HERITAGE IMPACT ASSESSMENT

In terms of Section 38(8) of the NHRA for the

UMMBILA EMOYENI RENEWABLE ENERGY SOLAR PV FACILITY, MPUMALANGA PROVINCE

Prepared by CTS Heritage

CTS HERITAGE

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For

Savannah Environmental

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EXECUTIVE SUMMARY

1. Site Name:

Ummbila Emoyeni Solar Energy Facility

2. Location:

South of Bethal, Mpumalanga

3. Locality Plan:

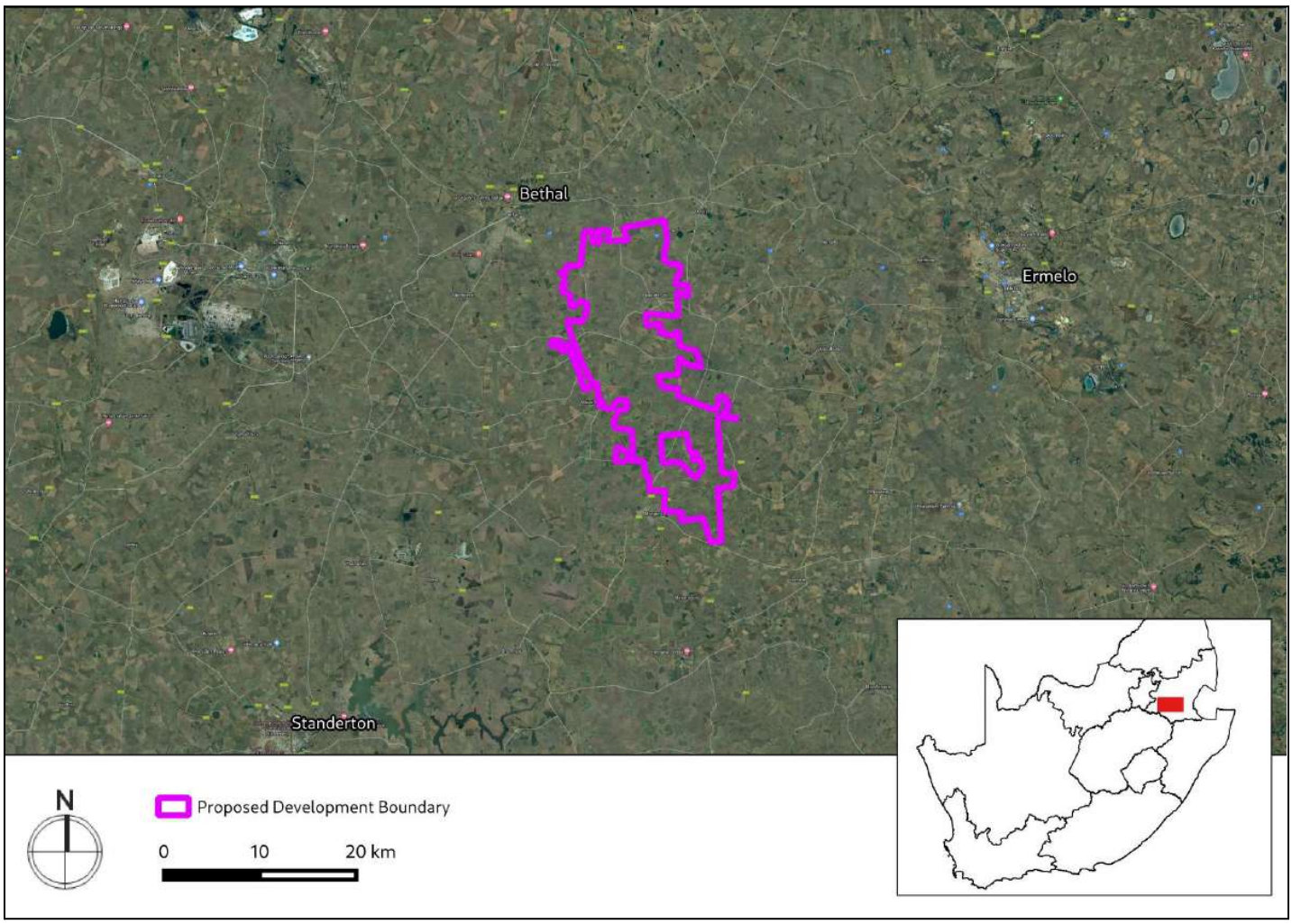

Figure 1: Location of the proposed development area

4. Description of Proposed Development:

Emoyeni Renewable Energy Farm (Pty) Ltd is proposing the development of a commercial Solar Energy Facility and associated infrastructure on a site located ~6km south-east of Bethal and 1km east of Morgenzon, within the Mpumalanga Province. The project site is located across the Govan Mbeki, Lekwa, and Msukaligwa Local Municipalities within the Gert Sibande District on the following properties:

Properties affected by the Ummbila Emoyeni Solar Energy Facility

Parent Farm Number	Farm Portions
Farm 264 – Geluksplaats	0, 11
Farm 423 – Bekkerust	0 R/E, 1, 5 R/E, 22,
Farm 420 – Rietfontein	8, 9, 10, 32

A preferred project focus area with an extent of 27 819ha been identified by Emoyeni Renewable Energy Farm (Pty) Ltd as a technically suitable area for the development of the Ummbilla Emoyeni Renewable Energy Farm with a contracted capacity of up to 666MW of wind energy and 150MW of solar energy. This layout, and project capacity, will be reduced as the EIA and scoping process identifies environmental constraints that exclude areas for development. This HIA assesses the likely impacts to heritage resources associated with the proposed Solar Energy Facility

5. Anticipated Impacts on Heritage Resources:

As noted by the VIA completed for this project, "The proposed landscape is relatively typical of the region and is not protected." However, the nature of the relationship between various landscape elements such as the farm werfs and road network contributes to the sense of place of this rural landscape. Recommendations to mitigate negative impact to this sense of place are outlined below.

Even though the area is rich in history, no significant archaeological heritage resources were identified during the field assessment. No Stone Age or Iron Age heritage resources were identified during the survey. The few heritage resources that were identified consist of the ruins of older farm structures and kraals. Due to the paucity of older farm structures in the area as a result of demolition, it is recommended that the identified ruins and kraals remain untouched and that a safety buffer should exist around all such structures. The field assessment identified six burial grounds or graves close to or within the proposed development footprints of turbines and roads. All graves

are of high local significance as a result of their social and cultural value, and are therefore graded IIIA. Mitigation measures for their ongoing conservation are proposed below.

The area proposed for the solar PV development is underlain by sediments of insignificant to zero palaeontological sensitivity. No impacts to sensitive fossil heritage are therefore anticipated to result from the proposed solar PV facility development. Should any development take place within the sensitive Vryheid Formation sediments (mapped in red in Figure 4.4), then the attached Chance Fossil Finds Procedure must be implemented for all excavations that exceed 1.5m in depth.

6. Recommendations:

Based on the outcomes of this report, it is not anticipated that the proposed development of the solar energy facility and its associated infrastructure will negatively impact on significant heritage resources on condition that:

- The layout indicated in Figure 6 above is preferred
- A 500m no development buffer should be implemented on either side of the N17, R35 and R39
- A 200m no development buffer should be implemented on either side of the secondary routes that run through the development area
- A 500m no development buffer must be implemented around the identified farm werfs
- A 50m no-go development buffer is implemented around all burial ground sites including Observations 001 and 012.
- A Management Plan for the ongoing conservation of these burials is developed prior to construction, along with a Guide on how to identify marked and unmarked burials and how to proceed should previously unidentified burials be uncovered during the construction process.
- The historic farm werf cluster mapped in Figure 4.3 is not impacted by the development.
- Should any development take place within the sensitive Vryheid Formation sediments (mapped in red in Figure 4.4), then the attached Chance Fossil Finds Procedure must be implemented for all excavations that exceed 1.5m in depth.
- Although all possible care has been taken to identify sites of cultural importance during the investigation of the study area, it is always possible that hidden or subsurface sites could be overlooked during the assessment. If any evidence of archaeological sites or remains (e.g. remnants of stone-made structures, indigenous ceramics, bones, stone artefacts, ostrich eggshell fragments, charcoal and ash concentrations), fossils, burials or other categories of heritage resources are found during the proposed development, work must cease in the vicinity of the find and SAHRA must be alerted immediately to determine an appropriate way forward.

Details of Specialist who prepared the HIA

Jenna Lavin, an archaeologist with an MSc in Archaeology and Palaeoenvironments, and currently completing an MPhil in Conservation Management, heads up the heritage division of the organisation, and has a wealth of experience in the heritage management sector. Jenna's previous position as the Assistant Director for Policy, Research and Planning at Heritage Western Cape has provided her with an in-depth understanding of national and international heritage legislation. Her 8 years of experience at various heritage authorities in South Africa means that she has dealt extensively with permitting, policy formulation, compliance and heritage management at national and provincial level and has also been heavily involved in rolling out training on SAHRIS to the Provincial Heritage Resources Authorities and local authorities.

Jenna is a member of the Association of Professional Heritage Practitioners (APHP), and is also an active member of the International Committee on Monuments and Sites (ICOMOS) as well as the International Committee on Archaeological Heritage Management (ICAHM). In addition, Jenna has been a member of the Association of Southern African Professional Archaeologists (ASAPA) since 2009. Recently, Jenna has been responsible for conducting training in how to write Wikipedia articles for the Africa Centre's WikiAfrica project.

Since 2016, Jenna has drafted over 250 Screening and Heritage Impact Assessments throughout South Africa.

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APPENDICES

1. INTRODUCTION

1.1 Background Information on Project

Emoyeni Renewable Energy Farm (Pty) Ltd is proposing the development of a commercial Solar Energy Facility and associated infrastructure on a site located ~6km south-east of Bethal and 1km east of Morgenzon, within the Mpumalanga Province. The project site is located across the Govan Mbeki, Lekwa, and Msukaligwa Local Municipalities within the Gert Sibande District on the following properties:

Table 1: Farm Portions

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A preferred project focus area with an extent of 27 819ha been identified by Emoyeni Renewable Energy Farm (Pty) Ltd as a technically suitable area for the development of the Ummbilla Emoyeni Renewable Energy Farm with a contracted capacity of up to 666MW of wind energy and 150MW of solar energy. This layout, and project capacity, will be reduced as the EIA and scoping process identifies environmental constraints that exclude areas for development.

The facility will have a contracted capacity of up to 150MW and will be known as the Ummbila Emoyeni Solar Energy Facility. The project is planned as part of a larger cluster of renewable energy projects (to be known as the Ummbila Emoyeni Renewable Energy Farm), which include one 666MW Wind Energy Facility and one 150MW Solar Energy Facility. The grid connection infrastructure for both facilities will include a 400/132kV Main Transmission Substation (MTS), to be located between Camden and SOL Substations, which will be looped in and out of the existing Camden-Sol 400kV transmission line; on-site switching stations (132kV in capacity) at each renewable energy facility (Eskom Portion); and 132kV power lines from the switching stations at each renewable energy facility to the new 400/132Kv MTS.

Infrastructure associated with the Ummbila Emoyeni Solar Energy Facility will include:

- PV modules in the range of 330Wp to 450Wp mounted on either a fixed tilt or single axis tracker structure, dependent on optimisation, technology available and cost.
- Inverters and transformers.

- 33kV cabling to connect to the onsite collector substation, to be laid underground where practical.
- 33kV/132kV onsite collector substation (IPP Portion).
- Battery Energy Storage System (BESS).
- Cabling between project components.
- Laydown and O&M hub (approximately 300m x 300m):
    - Construction compound (temporary).
    - Maintenance office.
- Access roads (up to 12m wide) and internal distribution roads (up to 12m wide).

A summary of the details and dimensions of the planned infrastructure associated with the project is provided below:

Table 2: Project Details

Infrastructure	**Footprint and dimensions**
Number of Panels	To be determined
Panel Height	Up to 5m
Technology	Use of fixed-tilt, single-axis tracking, and/or double-axis tracking PV technology. Monofacial or bifacial panels are both considered.
Contracted Capacity	Up to 150MW
Area occupied by the solar array	To be determined in the EIA phase
Area occupied by the on-site facility substation (IPP Portion)	~5ha
Capacity of on-site facility substation (IPP Portion)	33kV/132kV
Underground cabling between the PV array and the onsite substation	Cabling will be installed underground where feasible at a depth of up to 1.5m to connect the PV panels to the on-site facility substation. Where not technically feasible to place cabling underground, this will be installed above-ground. The cabling will have a capacity of up to 33kV.
Laydown and Operations and Maintenance (O&M) hub	~ 300m x 300m, comprising: ● Construction compound (temporary) of approximately 6 ha. ● O&M office of approximately 1.5ha.
Area occupied by laydown area	~75m x 120m
Access and internal roads	Wherever possible, existing access roads will be utilised to access the project site and development area. It is unlikely that access roads will need to be upgraded as part of the proposed development. Internal roads of up to 12-13m in width will be required to access the PV panels and the on-site substation.

Grid connection	The grid connection infrastructure will include a 400/132kV Main Transmission Substation (MTS), to be located between Camden and SOL Substations, which will be looped in and out of the existing Camden-Sol 400kV transmission line; on-site switching stations (132kV in capacity) at each renewable energy facility (Eskom Portion); 132kV power lines from the switching stations at each renewable energy facility to the new 400/132kV MTS; and a collector substation with 2 x 132kV bus bars and 4 x 132kV IPP feeder bays to onsite IPP Substation The grid connection infrastructure will be assessed as part of a separate Environmental Impact Assessment process in support of an application for Environmental Authorisation.
Temporary infrastructure	Temporary infrastructure, including laydown areas, hardstand areas and a concrete batching plant, will be required during the construction phase. All areas affected by temporary infrastructure will be rehabilitated following the completion of the construction phase, where it is not required for the operation phase.

The Ummbila Emoyeni Solar Energy Facility is proposed in response to the identified objectives of national and provincial government and local and district municipalities to develop renewable energy facilities for power generation purposes. It is the developer's intention to bid the Ummbila Emoyeni Solar Energy Facility under the Department of Mineral Resources and Energy's (DMRE's) Renewable Energy Independent Power Producer Procurement (REIPPP) Programme or a similar programme, with the aim of evacuating the generated power into the national grid. This will aid in the diversification and stabilisation of the country's electricity supply, in line with the objectives of the Integrated Resource Plan (IRP), with the Ummbila Emoyeni Solar Energy Facility set to inject up to 150MW of electricity into the national grid. Similarly, the location of the new generation in the Mpumalanga Province is important in the context of the Just Energy Transition (JET). The Ummbila Emoyeni Solar Energy Facility will provide valuable jobs and socio-economic benefits that are required in an area where coal fired generation will be phased out over the next 10 years (see graph below). This will be vitally important if the JET is to be successfully implemented and is a transition for everyone.

1.2 Description of Property and Affected Environment

The area proposed for development is dominated by agriculture and Soweto Highveld Grassland. The study area consists of a gentle to medium undulating landscape with a few prominent rocky outcrops visible consisting largely of shale, dolerite and sandstone.

The vegetation of the study area alternates between cultivated cornfields, grasslands for grazing, and the typical grass tundras of the Highveld plateau. There are narrow streams and small scattered wetlands present across the study area. Dirt roads, main roads and farmlands bound the site to the north, south, east and west.

Evidence of crop rotation and different types of cultivation is visible in areas of the development footprint. Scraped dirt roads, large farm vehicles and cargo trucks are present, moving through wet turf soil resulting in turbation of the roads.

The area is predominantly cornfields and grasslands in various stages of harvesting. In addition, large hay bales indicate that many “natural” grasslands are grown for animal feed. Therefore, it was clear that much of the area has been subjected to continuous agricultural activities and anthropogenic disturbances for a very long time.

