd	Director, Heritage & archaeological consultant	Jan 2014 –

Professional Accreditation:

Association of Southern African Professional Archaeologists (ASAPA) membership number: 233
CRM Section member with the following accreditation:

- Principal Investigator: Coastal shell middens (awarded 2007)
  Stone Age archaeology (awarded 2007)
  Grave relocation (awarded 2014)
- Field Director: Rock art (awarded 2007)
  Colonial period archaeology (awarded 2007)

Association of Professional Heritage Practitioners (APHP) membership number: 43

- Accredited Professional Heritage Practitioner

➢ *Memberships and affiliations:*

South African Archaeological Society Council member	2004 – 2016
Assoc. Southern African Professional Archaeologists (ASAPA) member	2006 –
UCT Department of Archaeology Research Associate	2013 – 2017
Heritage Western Cape APM Committee member	2013 –
UNISA Department of Archaeology and Anthropology Research Fellow	2014 –
Fish Hoek Valley Historical Association	2014 –
Kalk Bay Historical Association	2016 –
Association of Professional Heritage Practitioners member	2016 –

Fieldwork and project experience:

Extensive fieldwork and experience as both Field Director and Principle Investigator throughout the Western and Northern Cape, and also in the western parts of the Free State and Eastern Cape as follows:

Feasibility studies:

- Heritage feasibility studies examining all aspects of heritage from the desktop

Phase 1 surveys and impact assessments:

- Project types
  - Notification of Intent to Develop applications (for Heritage Western Cape)
  - Desktop-based Letter of Exemption (for the South African Heritage Resources Agency)
  - Heritage Impact Assessments (largely in the Environmental Impact Assessment or Basic Assessment context under NEMA and Section 38(8) of the NHRA, but also self-standing assessments under Section 38(1) of the NHRA)
  - Archaeological specialist studies
  - Phase 1 archaeological test excavations in historical and prehistoric sites
  - Archaeological research projects
- Development types
  - Mining and borrow pits
  - Roads (new and upgrades)
  - Residential, commercial and industrial development
  - Dams and pipe lines
  - Power lines and substations
  - Renewable energy facilities (wind energy, solar energy and hydro-electric facilities)

Phase 2 mitigation and research excavations:

- ESA open sites
  - Duinefontein, Gouda, Namaqualand
- MSA rock shelters
  - Fish Hoek, Yzerfontein, Cederberg, Namaqualand
- MSA open sites
  - Swartland, Bushmanland, Namaqualand
- LSA rock shelters
  - Cederberg, Namaqualand, Bushmanland
- LSA open sites (inland)
  - Swartland, Franschhoek, Namaqualand, Bushmanland
- LSA coastal shell middens
  - Melkbosstrand, Yzerfontein, Saldanha Bay, Paternoster, Dwarskersbos, Infanta, Knysna, Namaqualand
- LSA burials
  - Melkbosstrand, Saldanha Bay, Namaqualand, Knysna
- Historical sites
  - Franschhoek (farmstead and well), Waterfront (fort, dump and well), Noordhoek (cottage), variety of small excavations in central Cape Town and surrounding suburbs
- Historic burial grounds
  - Green Point (Prestwich Street), V&A Waterfront (Marina Residential), Paarl

Awards:

Western Cape Government Cultural Affairs Awards 2015/2016: Best Heritage Project.

APPENDIX 2 – Site Sensitivity Verification

As required in Part A of the Government Gazette 43110, GN 320, a site sensitivity verification was undertaken in order to confirm the current land use and environmental sensitivity of the proposed project area as identified by the National Web-Based Environmental Screening Tool. The details of the site sensitivity verification are noted below:

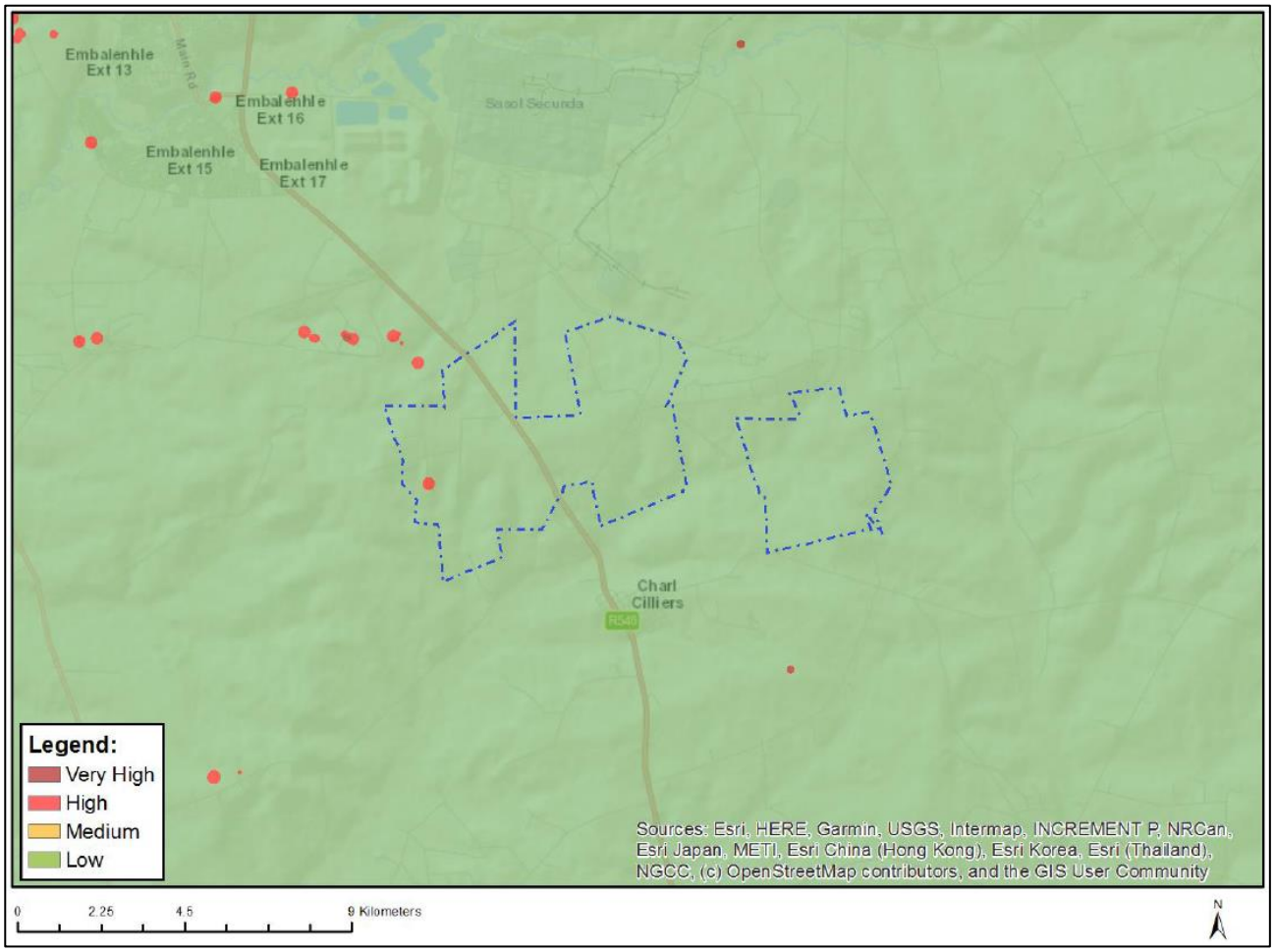
Date of Site Visit	24 and 25 March and 01 April 2022
Specialist Name	Jaco van der Walt
Professional Registration Number	ASAPA: 159; APHP: 114
Specialist Affiliation / Company	Beyond Heritage (Pty) Ltd

Method of the Site Sensitivity Verification

Initial work was carried out through field study of the preliminary turbine layout. Subsequent work included assessing modern and historical aerial photography in combination with the authors' accumulated knowledge of the local landscape. Desktop research was also used to inform on the heritage context of the area. This information is presented in the report (Sections 5.2.1 and 5.4.1).