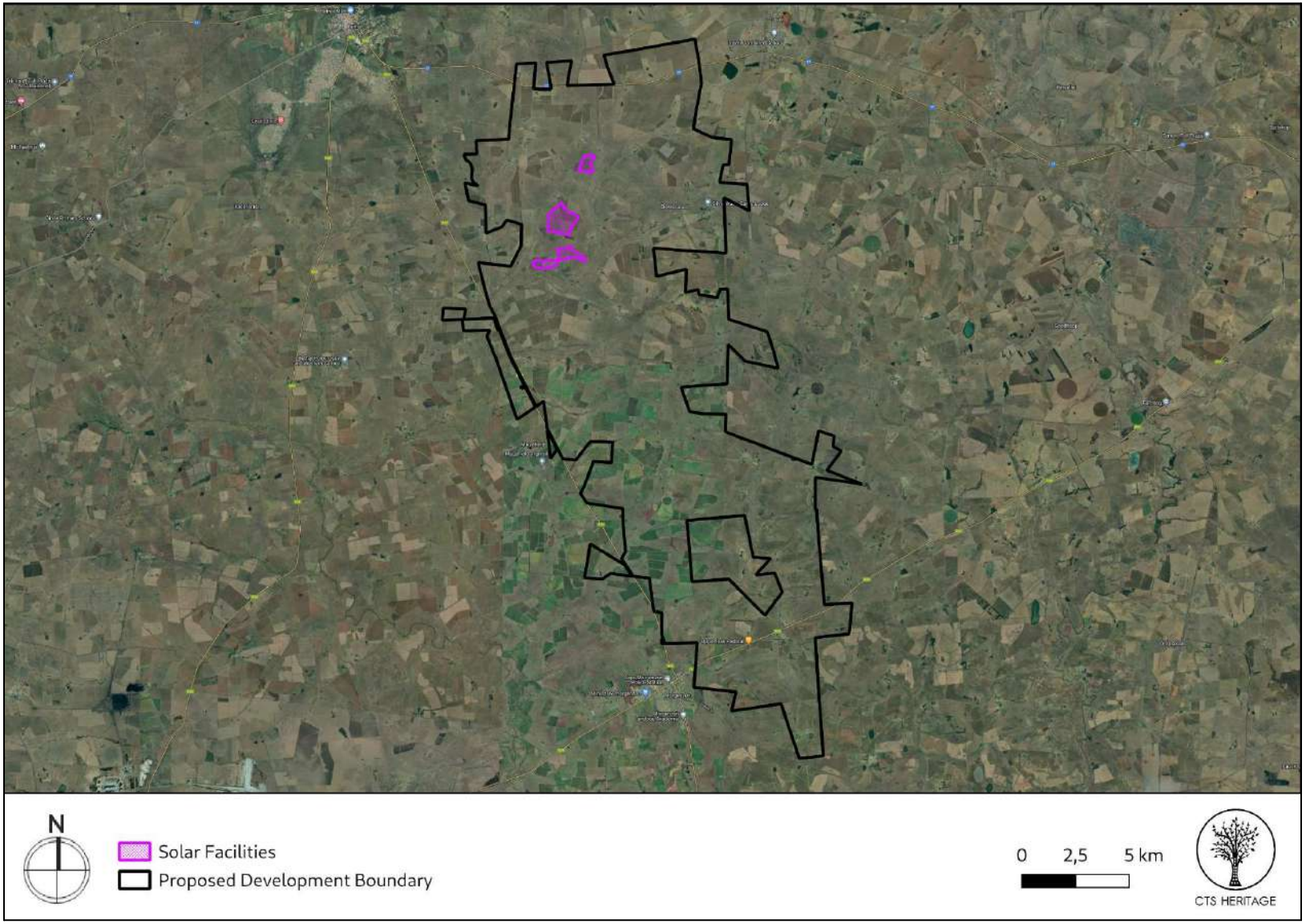

Figure 1.1: Proposed development relative to Bethal

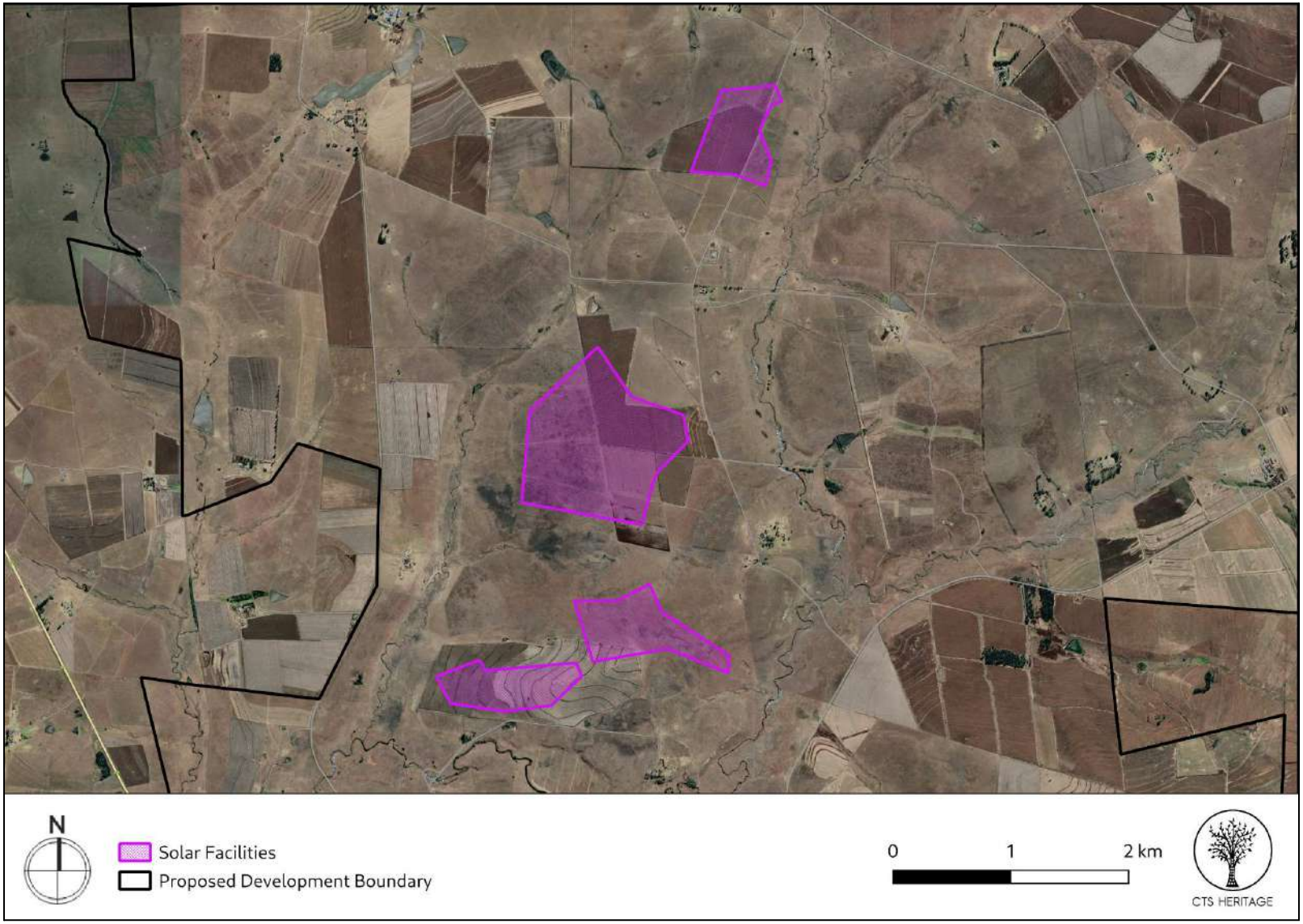

Figure 1.2: The proposed development layout of the PV Facility

2. METHODOLOGY

2.1 Purpose of HIA

The purpose of this Heritage Impact Assessment (HIA) is to satisfy the requirements of section 38(8), and therefore section 38(3) of the National Heritage Resources Act (Act 25 of 1999).

2.2 Summary of steps followed

- A Desktop Study was conducted of relevant reports previously written (please see the reference list for the age and nature of the reports used)
- An archaeologist conducted an assessment of archaeological resources likely to be disturbed by the proposed development. The archaeologist conducted her site visit from 9 to 12 June 2022
- A palaeontologist conducted an assessment of palaeontological resources likely to be disturbed by the proposed development. The palaeontologist conducted his site visit from 6 to 8 July 2022
- The identified resources were assessed to evaluate their heritage significance and impacts to these resources were assessed.
- Alternatives and mitigation options were discussed with the Environmental Assessment Practitioner

2.3 Assumptions and uncertainties

- The *significance* of the sites and artefacts is determined by means of their historical, social, aesthetic, technological and scientific value in relation to their uniqueness, condition of preservation and research potential. It must be kept in mind that the various aspects are not mutually exclusive, and that the evaluation of any site is done with reference to any number of these.

- It should be noted that archaeological and palaeontological deposits often occur below ground level. Should artefacts or skeletal material be revealed at the site during construction, such activities should be halted, and it would be required that the heritage consultants are notified for an investigation and evaluation of the find(s) to take place.

However, despite this, sufficient time and expertise was allocated to provide an accurate assessment of the heritage sensitivity of the area.

2.4 Constraints & Limitations

The area was surveyed as well as possible at the time and as the vegetation growth allowed. The area has previously been cultivated and disturbed by human and animal activity. Therefore, sites were predominantly recognised by focussing on vegetation changes and studying Google Earth imagery and old topographic maps.

Where the development footprints lie within agricultural, recently ploughed or cultivated lands, these were not surveyed in-depth, as any in-situ archaeological sites would have already been destroyed through this agricultural activity. In addition, due to the unseasonal winter rain and flooding, some turbine footings were inaccessible. Further limitations experienced were the multitude of locked gates or tight wire fencing that could not be traversed. The survey tracks followed the farm roads, fences and camp boundaries from which pedestrian surveys were conducted at various points.

The experience of the heritage practitioner, and observations made during the study, allow us to predict with some accuracy the heritage sensitivity of the receiving environment.

2.5 Savannah Impact Assessment Methodology

Direct, indirect and cumulative impacts of the issues identified through the Scoping study, as well as all other issues identified in the EIA phase were assessed in terms of the following criteria:

- The nature, which shall include a description of what causes the effect, what will be affected and how it will be affected.
- The extent, wherein it will be indicated whether the impact will be local (limited to the immediate area or site of development) or regional, and a value between 1 and 5 will be assigned as appropriate (with 1 being low and 5 being high).
- The duration, wherein it will be indicated whether:
    - The lifetime of the impact will be of a very short duration (0 – 1 years) – assigned a score of 1.
    - The lifetime of the impact will be of a short duration (2 – 5 years) – assigned a score of 2.
    - Medium-term (5 – 15 years) – assigned a score of 3.
    - Long term (> 15 years) – assigned a score of 4.
    - Permanent – assigned a score of 5.
- The consequences (magnitude), quantified on a scale from 0 – 10, where 0 is small and will have no effect on the environment, 2 is minor and will not result in an impact on processes, 4 is low and will cause a slight impact on processes, 6 is moderate and will result in processes continuing but in a modified way, 8 is high (processes are altered to the extent that they temporarily cease), and 10 is very high and results in complete destruction of patterns and permanent cessation of processes.
- The probability of occurrence, which shall describe the likelihood of the impact actually occurring. Probability will be estimated on a scale of 1 – 5, where 1 is very improbable (probably will not happen), 2 is improbable (some possibility, but low likelihood), 3 is probable (distinct possibility), 4 is highly probable (most likely) and 5 is definite (impact will occur regardless of any prevention measures).

- The significance, which shall be determined through a synthesis of the characteristics described above and can be assessed as low, medium or high.
- The status, which will be described as either positive, negative or neutral.
- The degree to which the impact can be reversed.
- The degree to which the impact may cause irreplaceable loss of resources.
- The degree to which the impact can be mitigated.

The significance is calculated by combining the criteria in the following formula:

S = (E + D + M) x P

S = Significance weighting

E = Extent

D = Duration

M = Magnitude

P = Probability

The significance weightings for each potential impact are as follows:

- < 30 points: Low (i.e. where this impact would not have a direct influence on the decision to develop in the area).
- 30 – 60 points: Medium (i.e. where the impact could influence the decision to develop in the area unless it is effectively mitigated).
- > 60 points: High (i.e. where the impact must have an influence on the decision process to develop in the area).

3. HISTORY AND EVOLUTION OF THE SITE AND CONTEXT

3.1 Desktop Assessment

Background:

The area proposed for this Renewable Energy Development is located immediately south of Bethal, west of Ermelo and East of Secunda. This area is known for its rolling hills and extensive coal mine infrastructure.

Van Vollenhoven (2015) described the broader assessment area in his assessment completed for a de-stoning plan located adjacent to this proposed development area. Van Vollenhoven (2015) describes the environment as "disturbed by recent human activities, mainly agriculture. This consists of maize fields. Other disturbance visible is mining infrastructure..., a railway track... and power lines... Signs of old fields were also present which could be seen in the pioneer plant species consisting of weeds and grass. Almost half of the surveyed area consists of natural grassland. The vegetation cover varies between short and long grass... The topography of the area forms part of the rolling hills of the surrounding landscape."

Van Vollenhoven (2015) notes that "At the beginning of the 19th century the Phuthing, a South Sotho group, stayed in the vicinity of modern day Bethal. During the Difaquane they fled to the south (Bergh 1999: 10-11; 109). In 1829 the traveller Robert Scoon passed through an area to the north of Bethal (Bergh 1999: 13). The first white farmers only settled here during the late 1850's. By the 1890's this area was inhabited by many white farmers (Bergh 1999: 18-20). The town of Standerton was established in 1879 although it already was a district in 1878. Bethal was established in 1880 and it became an independent district in 1898 (Bergh 1999: 20-21). During the Anglo-Transvaal War (1880-1881) the British garrison in Standerton was beleaguered by the Boer forces (Bergh 1999: 46). The Highveld areas also saw much action consisting of various skirmishes between Boer and Brit during the Anglo-Boer War (1899-1902). It includes skirmishes on the farms Oshoek (4 December 1901), Trigaardsfontein (10 December 1901), Witbank (11 January 1902) and Nelspan (26 January 1902) (Bergh 1999: 51, 54)... At Standerton there was both a concentration camp for white and for black people (Bergh 1999: 54)."

Archaeology

None of the area proposed for development has been previously assessed in any heritage impact assessment process. Heritage Impact Assessments have been completed nearby for projects in Secunda and these can be used to infer the archaeological sensitivity in the development area. Van Vollenhoven (2015) notes that the geographical area around the towns of Standerton and Bethal is not known to conserve Stone Age archaeology. He notes that "No such sites are indicated on maps contained in a historical atlas of this area (Bergh 1999: 4-5). However, this may only be since no research has actually been done in this area. The closest known Stone Age occurrences are a Late Stone Age site at the town of Ermelo and rock art sites far to the west of Standerton

(Bergh 1999: 4-5)." Van Vollenhoven (2015) noted no natural shelters during the survey; however, the good vegetation in the surrounding area and the rivers indicate that ample grazing and water may have been available, making it a prime spot for hunting in the past. Therefore one may assume that Stone Age people probably would have moved through the area. Late Iron Age sites are found in a large area around the towns of Bethal and Standerton and number at least 585 such sites.

In the heritage assessment of a powerline upgrade at the nearby Syferfontein Mine, Nel & Karodia (2013), noted that "*a heritage assessment was conducted in 2000 by the National Cultural History Museum and included in the Syferfontein Mine EMP in 2010. During the survey, a few Stone Age artefacts were identified. These artefacts were not considered to have any primary context and therefore were interpreted to have low significance value. No Early Iron Age sites were identified. The Late Iron Age sites found here conform to those identified in the literature for the Southern Highveld area (former southern Transvaal, northern Orange Free State) as Type V sites. As the soil is mostly turf, Iron Age settlement usually took place on the various dolerite outcrops. The added benefit of choosing these locations was that it was located at the source of building material used in constructing the settlements. One such site shows interesting features as the living units were actually excavated to obtain enough building material for the surrounding walls. A few of the farmsteads dating to early part of this century were identified as possibly having historical-architectural significance. A number of abandoned homesteads are located in the areas that were investigated. These seem to belong to farm labourers and were all abandoned within the last few years. They are therefore not viewed to be of cultural or historical significance. However, some graves are located in the vicinity of the homesteads and it is possible that more graves will be located nearby*".

None of the sites identified in the assessment referenced are located within or near the development area, however the text provides a good assessment of resources that may be present. It is clear that the development area has not previously been assessed. It is therefore possible that the proposed development will impact negatively on archaeological resources associated with the Late Iron Age, burial grounds and graves as well as stone age archaeological resources.

Palaeontology

According to the SAHRIS Palaeosensitivity Map, the area proposed for development is underlain by sediments of zero, moderate and very high palaeontological sensitivity (Figure 4a). According to the extract from the Council of Science Map for East Rand 2628 (Figure 3.2), the palaeontologically sensitive geology of the area is ascribed to the Vryheid Formation of the Ecca Group of sediments. Groenewald (2014, SAHRIS NID 167013) completed a field-based palaeontological assessment for the Waaihoek WEF in which he interrogates the palaeontological sensitivity of this formation. In this assessment, Groenewald (2014) notes that "The Vryheid Formation consists of interbedded very coarse-grained sandstone and mudstone that yields plant and trace fossils as well as some

prominent coal seams." In this assessment, Groenewald (2014) made the following recommendations for the WEF development within the Vryheid Formation "The PEA and CEO be made aware of the possibility of finding fossils in the Vryheid and Volksrust Formation sediments during excavation of the foundations for the turbines and other infrastructure. A professional palaeontologist is appointed to monitor possible palaeontological finds during excavation of turbine foundations and infrastructure where turbine positions and infrastructure fall on Vryheid and Volksrust Formation sediments." The sediments underlying the development area have very high levels of palaeontological sensitivity, the nature of the excavations associated with Renewable Energy facilities tends to be deep and as such, the likelihood of impacting intact Vryheid Formation sediments is high. Further investigation of the palaeontological sensitivity of the development area is recommended.

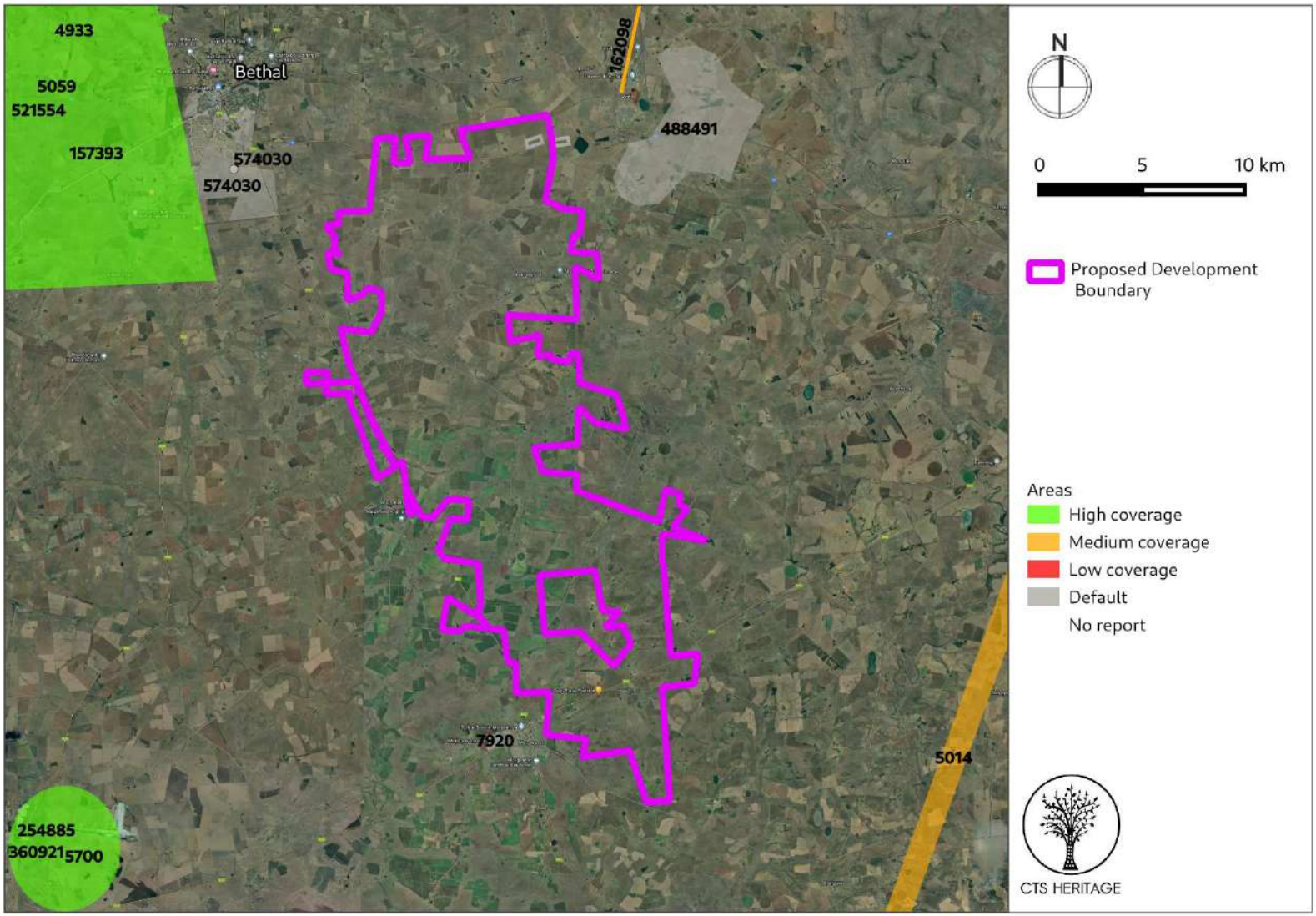

Figure 2: Spatialisation of heritage assessments conducted in proximity to the proposed development (see Appendices for insets

Figure 3.1: Palaeontological sensitivity of the proposed development area

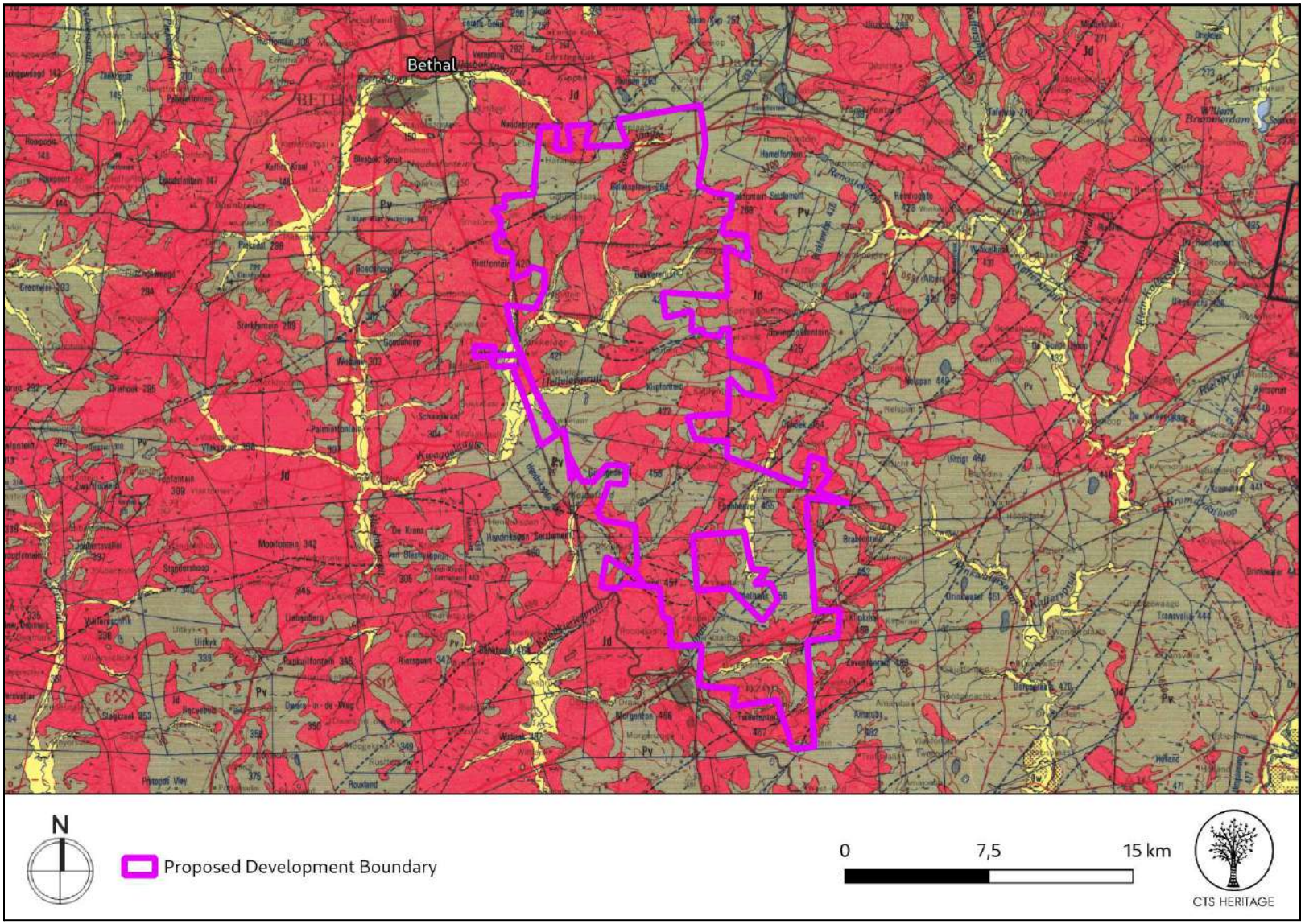

Figure 3.2: Geology Map. Extract from the CGS 2628 East Rand Map indicating that the development area for the REF development is underlain by sediments of Pv: Vryheid Formation of the Ecca Group and Jd: Jurassic Dolerite as well as Quaternary Sands

4. IDENTIFICATION OF HERITAGE RESOURCES

4.1 Summary of findings of Specialist Reports

Visual Impact Assessment

The concept of cultural landscape gives spatial and temporal expression to the processes and products of the interaction between people and the environment. It may thus be conceived as a particular configuration of topography, geology, vegetation, land use and settlement pattern and associations which establishes some coherence of natural and cultural processes.

According to the VIA completed for the project, the affected landscape can generally be divided into the following Landscape Character Areas:

- **Rural Landscape Areas.** This is the type of landscape that dominates the affected landscape. It is typified by relatively uniform rolling topography that is covered by a matrix of arable agriculture set in a framework of natural grassland.

  Due to the relatively low topography, and generally low vegetation, it is an open landscape over which long views are possible particularly when the viewer is located on the summit of a ridgeline.

  Within this general pattern homesteads are located that are made obvious due to their associated alien and ornamental vegetation.

  There are also stands of alien trees, many of which are Eucalyptus that are largely located along property boundaries and unused agricultural land.

  The rolling topography generally provides a large degree of VAC particularly for relatively low development such as the proposed array.
- **Urban Landscape Areas** are generally densely developed residential areas with small commercial areas. There are also small areas of industry also associated with urban areas. VAC is generally high, with views of the surrounding landscape generally only possible from urban edges.
- **Industrial Landscape Areas** Mpumalanga is known for its mining industry as well as other heavy industrial operations. These industries generally create their own visual presence that can override surrounding characteristics. The closest large scale mining / industrial operation is Tutuka Power Station which has the New Denmark Coal Mine immediately to the north of it from which is fed coal by conveyor belt.

Archaeology (Appendix 1)

The field assessment has determined that the area proposed for development has medium to high local historical significance. The broader cultural landscape consists of old farmhouses, kraals, circular stone structures, and the remnants of old water pumps, feeding and watering troughs. During the field assessment, the specialists were informed that some of the oldest farmhouses in the area, constructed with adobe, were demolished by current

farmers as they were considered “unsavable”. This is an unfortunate loss of a significant layer of vernacular architecture and unique settlement heritage from this area. It is imperative that further erosion of this significant layer within the landscape is prevented through an inventory process or similar to record any remaining adobe farmhouses in the area. Unfortunately, this is beyond the scope of this assessment.

Even though the area is rich in history, no significant archaeological heritage resources were identified during the field assessment. No Stone Age or Iron Age heritage resources were identified during the survey. The few heritage resources that were identified consist of the ruins of older farm structures and kraals. Due to the paucity of older farm structures in the area as a result of demolition, it is recommended that the identified ruins and kraals remain untouched and that a safety buffer should exist around all such structures.

The field assessment identified six burial grounds or graves close to or within the proposed development footprints of turbines, roads and the solar PV facility. All graves are of high local significance as a result of their social and cultural value, and are therefore graded IIIA.

Palaeontology (Appendix 2)

The area proposed for development is underlain by Permian aged sandstone and shale of the Vryheid Formation, Jurassic aged dolerite and quaternary aged alluvium with a very high, very low and moderate palaeontological sensitivity. Significant fossils are expected in areas where deep excavations (>1,5m) are planned in areas indicated in red on the palaeontological sensitivity map (Figure 4.4).

Dr Gideon Groenewald, a suitably qualified palaeontologist, was appointed to visit the site of the development on 6th to 8th July 2022. Deep weathering and extensive agricultural disturbance prevented the recording of fossils over most of the inspected areas, but it is significant to note that in the few places where exposures were noticed, highly significant fossils were recorded. In areas underlain by the Vryheid Formation, the field investigation confirmed the potential for the presence of fossils, and most of the important fossil structures were recorded.

4.2 Heritage Resources identified

Possible Receptors within the landscape which could be sensitive to landscape change have been identified in the VIA completed for this project. Area Receptors may include;

- The towns of **Bethal and Morgenzon;**
- The **Silver Water Reserve**; and
- The Protected Area of **Rietvlei Nature Reserve**.

- Point Receptors that include;
  - There are a number of **Local Farmsteads and Homesteads** located both within the focus area and the surrounding landscape.
- Linear Receptors or routes through the area that include;
  - **The N17, the R35, the R38 and the R39 as well as the unsurfaced local roads that run through the study area.** All of these are used mainly by local people with little tourism / recreational importance.

The way that the local farmsteads and roads interact with each other and elements of the landscape such as topography and river courses etc. all act as contributing elements to the cultural landscape. These elements are mapped in Figure 4.1 below.

In terms of the heritage resources identified in the archaeological field assessment, see Table 3 below. These are mapped relative to the development layout in Figure 4.2 and 4.3

Table 3: Artefacts identified during the field assessment development area

ID	Site Name	Description	Co-ordinates		Grading	Mitigation
1	Umbila Emoyeni 001	10? GRAVES Not all the cairns are intact	-26.50822222	29.57985	IIIA	No direct impact anticipated. Part of historic cluster
2	Umbila Emoyeni 002	STONE STRUCTURE Part of the historical identity of the area, including stone structures and foundations.	-26.51131389	29.57884167	IIIC	No direct impact anticipated. Part of historic cluster
3	Umbila Emoyeni 003	STONE FOUNDATION Part of the historical identity of the area, including stone structures and foundations.	-26.51185278	29.57861111	NCW	Likely to be impacted by the Solar PV Layout
9	Umbila Emoyeni 009	HISTORIC YARD MIDDEN Part of the historical identity of the area, including stone structures and foundations.	-26.50869722	29.58020833	IIIC	No direct impact anticipated. Part of historic cluster
10	Umbila Emoyeni 010	HISTORICAL HOUSE AND YARD Part of the historical identity of the area,	-26.50905278	29.58053611	IIIC	No direct impact anticipated. Part

		including stone structures and foundations.				of historic cluster
11	Umbila Emoyeni 011	LARGE STONE KRAAL Part of the historical identity of the area, including stone structures and foundations.	-26.51104444	29.58501667	IIIC	No direct impact anticipated. Part of historic cluster
12	Umbila Emoyeni 012	5 GRAVES Metal cross, fieldstone cairns. Graves are along the proposed powerline route	-26.54944722	29.56575833	IIIA	No direct impact anticipated

The palaeontological assessment identified trace fossils within the Vryheid Formation outcrops within the development area. The PIA notes that "Deep weathering and extensive agricultural disturbance prevented the recording of fossils over most of the inspected areas, but it is significant to note that in the few places where exposures were noticed, highly significant fossils were recorded." The fossil observations described in Table 4 below are mapped in Figure 4.4.

Table 4: Palaeontological observations made during the field assessment development area

Photo	Coordinates		Comments	Grade
UMMB8	26.491010° S	29.606630° E	Weathered shale and sandstone exposed during ploughing of very shallow soils on the Vryheid Formation in the northern part of the study area. Excavation for turbine foundations will expose shale and sandstone with a high chance of fossil finds.	NCW
UMMB10	26.508400° S	29.587170° E	Coarse-grained feldspathic sandstone of the Vryheid Formation. Large-scale trough cross-bedding.	IIIC
UMMB16	26.550580° S	29.591510°E	Trace fossils, as reported on by Mason and Christie (1985) is abundantly present in the siltstone and shale of the Vryheid Formation	IIIC
UMMB20.5	26.567758° S	29.539098° E	Soft sediment deformation or possible trace fossil (feeding trail?) in sandstone of the Vryheid Formation	IIIC

4.3 Mapping and spatialisation of heritage resources

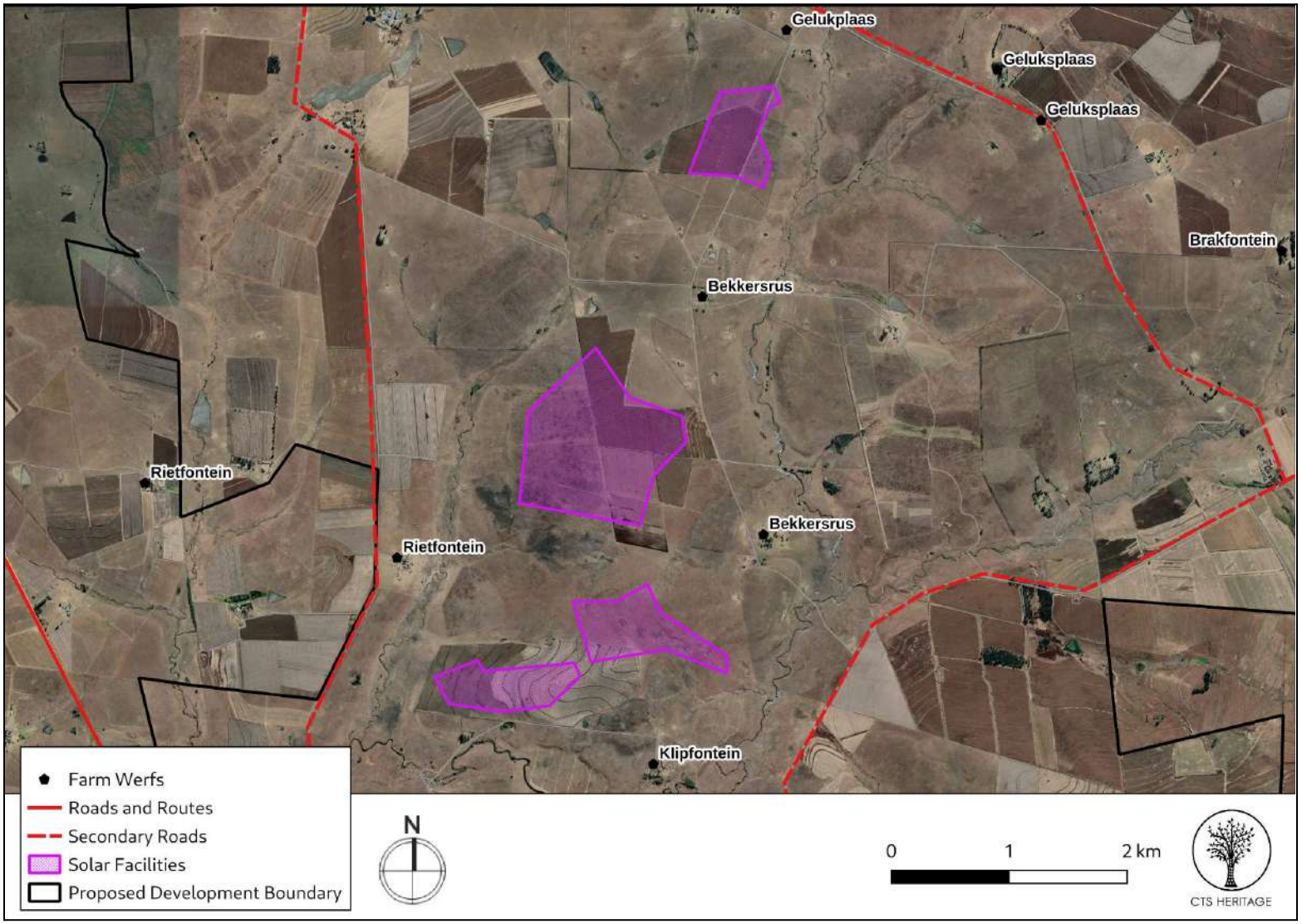

Figure 4.1: Map of sensitive receptors within the proposed development area

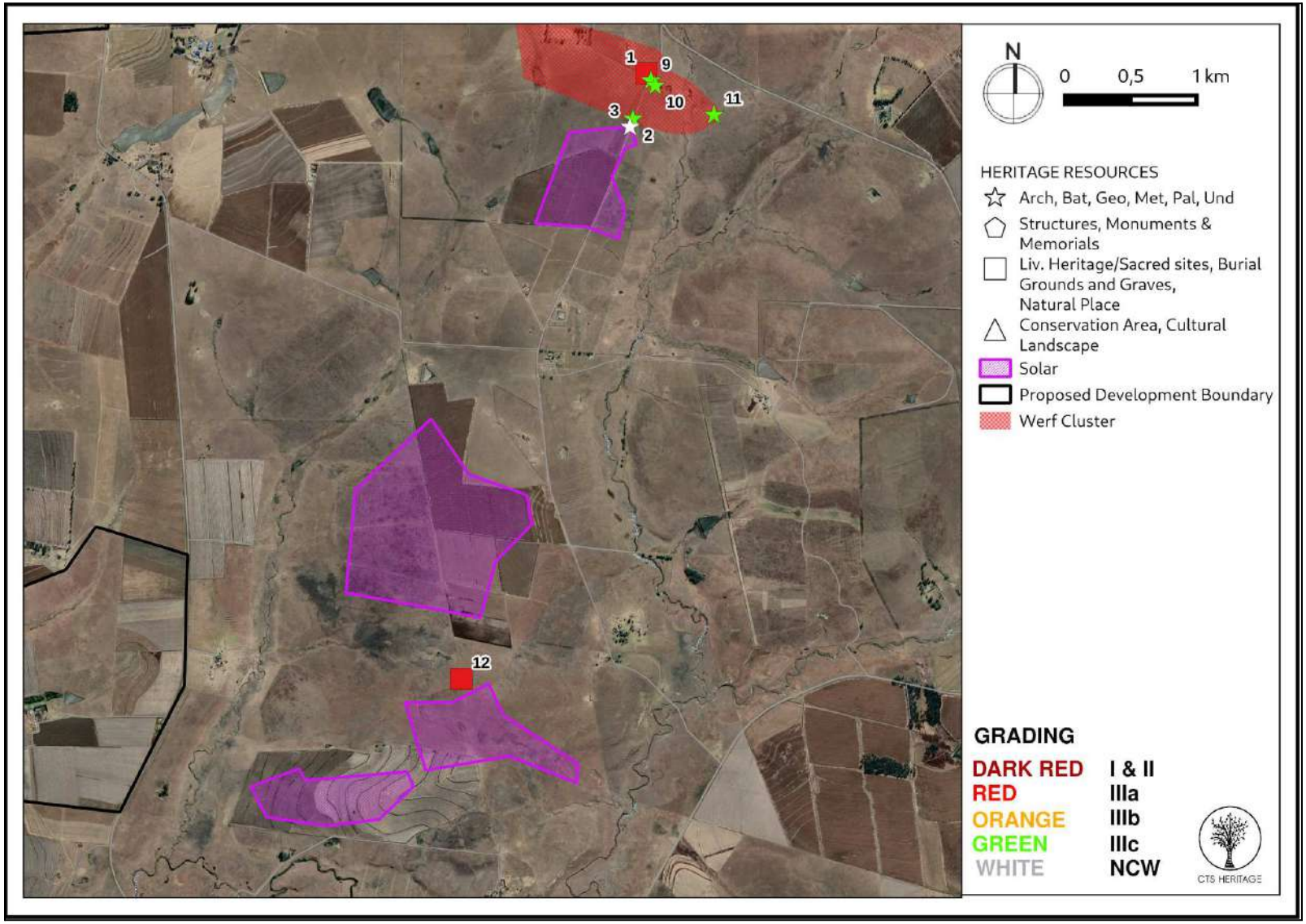

Figure 4.2: Map of archaeological heritage resources within the proposed development area