Outcome

The first map below is extracted from the screening tool report and shows the archaeological and heritage sensitivity to be low throughout the study area with the exception of one small area of high sensitivity in the west that appears to be associated with a farmstead. The site visit showed that in fact the majority of the site is of low sensitivity but that a number of small areas (where heritage resources were found) considered to be of medium to high sensitivity. The second map below shows the areas considered to be sensitive from a heritage point of view. Medium to high cultural significance site (orange and red) can be considered high sensitivity while low cultural significance sites can be considered as being of medium sensitivity. A photographic record and description of the relevant heritage resources are contained within the impact assessment report.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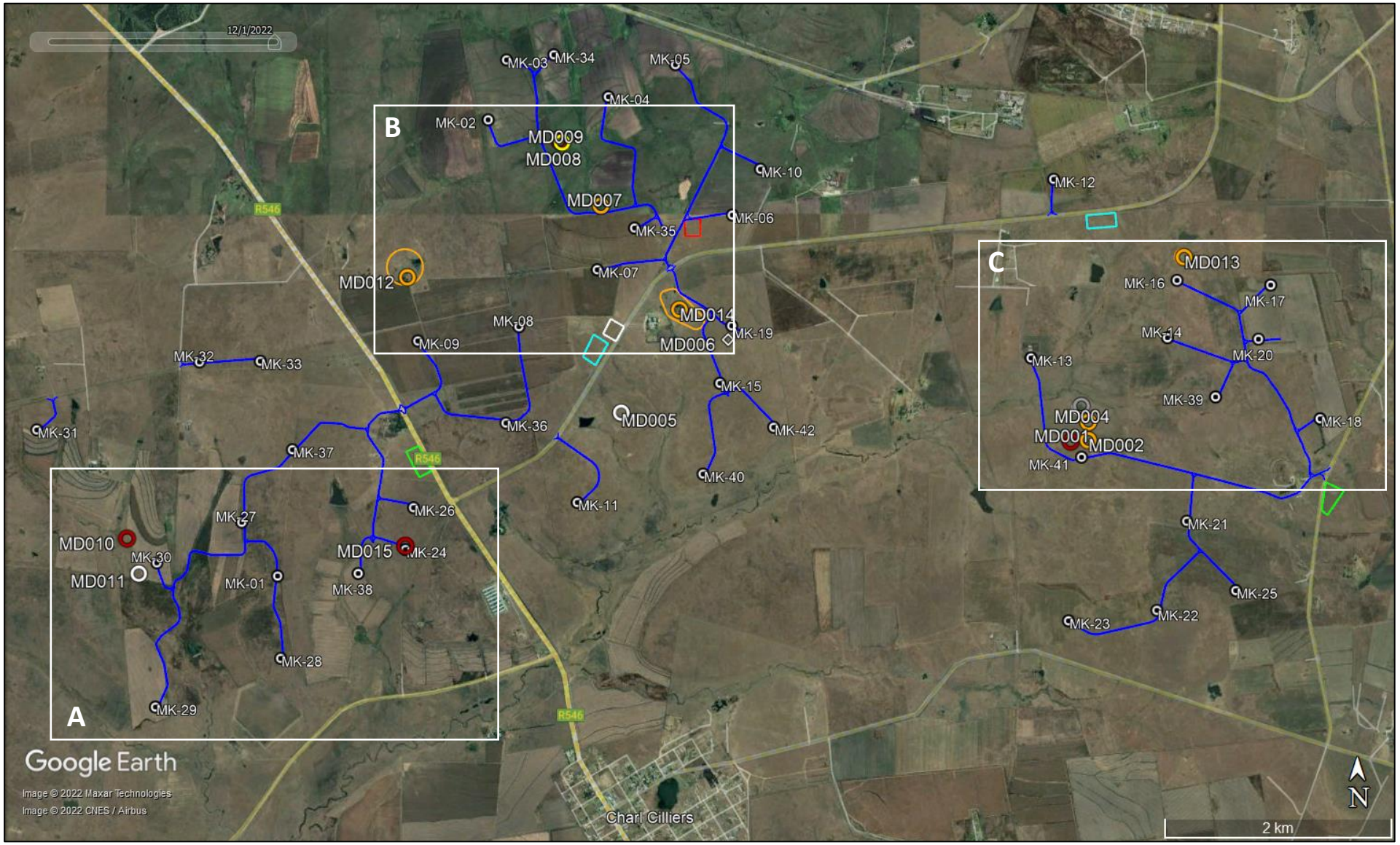
APPENDIX 3 – Mapping