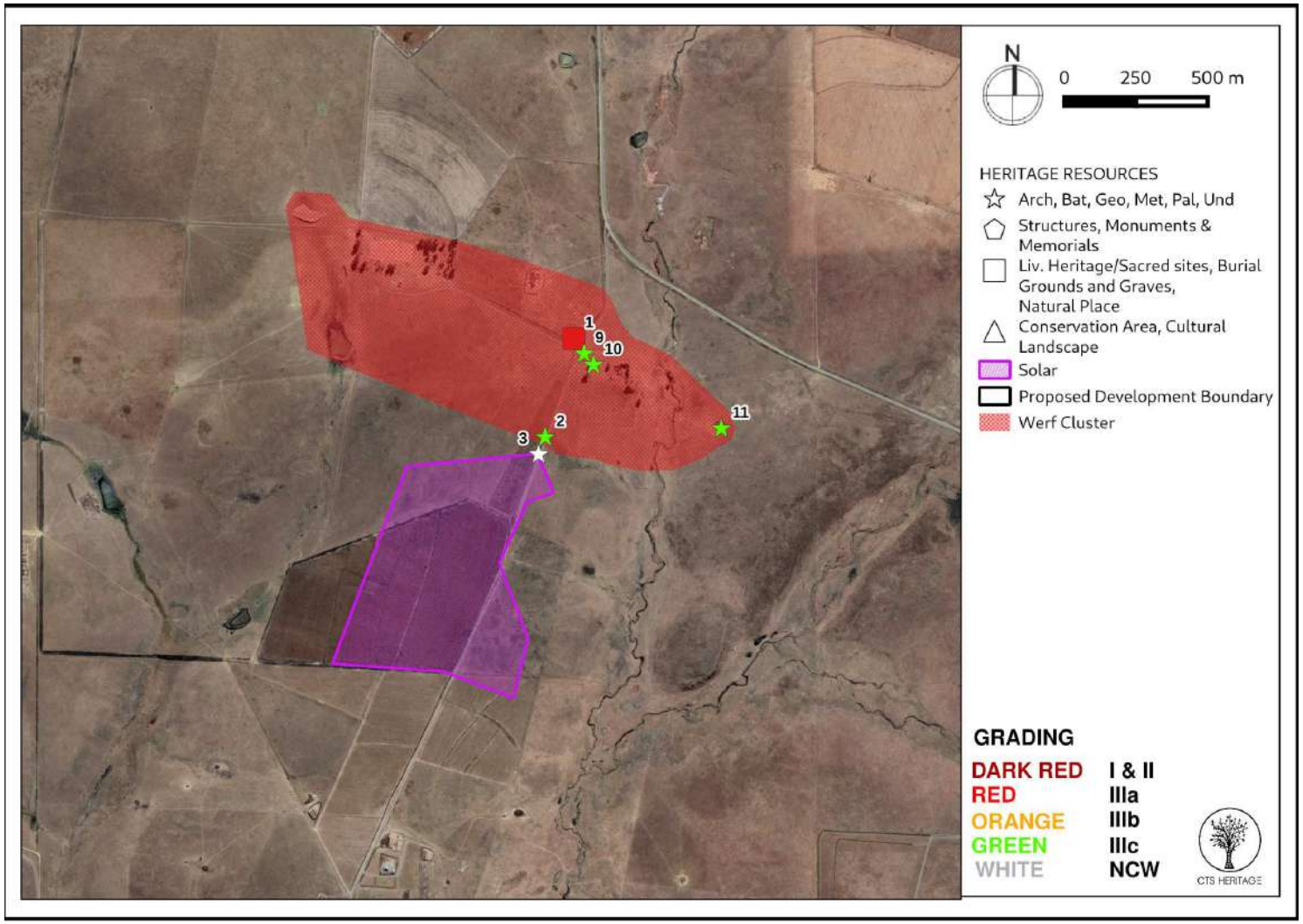

Figure 4.3: Map of all sites and observations noted within the development area - Inset A

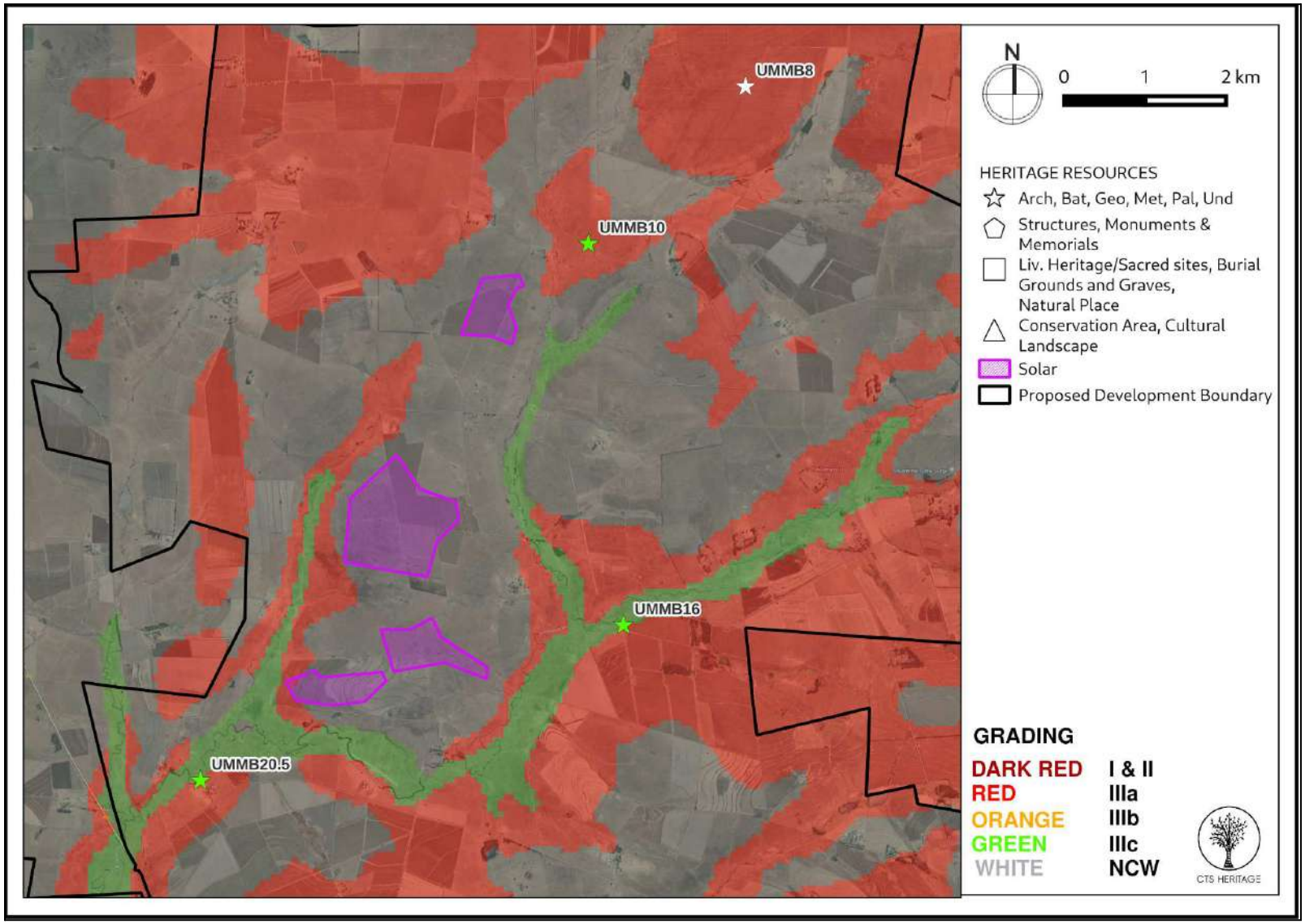

Figure 4.4: Map of palaeontological heritage resources within the proposed development area

5. ASSESSMENT OF THE IMPACT OF THE DEVELOPMENT

5.1 Assessment of impact to Heritage Resources

5.1.1 Cultural Landscape and Visual Impacts

According to the VIA completed for this project, "The proposed solar project is located within a landscape area with an overriding rural character within which there are large industrial nodes including mining operations and coal fired power stations. Whilst the proposed project will create a new large scale industrial node within the agricultural landscape, this is not entirely out of character with the broader region. However, it will be a significant local character change."

The following recommendations are adapted from Winter and Wilson (2021).

Solar PV placement ("where" and "how"):

The following general principles apply to the PV layout:

- Avoid steep slopes.
- Avoid proximity to historic corridors.
- Avoid placement within viewshed of farmsteads.

The indicators are to be aligned with the visual sensitivity analysis and to include the following:

- Setback from the primary routes running through the area (N17, R35 and R39) by at least 500m on either side
- Setback from the secondary routes running through the area by at least 200m on either side.
- Avoid steep or elevated topography, ridgelines or koppies.
- Setback from farmsteads forming part of the settlement pattern by at least 500m
- Concentrate placement in proximity to the existing infrastructure.

Table 5: Impact table for Cultural Landscape Heritage Resources impacted by the Solar Energy Facility

NATURE: The broader context of the area proposed for development has cultural significance that may be impacted by the proposed development				
		Before Mitigation		**After Mitigation**
MAGNITUDE	**M (5)**	While the cultural value of the development area is moderate, the location of the proposed turbines means that impact to the cultural landscape is likely to result from the proposed development.	**M (5)**	While the cultural value of the development area is moderate, the location of the proposed turbines means that impact to the cultural landscape is likely to result from the proposed development.
DURATION	**H (4)**	Where manifest, the impact will be long term - for the duration of the PV lifetime	**H (4)**	Where manifest, the impact will be long term - for the duration of the PV lifetime
EXTENT	**H (5)**	Regional	**H (5)**	Regional
PROBABILITY	**H (5)**	It is extremely likely that a significant cultural landscape resources will be impacted	**L (1)**	It is extremely unlikely that any significant cultural landscape resources will be impacted
SIGNIFICANCE	**H**	(5+4+5)x5=70	**L**	(5+4+5)x1=14
STATUS		Neutral		Neutral
REVERSIBILITY	**L**	Any impacts to heritage resources that do occur are reversible once the WEF infrastructure is removed	**L**	Any impacts to heritage resources that do occur are reversible once the WEF infrastructure is removed
IRREPLACEABLE LOSS OF RESOURCES?	**L**	Unlikely	**L**	Unlikely
CAN IMPACTS BE MITIGATED		Yes		
MITIGATION: - A 500m no development buffer should be implemented on either side of the N17, R35 and R39 - A 200m no development buffer should be implemented on either side of the secondary routes that run through the development area - A 500m no development buffer must be implemented around the identified farm werfs				
RESIDUAL RISK: NA				

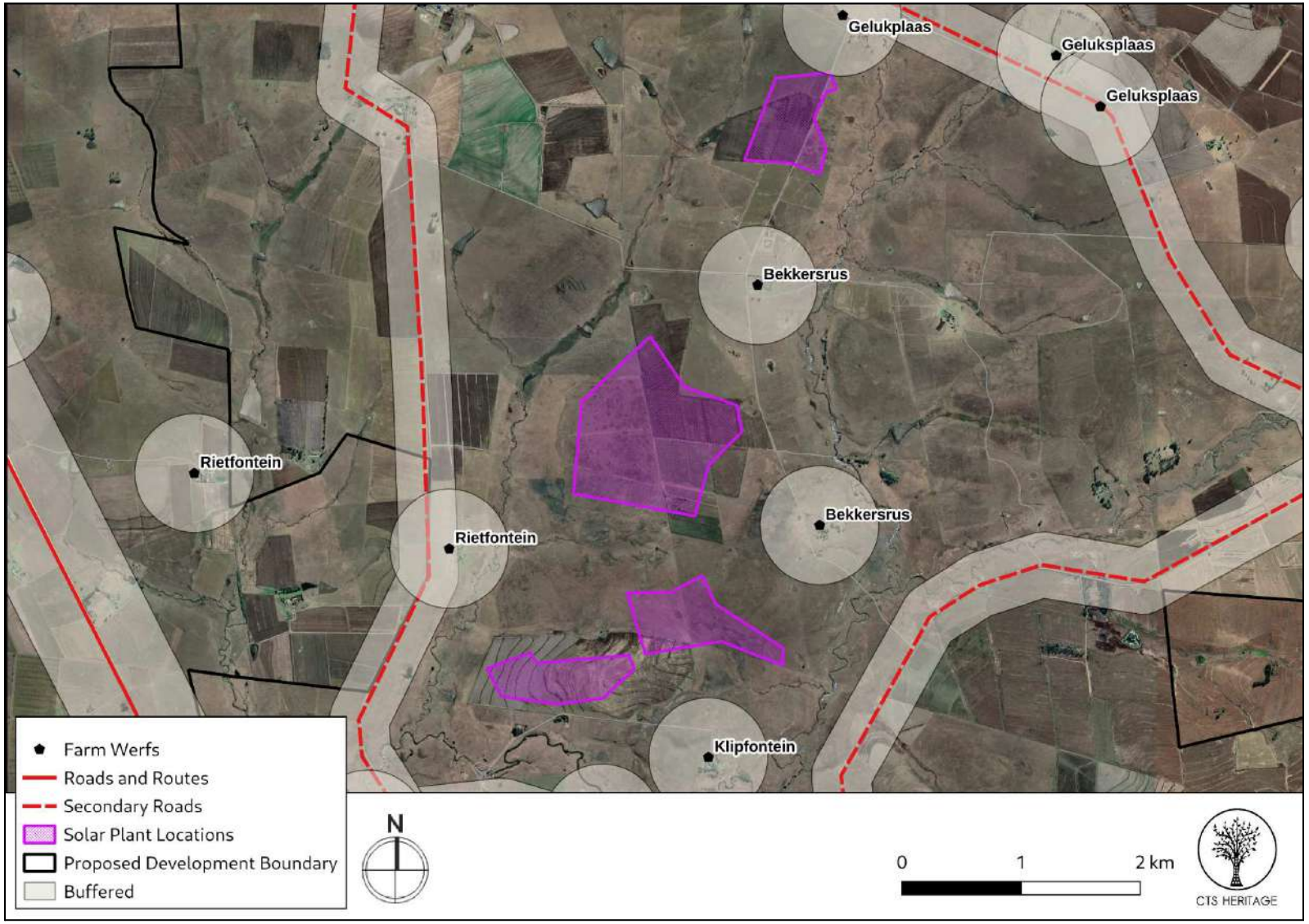

Figure 5.1: Cultural landscape mitigation measures

5.1.2 Archaeology

The proposed development will not have a substantial negative impact on the archaeological heritage resources identified within the proposed development area for the renewable energy facilities and associated infrastructure. No Stone Age or Iron age archaeology was identified during the field assessment. Some historical ruins and kraals of contextual historic significance, graded IIIC, were identified; however, none of these are likely to be impacted as per the layout provided.

A number of burial grounds and/or graves were identified during the field assessment (Grade IIIA) and some of these fall within areas likely to be impacted as per the proposed layout. Mitigation measures in this regard are provided below.

Solar PV

Burial ground (Observation 001) and the historic structures (Observations 002, 009, 010 and 011) form part of a cluster of sites that are related to the historic farm werf in this area known as Gelukplaas. This cluster of historic structures and the burial ground, along with the existing farm werf and its infrastructure have been mapped as a "cluster" of sites in Figure 5.2 below. This cluster is graded IIIC and impacts to this cluster should be avoided. In the layout provided, the proposed Solar PV layout avoids impact to this cluster of graded sites. Observation 003 lies on the border of the proposed Solar PV area and although this site has been determined to be Not Conservation-Worthy, it is possible that buried archaeological material associated with this foundation may be located in close proximity to Observation 003. Care must be taken in this regard.

The burial ground recorded as Observation 012 lies in between two proposed Solar PV facilities (Figure 5.3). The provided layout for the Solar PVs respects the recommended 50m buffer area around Observation 012 and as such, no direct impact is anticipated.

Table 6: Impact table for Archaeological Heritage Resources impacted by the Solar Energy Facility

NATURE: The area proposed for development is known to conserve heritage resources of archaeological significance that may be impacted by the proposed development				
		Before Mitigation		**After Mitigation**
MAGNITUDE	**H (7)**	Some significant archaeological resources were identified within the development area	**H (7)**	Some significant archaeological resources were identified within the development area
DURATION	**H (5)**	Where manifest, the impact will be permanent	**H (5)**	Where manifest, the impact will be permanent
EXTENT	**L (1)**	Localised within the site boundary	**L (1)**	Localised within the site boundary
PROBABILITY	**H (4)**	It is possible that any significant archaeological resources will be impacted	**L (1)**	It is extremely unlikely that any significant archaeological resources will be impacted
SIGNIFICANCE	**M**	(7+5+1)x4=52	**L**	(7+5+1)x1=13
STATUS		Neutral		Neutral
REVERSIBILITY	**L**	Any impacts to heritage resources that do occur are irreversible	**L**	Any impacts to heritage resources that do occur are irreversible
IRREPLACEABLE LOSS OF RESOURCES?	**L**	Unlikely	**L**	Unlikely
CAN IMPACTS BE MITIGATED		Yes		
MITIGATION: - A 50m no-go development buffer is implemented around all burial ground sites including Observations 001 and 012. - A Management Plan for the ongoing conservation of these burials is developed prior to construction, along with a Guide on how to identify marked and unmarked burials and how to proceed should previously unidentified burials be uncovered during the construction process. - The historic farm werf cluster mapped in Figure 6.3 is not impacted by the development.				
RESIDUAL RISK: Should any significant archaeological resources be impacted (however unlikely) residual impacts may occur, including a negative impact due to the loss of potentially scientific cultural resources				

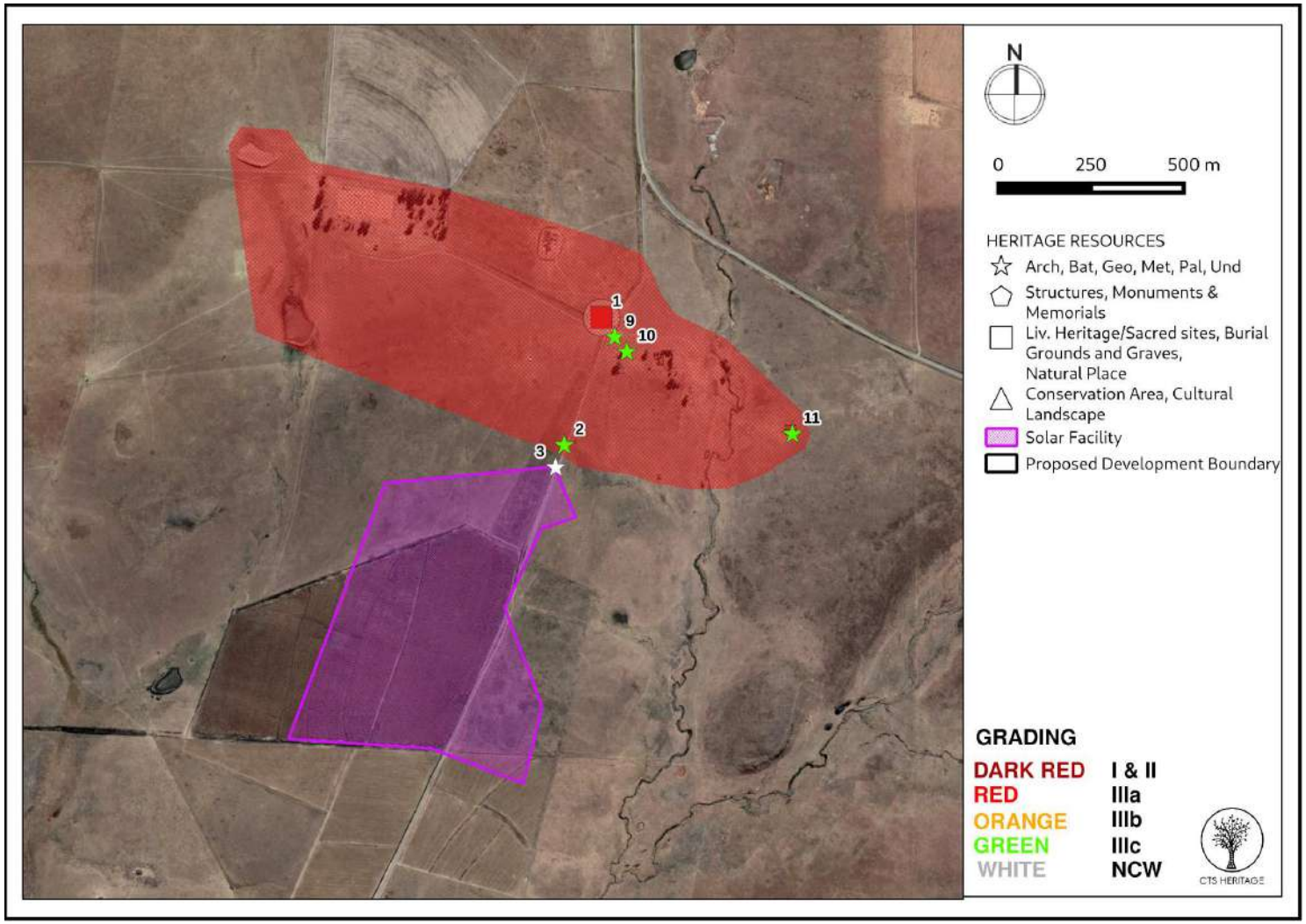

Figure 5.2: Map of heritage resources identified during the field assessment relative to the proposed development footprint

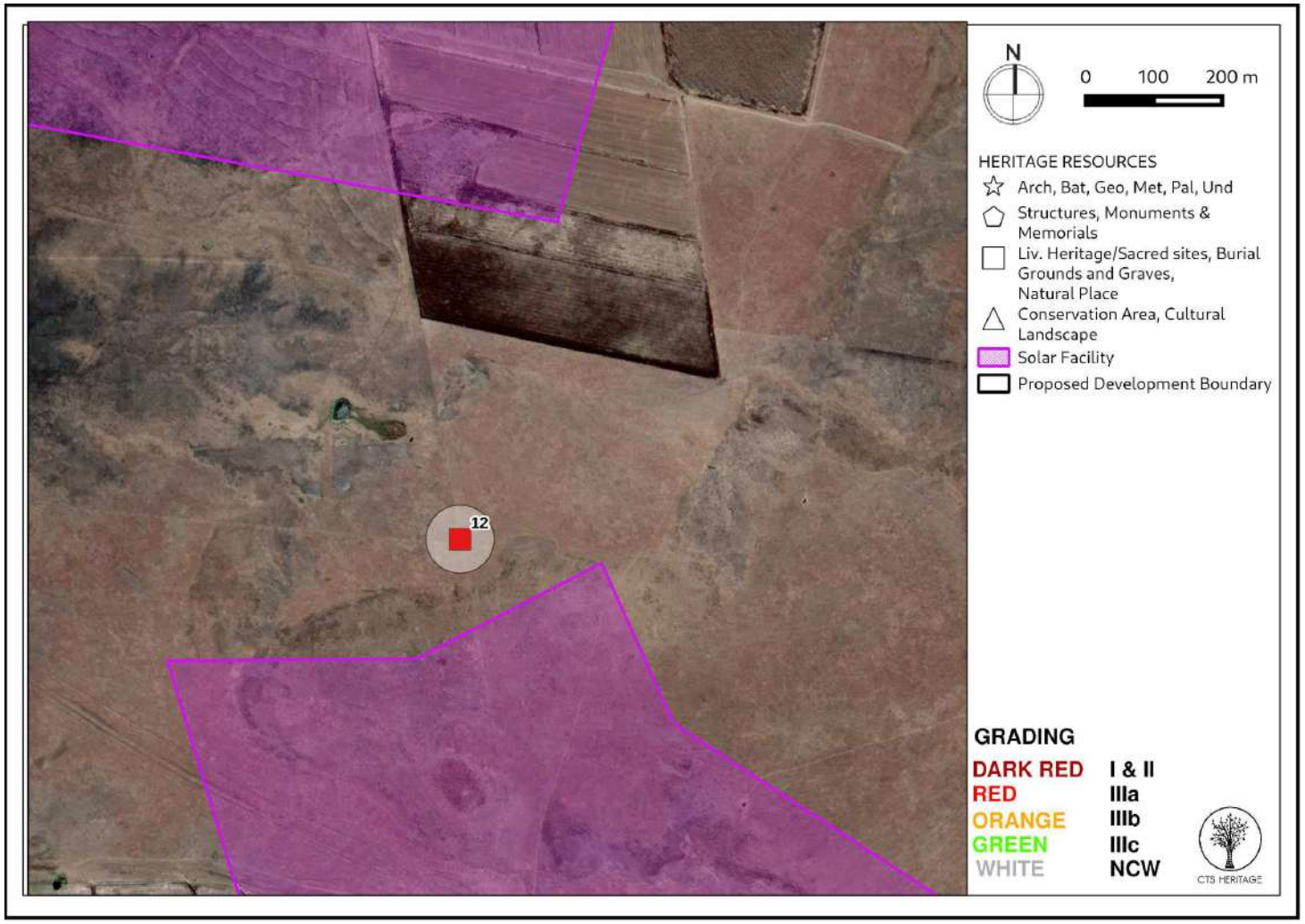

Figure 5.3: Map of heritage resources identified during the field assessment relative to the proposed development footprint - Observation 012

5.1.3 Palaeontology

The area proposed for the solar PV development is underlain by sediments of insignificant to zero palaeontological sensitivity. No impacts to sensitive fossil heritage are therefore anticipated to result from the proposed solar PV facility development.

Should any development take place within the sensitive Vryheid Formation sediments (mapped in red in Figure 4.4), then the attached Chance Fossil Finds Procedure must be implemented for all excavations that exceed 1.5m in depth.

Table 7: Impact table for Palaeontological Heritage Resources impacted by the Solar Energy Facility

NATURE: The area proposed for development is known to conserve heritage resources of palaeontological significance that may be impacted by the proposed development				
		Before Mitigation		**After Mitigation**
MAGNITUDE	**L (2)**	No highly significant palaeontological resources were identified within the development area; andthe geology underlying the development area is not sensitive for impacts to significant fossils	**L (2)**	No highly significant palaeontological resources were identified within the development area; andthe geology underlying the development area is not sensitive for impacts to significant fossils
DURATION	**H (5)**	Where manifest, the impact will be permanent.	**H (5)**	Where manifest, the impact will be permanent.
EXTENT	**L (1)**	Localised within the site boundary	**L (1)**	Localised within the site boundary
PROBABILITY	**L (1)**	It is extremely unlikely that any significant paleontological resources will be negatively impacted	**L (1)**	It is extremely unlikely that any significant paleontological resources will be negatively impacted
SIGNIFICANCE	**L**	(1+5+2)x1=8	**L**	(1+5+2)x1=8
STATUS		Neutral		Neutral
REVERSIBILITY	**L**	Any impacts to heritage resources that do occur are irreversible	**L**	Any impacts to heritage resources that do occur are irreversible
IRREPLACEABLE LOSS OF RESOURCES?	**L**	Unlikely	**L**	Unlikely
CAN IMPACTS BE MITIGATED		Yes		
MITIGATION: Should any development take place within the sensitive Vryheid Formation sediments (mapped in red in Figure 6.4), then the attached Chance Fossil Finds Procedure must be implemented for all excavations that exceed 1.5m in depth.				
RESIDUAL RISK: Should any significant palaeontological resources be impacted (however unlikely) residual impacts may occur, including a negative impact due to the loss of potentially scientific cultural resources				

5.2 Sustainable Social and Economic Benefit

According to information provided by the client, "the socio-economic benefits of the Ummbila Emoyeni solar PV Facility (the Project) can be divided into three groups. These groups are correlated with the Project's lifecycle phases – Development, Construction and Operations. During the Development Phase, the development team and many external specialists make routine visits to the area. This brings capital to the community as they use local accommodation, visit restaurants in the towns they pass through and shop at local stores for provisions.

During the Construction Phase, the team ensures that as many materials as possible are procured through local suppliers. This includes much of the balance of plant (electrical components, steel parts, fasteners and fittings, cables, pipes valves, etc.) as well as the vast majority of concrete that is used on the site. In the case of concrete tower sections being utilised (as is intended in the case of the Project) local batching plants will be established near the site. These will reduce the load put on the team by transporting such large components and provide and influx of capital, skills and jobs into the local community. Roads will also be repaired and expanded to facilitate the construction of the Project. These roads will be used by locals thereafter. Job creation and skills development are also integral to the Construction Phase as local labourers are trained and hired to assist the team in bringing the Project to fruition. The skills gained through this process can be used in future work opportunities.

Finally, the entire construction team will live near the site for the duration of the construction phase. Due to the anticipated size of the Project, this period will last at least 5 years. The presence of this many people who require accommodation, food and entertainment will ensure that local businesses can grow and thrive.

During the Project's Operations Phase, a small team will remain on-site to perform maintenance work on the infrastructure. This team will contain locals who are trained to assist an external expert with this work. Additionally, a local security team will patrol the site 24/7 creating jobs and enhancing security for local farmers. A camera network will also be established at key points.

At Financial Close (end of the Development Phase), locally owned community trusts will be established which will serve to direct capital towards making positive change in the local community. An example of an activity which similar trusts have undertaken in the past is the construction of schools."

As such, on condition that the recommendations indicated below are implemented, the anticipated socio-economic benefits of the proposed development outweigh the likely impacts to heritage resources.

5.3 Proposed development alternatives

While no specific alternatives are proposed for this project, a rationalised layout that is informed by the sensitivities identified through the Impact Assessment process has been developed. This rationalised layout is mapped as Figure 6 below. This rationalised layout is preferred in terms of impacts to heritage resources and the optimised layout does not encroach into any no-go areas.

5.4 Cumulative Impacts

According to the VIA completed for the project, the proposed project will result in loss of rural landscape. However it will not change the character of the broader landscape that is generally comprised of islands of large scale industrial operations surrounded by extensive rural areas. At this stage, there is the potential for the cumulative impact of proposed renewable energy facilities to negatively impact the cultural landscape due to a change in the landscape character from natural wilderness to semi-industrial. Although this project falls outside of a REDZ area, it is noted that it is preferable to have renewable energy facility development clustered in an area such as a REDZ.

To address concerns about the cumulative impact of RE facilities within the greater region, a cautious approach is required in terms of assessing the desirability of such development from a cultural landscape perspective. The placement of RE facilities must take cognisance of the very high visual impact on a relatively intact and representative cultural landscape, and the extremely limited ability to visually screen this infrastructural development.

Table 8: Cumulative Impact Table

NATURE: Cumulative Impact to the sense of place				
		Overall impact of the proposed project considered in isolation		**Cumulative impact of the project and other projects in the area**
MAGNITUDE	**H (7)**	High	**H (7)**	High
DURATION	**M (3)**	Medium-term	**H (4)**	Long-term
EXTENT	**L (1)**	Low	**L (1)**	Low
PROBABILITY	**H (3)**	Probable	**H (3)**	Probable
SIGNIFICANCE	**M**	(7+3+1)x3=33	**M**	(7+4+1)x3=36
STATUS		Negative		Negative
REVERSIBILITY	**H**	High	**L**	Low
IRREPLACEABLE LOSS OF RESOURCES?	**M**	Possible	**M**	Possible
CAN IMPACTS BE MITIGATED		NA		NA
CONFIDENCE IN FINDINGS: High				
MITIGATION: Implementation of recommended no development buffers along major routes				

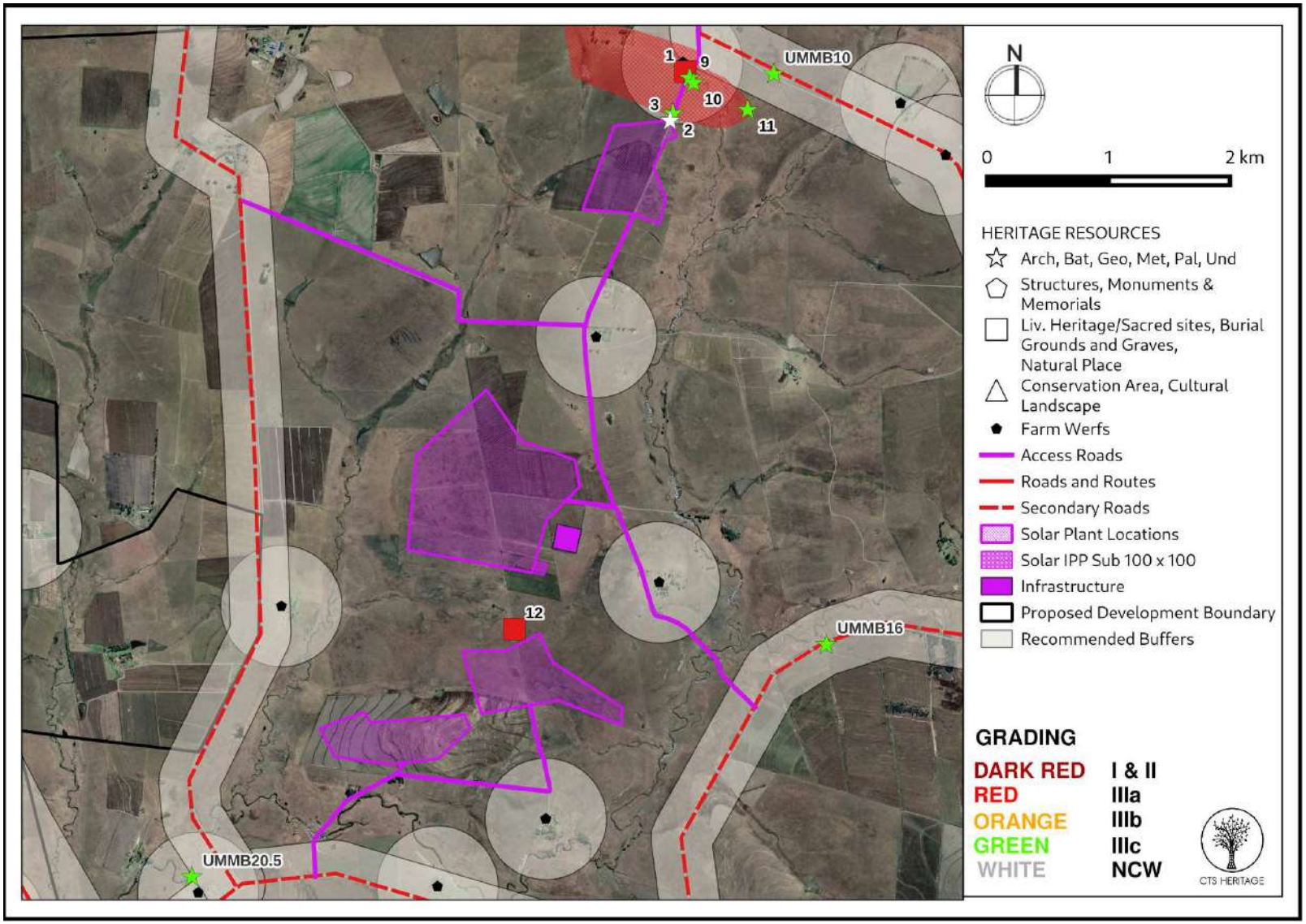

Figure 6: Rationalised PV layout with proposed infrastructure and access roads indicated - preferred

6. RESULTS OF PUBLIC CONSULTATION

As this application is made in terms of NEMA, the public consultation on the HIA will take place with the broader public consultation process required for the Environmental Impact Assessment process and will be managed by the lead environmental consultants on the project.