The mapping below shows the locations of all finds.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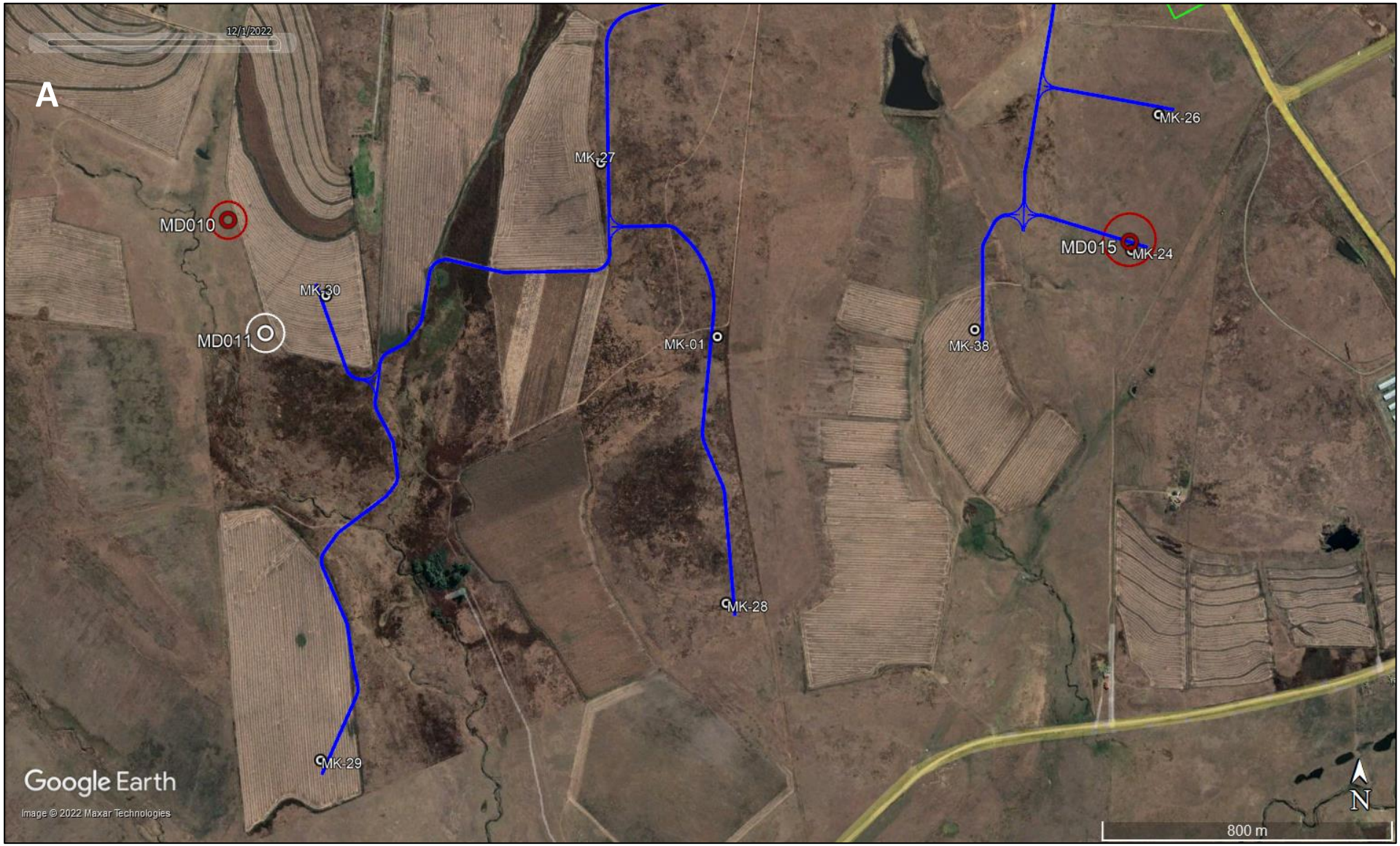
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Image © 2022 Maxar Technologies