7. CONCLUSION

As noted by the VIA completed for this project, "The proposed landscape is relatively typical of the region and is not protected." However, the nature of the relationship between various landscape elements such as the farm werfs and road network contributes to the sense of place of this rural landscape. Recommendations to mitigate negative impact to this sense of place are outlined below.

Even though the area is rich in history, no significant archaeological heritage resources were identified during the field assessment. No Stone Age or Iron Age heritage resources were identified during the survey. The few heritage resources that were identified consist of the ruins of older farm structures and kraals. Due to the paucity of older farm structures in the area as a result of demolition, it is recommended that the identified ruins and kraals remain untouched and that a safety buffer should exist around all such structures. The field assessment identified six burial grounds or graves close to or within the proposed development footprints of turbines and roads. All graves are of high local significance as a result of their social and cultural value, and are therefore graded IIIA. Mitigation measures for their ongoing conservation are proposed below.

The area proposed for the solar PV development is underlain by sediments of insignificant to zero palaeontological sensitivity. No impacts to sensitive fossil heritage are therefore anticipated to result from the proposed solar PV facility development. Should any development take place within the sensitive Vryheid Formation sediments (mapped in red in Figure 4.4), then the attached Chance Fossil Finds Procedure must be implemented for all excavations that exceed 1.5m in depth.

8. RECOMMENDATIONS

Based on the outcomes of this report, it is not anticipated that the proposed development of the solar energy facility and its associated infrastructure will negatively impact on significant heritage resources on condition that:

- The layout indicated in Figure 6 above is preferred
- A 500m no development buffer should be implemented on either side of the N17, R35 and R39
- A 200m no development buffer should be implemented on either side of the secondary routes that run through the development area

- A 500m no development buffer must be implemented around the identified farm werfs
- A 50m no-go development buffer is implemented around all burial ground sites including Observations 001 and 012.
- A Management Plan for the ongoing conservation of these burials is developed prior to construction, along with a Guide on how to identify marked and unmarked burials and how to proceed should previously unidentified burials be uncovered during the construction process.
- The historic farm werf cluster mapped in Figure 4.3 is not impacted by the development.
- Should any development take place within the sensitive Vryheid Formation sediments (mapped in red in Figure 4.4), then the attached Chance Fossil Finds Procedure must be implemented for all excavations that exceed 1.5m in depth.
- Although all possible care has been taken to identify sites of cultural importance during the investigation of the study area, it is always possible that hidden or subsurface sites could be overlooked during the assessment. If any evidence of archaeological sites or remains (e.g. remnants of stone-made structures, indigenous ceramics, bones, stone artefacts, ostrich eggshell fragments, charcoal and ash concentrations), fossils, burials or other categories of heritage resources are found during the proposed development, work must cease in the vicinity of the find and SAHRA must be alerted immediately to determine an appropriate way forward.

9. REFERENCES

Heritage Impact Assessments				
Nid	**Report Type**	**Author/s**	**Date**	**Title**
157393	Heritage Statement	Shahzaade Karodia Khan, Johan Nel	01/02/2014	HERITAGE STATEMENT FOR THE BASIC ASSESSMENT UNDERTAKEN FOR A POWERLINE UPGRADE, SYFERFONTEIN MINE, SECUNDA, MPUMALANGA PROVINCE
358403	HIA Phase 1	Anton van Vollenhoven	10/08/2015	A report on a Cultural Heritage Impact Assessment for the Development of a De-stoning Plan at the New Denmark Colliery, close to Standerton, Mpumalanga Province
5014	AIA Phase 1	Julius CC Pistorius	01/06/2007	A Phase 1 Heritage Impact Assessment Study for the Proposed New 88 kV Power Line Running from the Majuba Power Station near Amersfoort to the Camden Power Station near Ermelo in the Mpumalanga Province
5059	AIA Phase 1	Johnny Van Schalkwyk	01/05/2003	Archaeological Survey of a Section of the Secunda-Mozambique Gas Pipeline Bethal and Highveld Ridge
5700	AIA Phase 1	Johnny Van Schalkwyk	01/10/2002	A Survey of Cultural Resources for the Proposed New Tutuka-Alpha Standerton Power Transmission Line, Standerton District
7920	AIA Phase 1	Johnny Van Schalkwyk	01/02/2004	Heritage Impact Assessment for the Planned Sivukile Extension 4 Township Lekwa Municipality

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APPENDICES

APPENDICES

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APPENDIX 1: Archaeological Assessment (2022)

ARCHAEOLOGICAL SPECIALIST STUDY

In terms of Section 38(8) of the NHRA for a

UMMBILA EMOYENI RENEWABLE ENERGY WIND AND SOLAR PV FACILITIES, MPUMALANGA PROVINCE

Prepared by

CTS HERITAGE

Jenna Lavin

In Association with

Heidi Fivaz of Ubique Heritage Consultants

and

Savannah Environmental

June 2022

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EXECUTIVE SUMMARY

Emoyeni Renewable Energy Farm (Pty) Ltd is proposing the development of renewable energy facilities, collectively known as the Ummbila Emoyeni Renewable Energy Facility, consisting of a commercial wind farm, solar PV facility, and associated grid infrastructure, including a battery energy storage system, located approximately 6km southeast of Bethal in the Mpumalanga Province of South Africa.

The field assessment has determined that the area proposed for development has medium to high local historical significance. The broader cultural landscape consists of old farmhouses, kraals, circular stone structures, and the remnants of old water pumps, feeding and watering troughs. During the field assessment, the specialists were informed that some of the oldest farmhouses in the area, constructed with adobe, were demolished by current farmers as they were considered “unsavable”. This is an unfortunate loss of a significant layer of vernacular architecture and unique settlement heritage from this area. It is imperative that further erosion of this significant layer within the landscape is prevented through an inventory process or similar to record any remaining adobe farmhouses in the area. Unfortunately, this is beyond the scope of this assessment.

Even though the area is rich in history, no significant archaeological heritage resources were identified during the field assessment. No Stone Age or Iron Age heritage resources were identified during the survey. The few heritage resources that were identified consist of the ruins of older farm structures and kraals. Due to the paucity of older farm structures in the area as a result of demolition, it is recommended that the identified ruins and kraals remain untouched and that a safety buffer should exist around all such structures.

The field assessment identified six burial grounds or graves close to or within the proposed development footprints of turbines, roads and the solar PV facility.. All graves are of high local significance as a result of their social and cultural value, and are therefore graded IIIA.

Based on the outcomes of this report, it is not anticipated that the proposed development of the renewable energy facilities and its associated grid connection infrastructure will negatively impact on significant archaeological heritage on condition that:

- A 50m no-go development buffer is implemented around all burial ground sites including Observations 001, 005, 006, 008, 012 and 013.
- A Management Plan for the ongoing conservation of these burials is developed prior to construction, along with a Guide on how to identify marked and unmarked burials and how to proceed should previously unidentified burials be uncovered during the construction process.
- The historic farm werf cluster mapped in Figure 7.5 is not impacted by the development.
- Turbine 101 must be relocated 300m east along the road alignment to ensure that no human remains are impacted by the development.
- The road to Turbine 60 must be relocated to ensure that a no-development buffer of at least 50m is implemented around the burial site 013 so that no impact takes place.

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- Although all possible care has been taken to identify sites of cultural importance during the investigation of the study area, it is always possible that hidden or subsurface sites could be overlooked during the assessment. If any evidence of archaeological sites or remains (e.g. remnants of stone-made structures, indigenous ceramics, bones, stone artefacts, ostrich eggshell fragments, charcoal and ash concentrations), fossils, burials or other categories of heritage resources are found during the proposed development, work must cease in the vicinity of the find and SAHRA must be alerted immediately to determine an appropriate way forward.

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CONTENTS

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1. INTRODUCTION

1.1 Background Information on Project

Emoyeni Renewable Energy Farm (Pty) Ltd is proposing the development of renewable energy facilities, collectively known as the Ummbila Emoyeni Renewable Energy Facility, consisting of a commercial wind farm, solar PV facility, and associated grid infrastructure, including a battery energy storage system, located approximately 6km southeast of Bethal in the Mpumalanga Province of South Africa.

A preferred project focus area with an extent of 27 819ha been identified by Emoyeni Renewable Energy Farm (Pty) Ltd as a technically suitable area for the development of the Ummbilla Emoyeni Renewable Energy Farm with a contracted capacity of up to 666MW of wind energy and 150MW of solar energy. This layout, and project capacity, will be reduced as the EIA and scoping process identifies environmental constraints that exclude areas for development.

The project site comprises the following farm portions:

Table 1: Farm Portions

Parent Farm Number	Farm Portions
Farm 261 – Naudesfontein	15, 21
Farm 264 – Geluksplaats	0, 1, 3, 4, 5, 6, 8, 9, 11, 12
Farm 268 – Brak Fontein Settlement	6,7,10,11,12
Farm 420 – Rietfontein	8,9,10,11,12,15,16,18,19,22,32
Farm 421 - Sukkelaar	2, 2, 7, 9, 9 10, 10 11, 11 12, 12 22 ,25, 34, 35, 36, 37, 37, 38, 39, 40, 42, 42
Farm 422 – Klipfontein	0, 2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 13, 14, 16, 17, 18, 19, 20, 21, 22, 23
Farm 423 – Bekkerust	0, 1, 2, 4, 5, 6, 10, 11, 12, 13 14, 15, 17, 19, 20, 22, 23, 2425
Farm 452 – Brakfontein	5
Farm 454 – Oshoek	4, 13, 18
Farm 455 – Ebenhaezer	0, 1, 2, 3
Farm 456 – Vaalbank	1, 2, 3, 4, 7, 8, 13, 15, 16, 17, 18, 19
Farm 457 – Roodekrans	0, 1, 4, 7, 22, 23, 23
Farm 458 – Goedgedacht	0, 2, 4, 4, 5, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 21, 21, 22, 25, 26, 27, 28, 29, 31, 32, 33, 34, 35, 37, 39
Farm 467 – Twee Fontein	0, 1, 4, 5, 6, 7, 8, 10
Farm 469 – Klipkraal	5, 6, 7, 8
Farm 548 – Durabel	0

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The wind farm is proposed to accommodate the following infrastructure:

- Up to 111 wind turbines with a maximum hub height of up to 200m. The tip height of the turbines will be up to 300m.
- 33kV / 132kV onsite collector substations
- Battery Energy Storage System (BESS)
- Cabling between turbines, to be laid underground where practical
- Laydown and O&M hub (approximately 300m x 300m):
    - Batching plant of 4ha to 7ha
    - Construction compound (temporary) of 6 Ha approximately
    - Operation and Maintenance office of 1.5Ha approximately ,
- Laydown and crane hardstand areas (approximately 75m x 120m)
- Access roads of 12-13m wide, with 12m at turning circles.

The solar PV facility is proposed to accommodate the following infrastructure:

- PV modules and mounting structures with a capacity per panel of 350W to 450W and dependent on optimization and cost.
- Inverters and transformers
- 33kV/132kV onsite collector substation
- Battery Energy Storage System (BESS)
- Cabling between project components
- Laydown and O&M hub (approximately 300m x 300m):
    - Construction compound (temporary),
    - Maintenance office
- Access roads (up to 12m wide)

The project will include associated grid infrastructure that is required to connect the Ummbila Emoyeni Renewable Energy Facility to the national grid. The grid connection solution entails establishing a 400/132 kV MTS, between Camden and SOL Substations, which will be looped in and out of the existing Camden-Sol 400 kV line[1]. The location of the MTS will be refined through an ongoing process of communication with Eskom Planning but will be within close proximity to the 400kV line in order to cut into this line.

It is anticipated that the power generated by the project will be bid into the REIPPPP tender process (DMRE) and/or into private off take opportunities. The LILO corridor will intersect with either the Camden-Zeus 1 400kV, Camden-Zeus 2 400kV or Camden-Tutuka 400kV power line.

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1.2 Description of Property and Affected Environment

The area proposed for development is dominated by agriculture and Soweto Highveld Grassland. The study area consists of a gentle to medium undulating landscape with a few prominent rocky outcrops visible consisting largely of shale, dolerite and sandstone.

The vegetation of the study area alternates between cultivated cornfields, grasslands for grazing, and the typical grass tundras of the Highveld plateau. There are narrow streams and small scattered wetlands present across the study area. Dirt roads, main roads and farmlands bound the site to the north, south, east and west.

Evidence of crop rotation and different types of cultivation is visible in areas of the development footprint. Scraped dirt roads, large farm vehicles and cargo trucks are present, moving through wet turf soil resulting in turbation of the roads.

The area is predominantly cornfields and grasslands in various stages of harvesting. In addition, large hay bales indicate that many “natural” grasslands are grown for animal feed. Therefore, it was clear that much of the area has been subjected to continuous agricultural activities and anthropogenic disturbances for a very long time.

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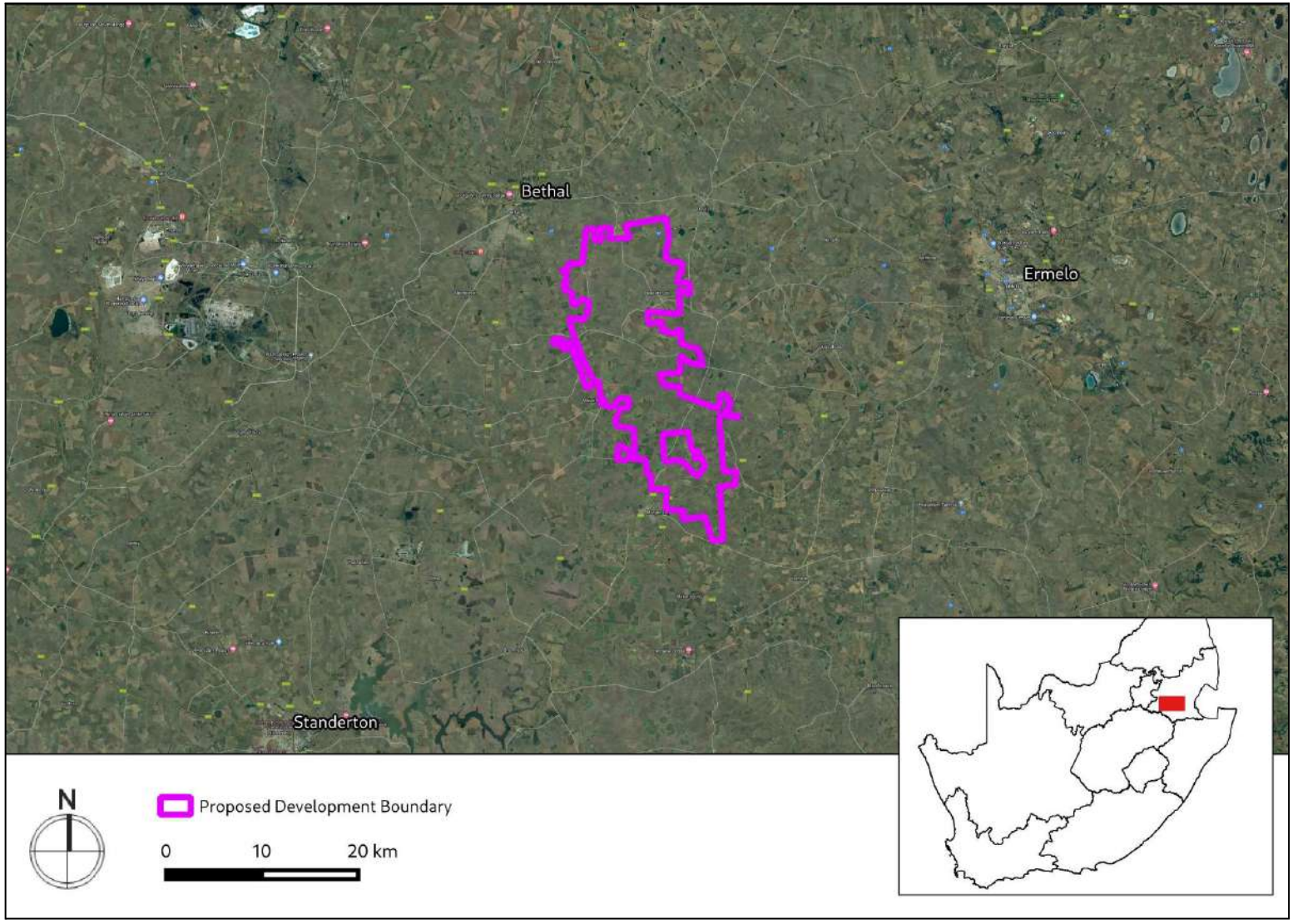

Figure 1.1: Satellite image indicating proposed location of development

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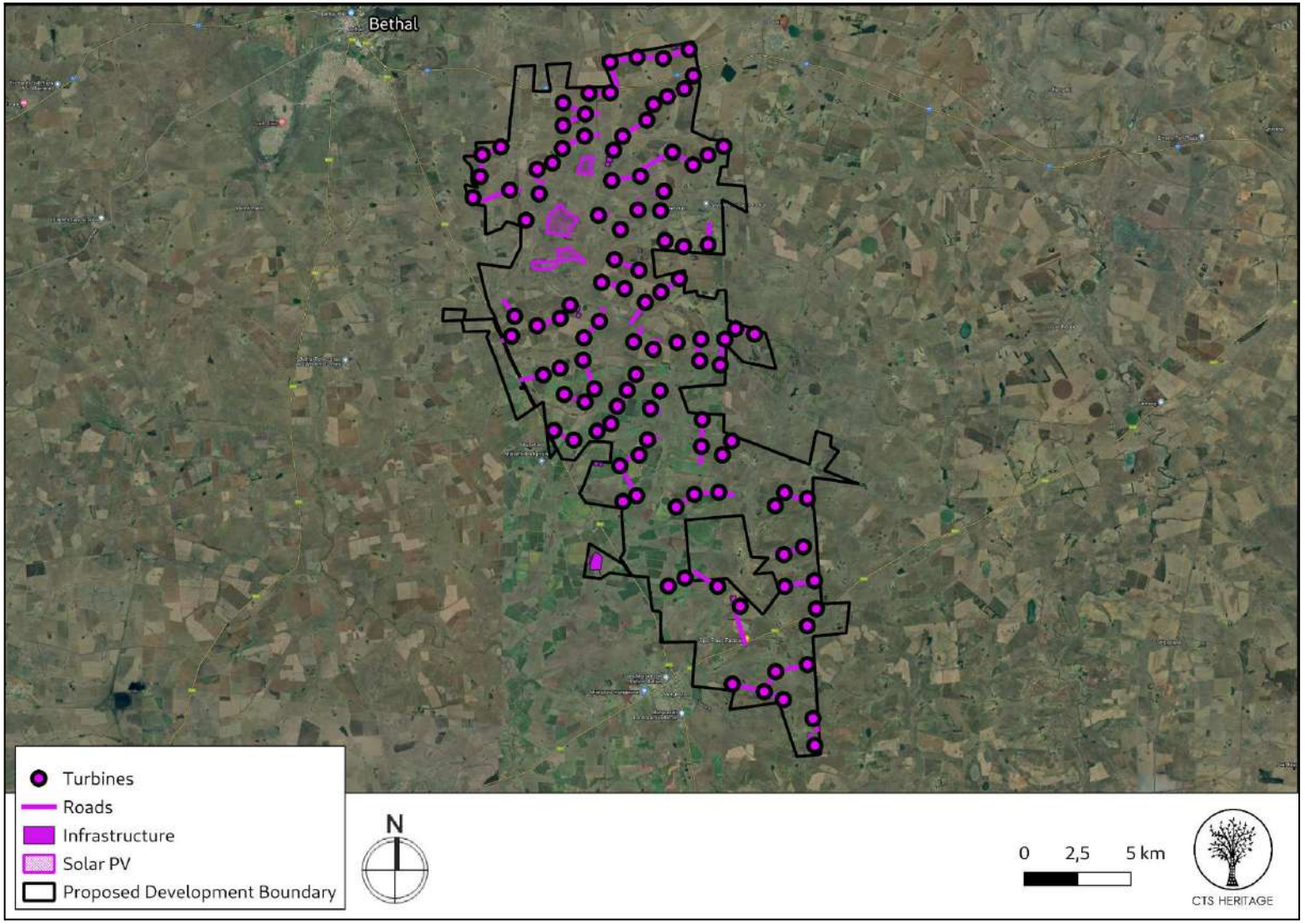

Figure 1.2: Project boundary with proposed layout

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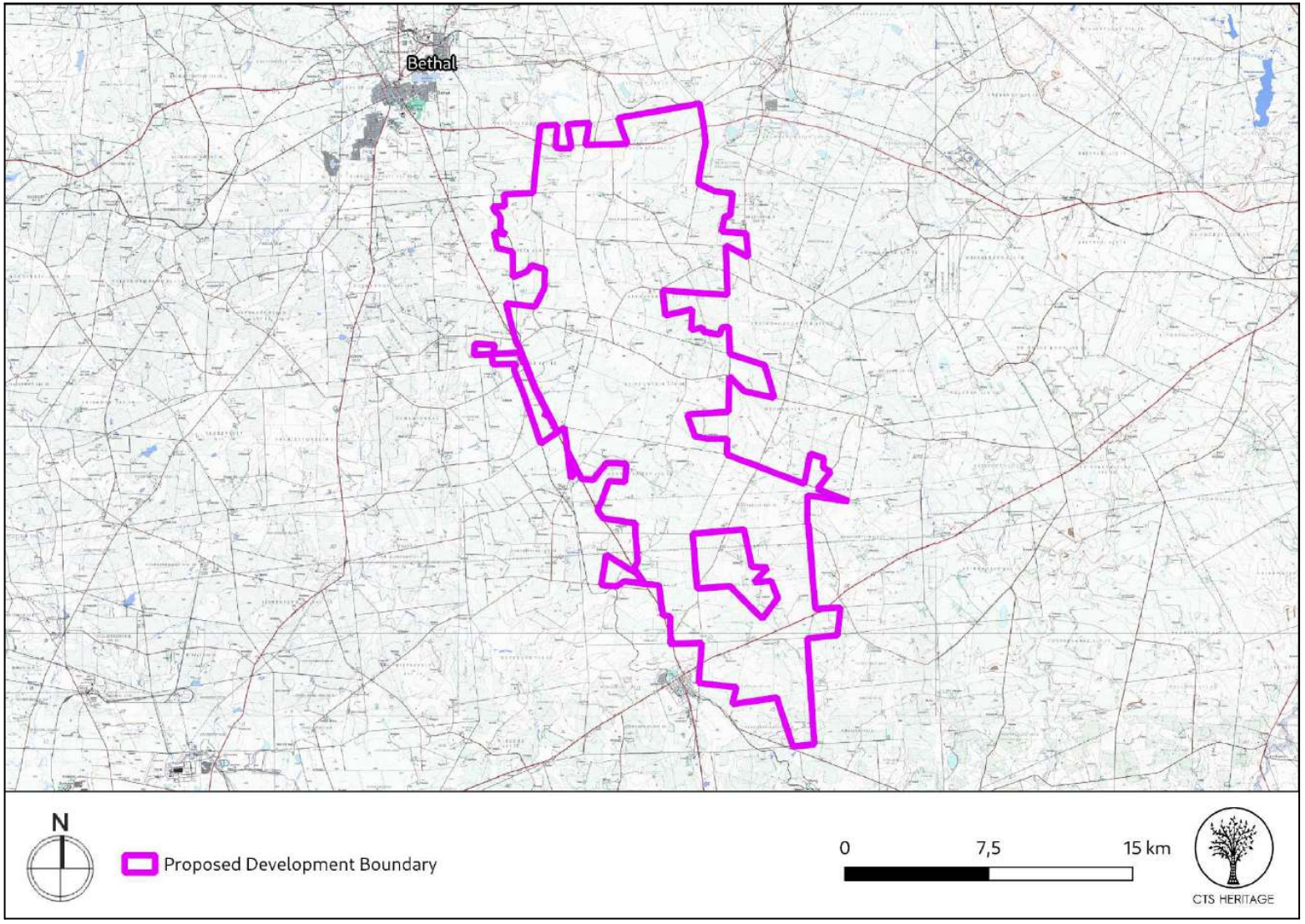

Figure 1.3: Project boundary on the 1:50 000 Topo Map

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2. METHODOLOGY

2.1 Purpose of Archaeological Study

The purpose of this archaeological study is to satisfy the requirements of section 38(8), and therefore section 38(3) of the National Heritage Resources Act (Act 25 of 1999) in terms of impacts to archaeological resources.

2.2 Summary of steps followed

- An archaeologist conducted a survey of the site and its environs from 9 to 12 June 2022 to determine what archaeological resources are likely to be impacted by the proposed development.
- The area proposed for development was assessed on foot, photographs of the context and finds were taken, and tracks were recorded using a GPS.
- The identified resources were assessed to evaluate their heritage significance in terms of the grading system outlined in section 3 of the NHRA (Act 25 of 1999).
- Alternatives and mitigation options were discussed with the Environmental Assessment Practitioner.

2.3 Constraints & Limitations

The area was surveyed as well as possible at the time and as the vegetation growth allowed. The area has previously been cultivated and disturbed by human and animal activity. Therefore, sites were predominantly recognised by focussing on vegetation changes and studying Google Earth imagery and old topographic maps.

Where the development footprints lie within agricultural, recently ploughed or cultivated lands, these were not surveyed in-depth, as any in-situ archaeological sites would have already been destroyed through this agricultural activity. In addition, due to the unseasonal winter rain and flooding, some turbine footings were inaccessible. Further limitations experienced were the multitude of locked gates or tight wire fencing that could not be traversed. The survey tracks followed the farm roads, fences and camp boundaries from which pedestrian surveys were conducted at various points.

The experience of the heritage practitioner, and observations made during the study, allow us to predict with some accuracy the archaeological sensitivity of the receiving environment.

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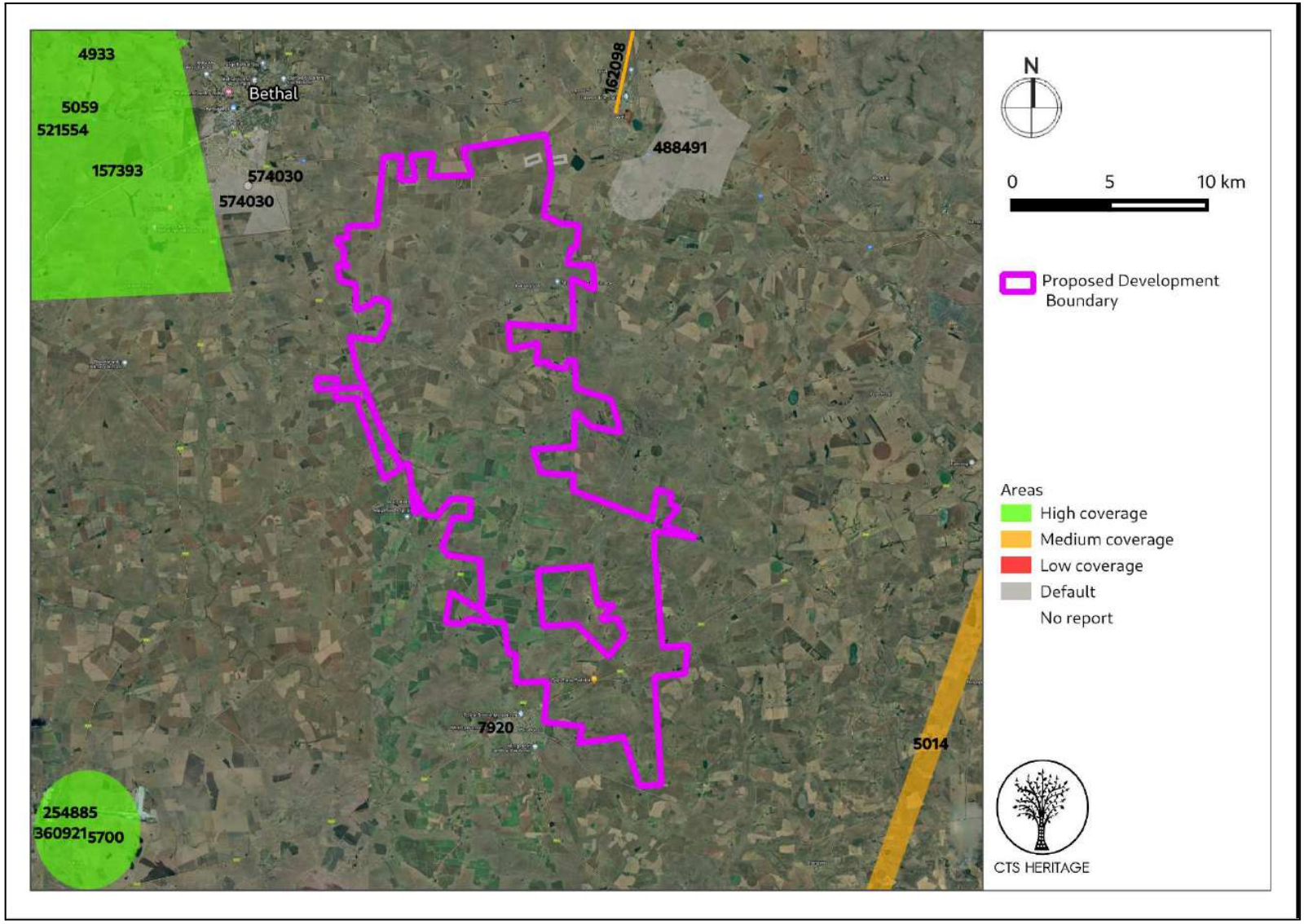

Figure 2: Close up satellite image indicating proposed location of development in relation to heritage studies previously conducted

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3. HISTORY AND EVOLUTION OF THE SITE AND CONTEXT

Background:

The area proposed for this Renewable Energy Development is located immediately south of Bethal, west of Ermelo and East of Secunda. This area is known for its rolling hills and extensive coal mine infrastructure.

Van Vollenhoven (2015) described the broader assessment area in his assessment completed for a de-stoning plan located adjacent to this proposed development area. Van Vollenhoven (2015) describes the environment as "disturbed by recent human activities, mainly agriculture. This consists of maize fields. Other disturbance visible is mining infrastructure..., a railway track... and power lines... Signs of old fields were also present which could be seen in the pioneer plant species consisting of weeds and grass. Almost half of the surveyed area consists of natural grassland. The vegetation cover varies between short and long grass... The topography of the area forms part of the rolling hills of the surrounding landscape."

Van Vollenhoven (2015) notes that "At the beginning of the 19th century the Phuthing, a South Sotho group, stayed in the vicinity of modern day Bethal. During the Difaquane they fled to the south (Bergh 1999: 10-11; 109). In 1829 the traveller Robert Scoon passed through an area to the north of Bethal (Bergh 1999: 13). The first white farmers only settled here during the late 1850's. By the 1890's this area was inhabited by many white farmers (Bergh 1999: 18-20). The town of Standerton was established in 1879 although it already was a district in 1878. Bethal was established in 1880 and it became an independent district in 1898 (Bergh 1999: 20-21). During the Anglo-Transvaal War (1880-1881) the British garrison in Standerton was beleaguered by the Boer forces (Bergh 1999: 46). The Highveld areas also saw much action consisting of various skirmishes between Boer and Brit during the Anglo-Boer War (1899-1902). It includes skirmishes on the farms Oshoek (4 December 1901), Trigaardsfontein (10 December 1901), Witbank (11 January 1902) and Nelspan (26 January 1902) (Bergh 1999: 51, 54)... At Standerton there was both a concentration camp for white and for black people (Bergh 1999: 54)."

Archaeology

None of the area proposed for development has been previously assessed in any heritage impact assessment process. Heritage Impact Assessments have been completed nearby for projects in Secunda and these can be used to infer the archaeological sensitivity in the development area. Van Vollenhoven (2015) notes that the geographical area around the towns of Standerton and Bethal is not known to conserve Stone Age archaeology. He notes that "No such sites are indicated on maps contained in a historical atlas of this area (Bergh 1999: 4-5). However, this may only be since no research has actually been done in this area. The closest known Stone Age occurrences are a Late Stone Age site at the town of Ermelo and rock art sites far to the west of Standerton (Bergh 1999: 4-5)." Van Vollenhoven (2015) noted no natural shelters during the survey; however, the good vegetation in the surrounding area and the rivers indicate that ample grazing and water may have been available, making it a prime spot for hunting in the past. Therefore one may assume that Stone Age people probably would have moved through the area. Late Iron Age sites are found in a large area around the towns of Bethal and Standerton and number at least 585 such sites.

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In the heritage assessment of a powerline upgrade at the nearby Syferfontein Mine, Nel & Karodia (2013), noted that "*a heritage assessment was conducted in 2000 by the National Cultural History Museum and included in the Syferfontein Mine EMP in 2010. During the survey, a few Stone Age artefacts were identified. These artefacts were not considered to have any primary context and therefore were interpreted to have low significance value. No Early Iron Age sites were identified. The Late Iron Age sites found here conform to those identified in the literature for the Southern Highveld area (former southern Transvaal, northern Orange Free State) as Type V sites. As the soil is mostly turf, Iron Age settlement usually took place on the various dolerite outcrops. The added benefit of choosing these locations was that it was located at the source of building material used in constructing the settlements. One such site shows interesting features as the living units were actually excavated to obtain enough building material for the surrounding walls. A few of the farmsteads dating to early part of this century were identified as possibly having historical-architectural significance. A number of abandoned homesteads are located in the areas that were investigated. These seem to belong to farm labourers and were all abandoned within the last few years. They are therefore not viewed to be of cultural or historical significance. However, some graves are located in the vicinity of the homesteads and it is possible that more graves will be located nearby*".

None of the sites identified in the assessment referenced are located within or near the development area, however the text provides a good assessment of resources that may be present. It is clear that the development area has not previously been assessed. It is therefore possible that the proposed development will impact negatively on archaeological resources associated with the Late Iron Age, burial grounds and graves as well as stone age archaeological resources.

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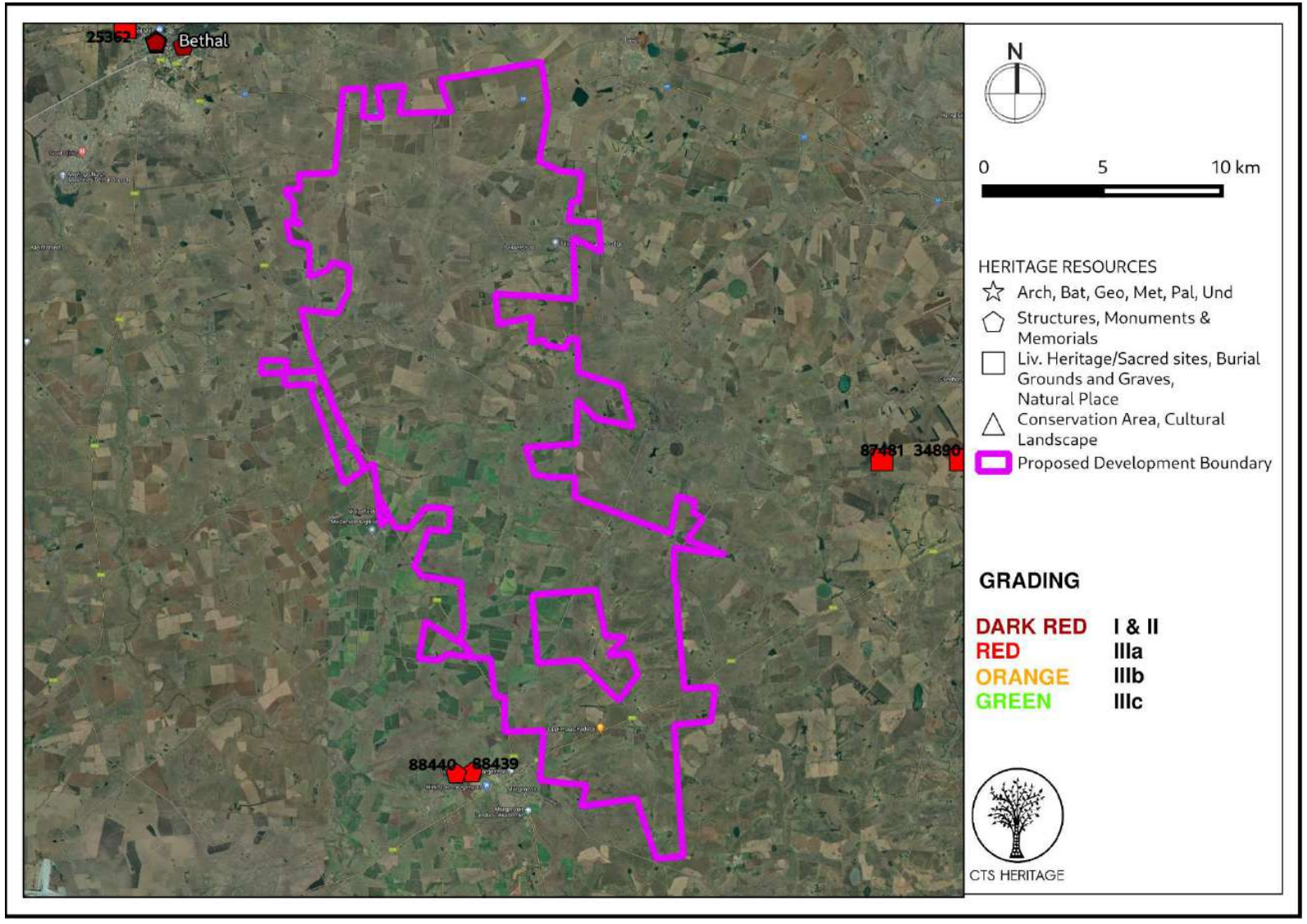

Figure 3. Heritage Resources Map. Heritage Resources previously identified in and near the study area, with SAHRIS Site IDs indicated

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4. IDENTIFICATION OF HERITAGE RESOURCES

4.1 Field Assessment

The field assessment has determined that the area proposed for development has medium to high local historical significance. The broader cultural landscape consists of old farmhouses, kraals, circular stone structures, and the remnants of old water pumps, feeding and watering troughs. During the field assessment, the specialists were informed that some of the oldest farmhouses in the area, constructed with adobe, were demolished by current farmers as they were considered “unsavable”. This is an unfortunate loss of a significant layer of vernacular architecture and unique settlement heritage from this area. It is imperative that further erosion of this significant layer within the landscape is prevented through an inventory process or similar to record any remaining adobe farmhouses in the area. Unfortunately, this is beyond the scope of this assessment.