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Image © 2022 Maxar Technologies
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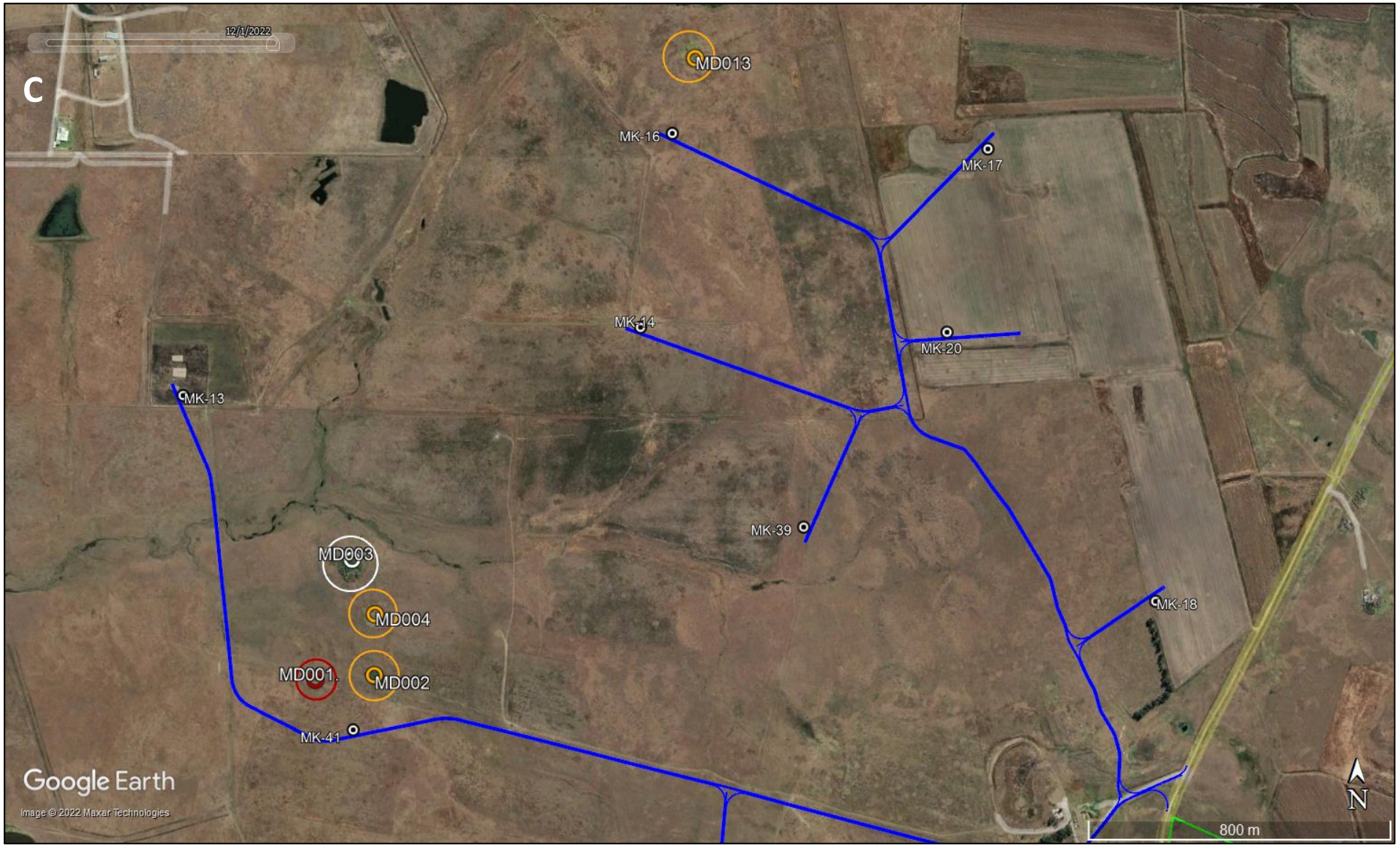
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