Even though the area is rich in history, no significant archaeological heritage resources were identified during the field assessment. No Stone Age or Iron Age heritage resources were identified during the survey. The few heritage resources that were identified consist of the ruins of older farm structures and kraals. Due to the paucity of older farm structures in the area as a result of demolition, it is recommended that the identified ruins and kraals remain untouched and that a safety buffer should exist around all such structures.

The field assessment identified six burial grounds or graves close to or within the proposed development footprints of turbines, roads and the solar PV facility.. All graves are of high local significance as a result of their social and cultural value, and are therefore graded IIIA.

Figure 4.1: Contextual image of development area

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Figure 4.2: Contextual image of development area

Figure 4.3: Contextual image of development area

Figure 4.4: Contextual image of development area

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Figure 4.5: Contextual image of development area

Figure 4.6: Contextual image of development area

Figure 4.7: Contextual Images of landscape

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Figure 4.8: Contextual Images of Landscape

Figure 4.9: Contextual Images of Landscape

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Figure 4.10: Contextual image of development area

Figure 4.11: Contextual image of development area

Figure 4.12: Contextual image of development area

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Figure 4.13: Contextual image of development area

Figure 4.14: Contextual image of development area

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Figure 4.15: Contextual image of development area

Figure 4.16: Contextual image of development area

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Figure 4.17: Contextual image of development area

Figure 4.18: Contextual image of development area

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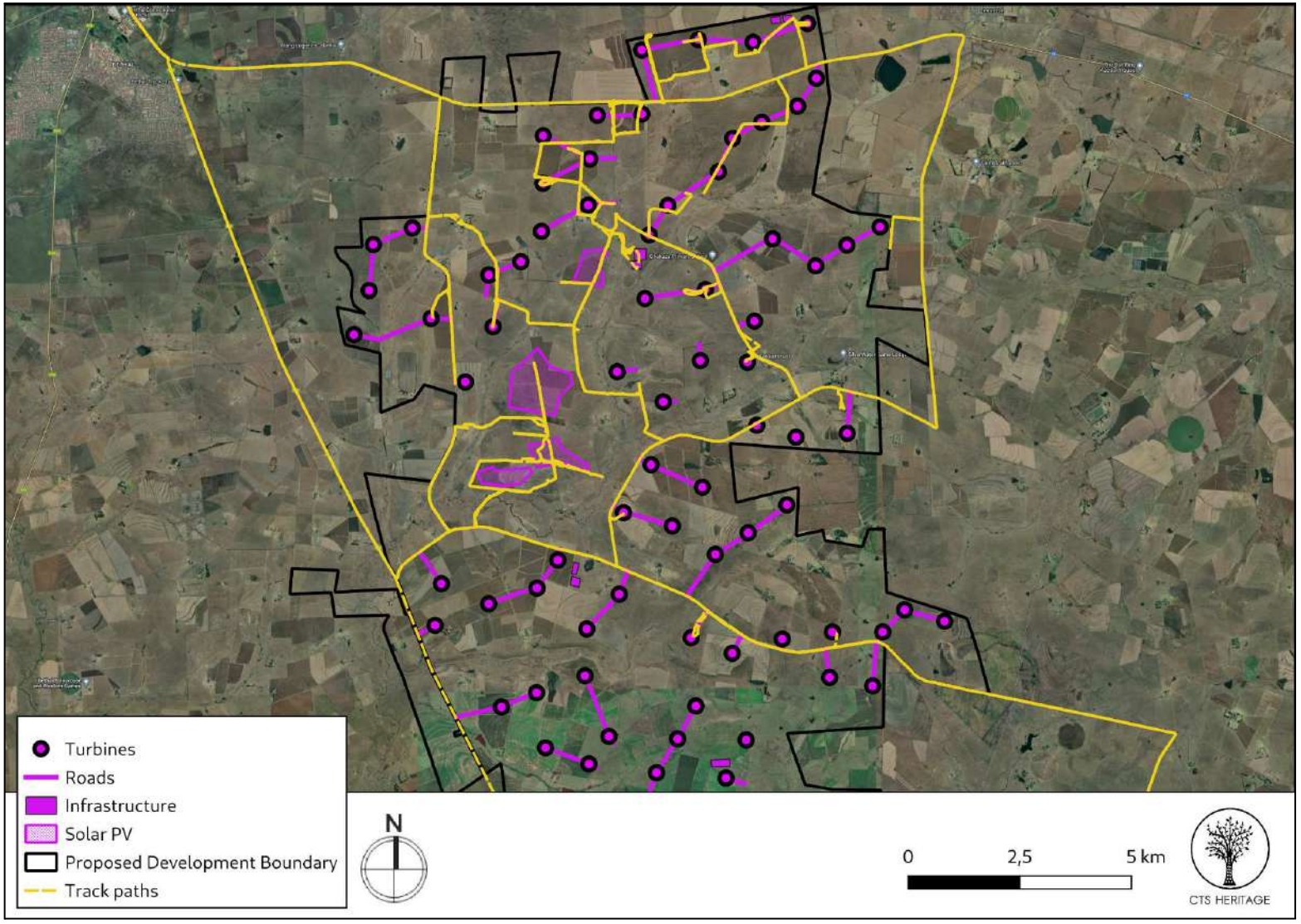

Figure 5.1: Overall track paths of foot survey for the proposed development- northern section

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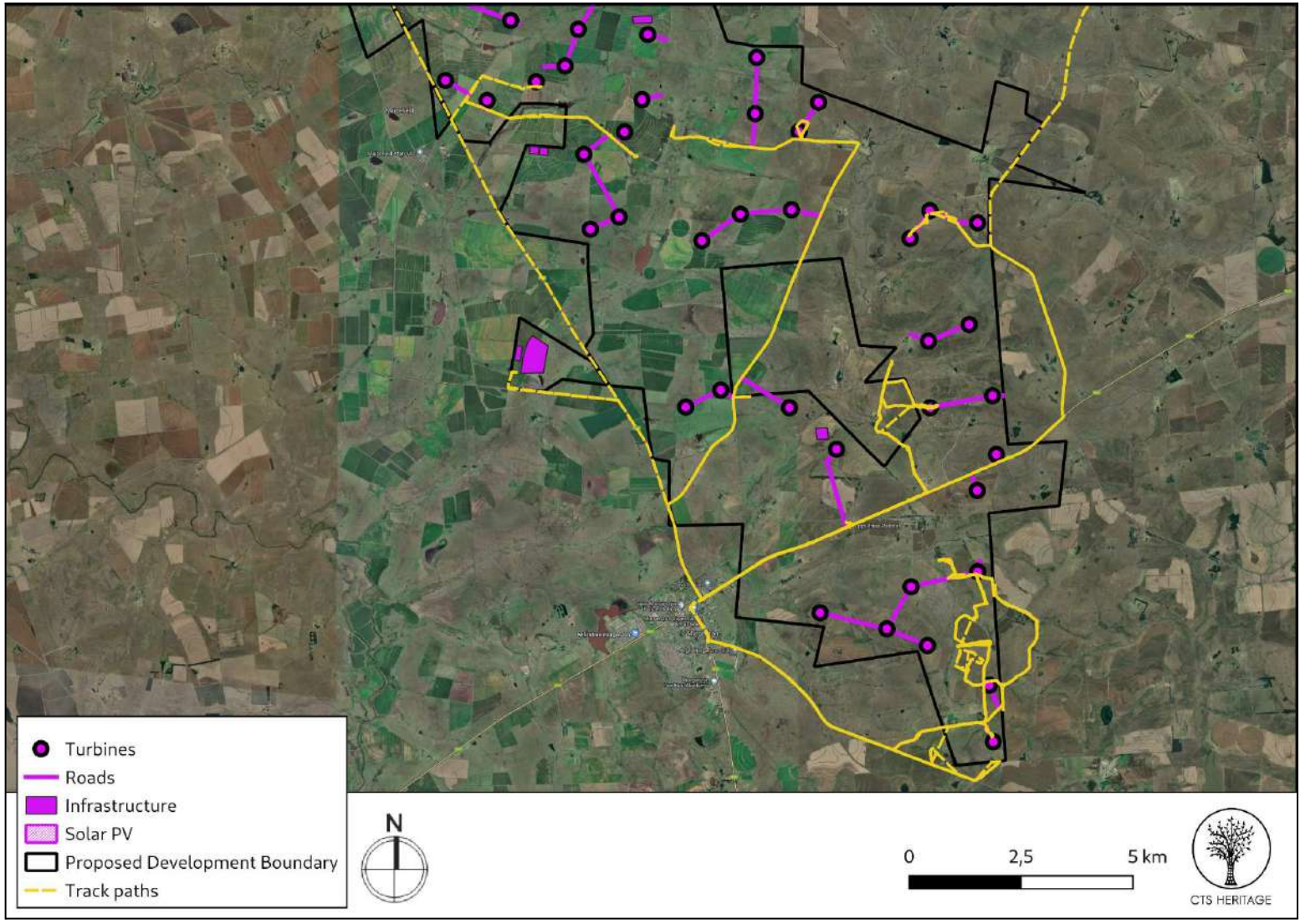

Figure 5.2: Overall track paths of foot survey for the proposed development- southern section

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4.2 Archaeological Resources identified

Table 1: Observations noted during the field assessment

ID	Site Name	Description	Co-ordinates		Grading	Mitigation
1	Umbila Emoyeni 001	10? GRAVES Not all the cairns are intact	-26.50822222	29.57985	IIIA	No direct impact anticipated. Part of historic cluster
2	Umbila Emoyeni 002	STONE STRUCTURE Part of the historical identity of the area, including stone structures and foundations.	-26.51131389	29.57884167	IIIC	No direct impact anticipated. Part of historic cluster
3	Umbila Emoyeni 003	STONE FOUNDATION Part of the historical identity of the area, including stone structures and foundations.	-26.51185278	29.57861111	NCW	Likely to be impacted by the Solar PV Layout
4	Umbila Emoyeni 004	AREA WITH OLD STONE HOUSE STONE CIRCLES STONE KRAAL Part of the historical identity of the area, including stone structures and foundations.	-26.74378611	29.69147222	IIIC	Not impacted by the current development layout
5	Umbila Emoyeni 005	41 GRAVES Fieldstone cairns, with a few cement headstones. Headstones are marked, challenging to discern dates. Graves are situated right next to a cornfield, with a wire fence dissecting what may be more graves	-26.7268	29.68093056	IIIA	No direct impact anticipated however possibility of more burials in the area
6	Umbila Emoyeni 006	15 GRAVES Fieldstone cairns. No inscriptions that could be read. Graves are situated on top of the koppie, within the wind turbine footprint.	-26.69272778	29.67026111	IIIA	Turbine must be relocated more than 300m east of its present location
7	Umbila Emoyeni 007	OLD STRUCTURES Part of the historical identity of the area, including stone structures and foundations.	-26.51163056	29.64264722	NCW	Not impacted by the current development layout
8	Umbila Emoyeni 008	POSSIBLE GRAVE One stone cairn	-26.50435	29.59498889	IIIA	No direct impact anticipated
9	Umbila Emoyeni 009	HISTORIC YARD MIDDEN Part of the historical identity of the area, including stone structures and foundations.	-26.50869722	29.58020833	IIIC	No direct impact anticipated. Part of historic cluster
10	Umbila Emoyeni 010	HISTORICAL HOUSE AND YARD Part of the historical identity of the area, including stone structures and foundations.	-26.50905278	29.58053611	IIIC	No direct impact anticipated. Part of historic cluster
11	Umbila Emoyeni 011	LARGE STONE KRAAL Part of the historical identity of the area, including stone structures and foundations.	-26.51104444	29.58501667	IIIC	No direct impact anticipated. Part of historic cluster
12	Umbila Emoyeni 012	5 GRAVES Metal cross, fieldstone cairns. Graves are along the proposed powerline route	-26.54944722	29.56575833	IIIA	No direct impact anticipated
13	Umbila Emoyeni 013	80 GRAVES Fieldstone cairns and headstones, painted cement frames and headstones, cement and concrete slabs and headstones. Some of the	-26.58522222	29.60138611	IIIA	Road/grid must be realigned to ensure a minimum of a

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		graves have inscriptions; dates indicated as the 1940s and 1950s. Approximately 80 graves within a rectangular packed stone border Graves are along the proposed powerline route				50m no development buffer is implemented around the site
14	Umbila Emoyeni 014	HISTORICAL PUMP	-26.58596389	29.60083611	NCW	No direct impact anticipated
15	Umbila Emoyeni 015	SITE SURFACE SCATTERS METAL Surface scatters of glass, large metal objects, farm implements and a cast-iron pot. Could be associated with the graveyard at WP 013 GR	-26.58672222	29.59949444	IIIC	No direct impact anticipated

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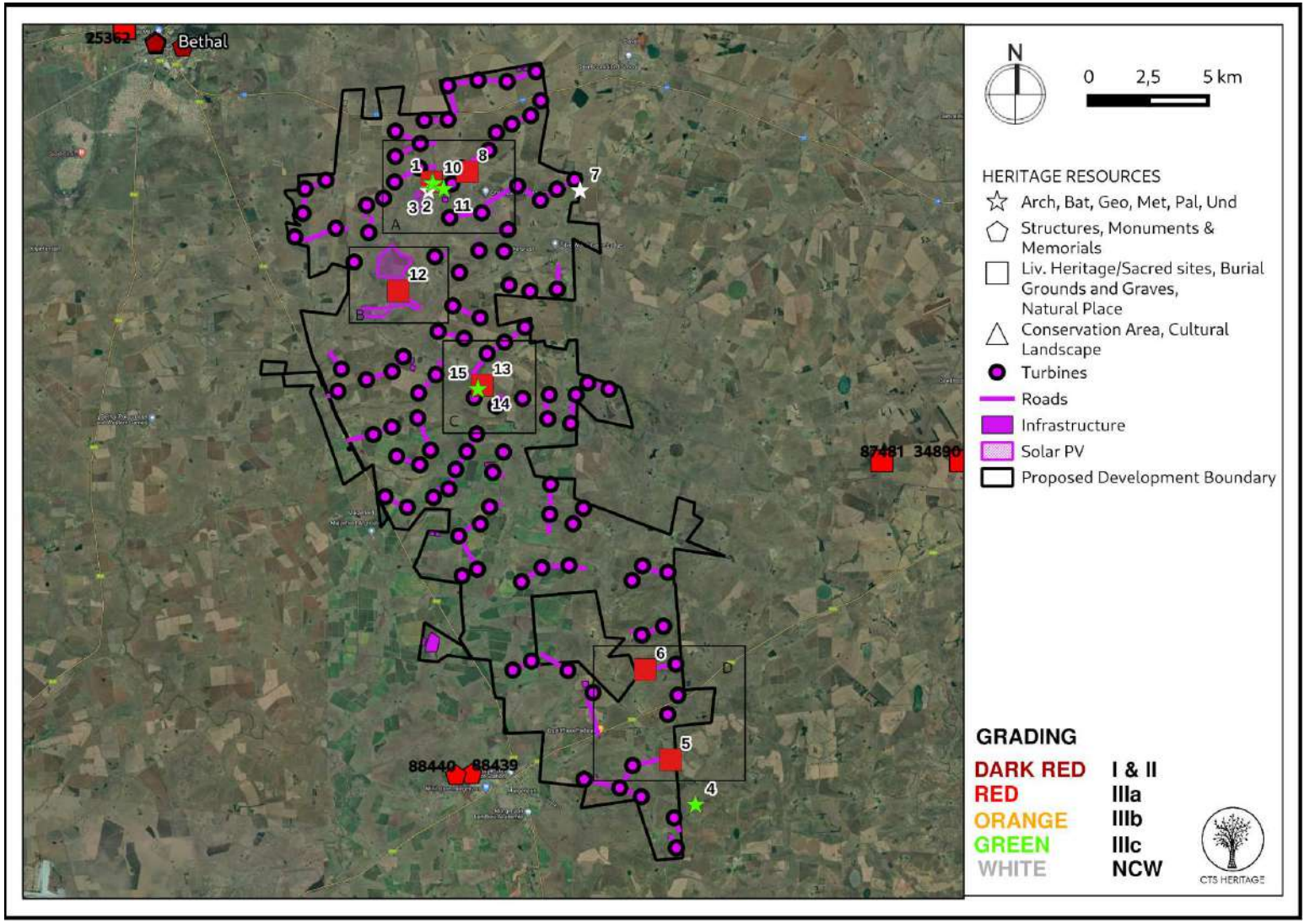

Figure 6: Map of all sites and observations noted within the development area

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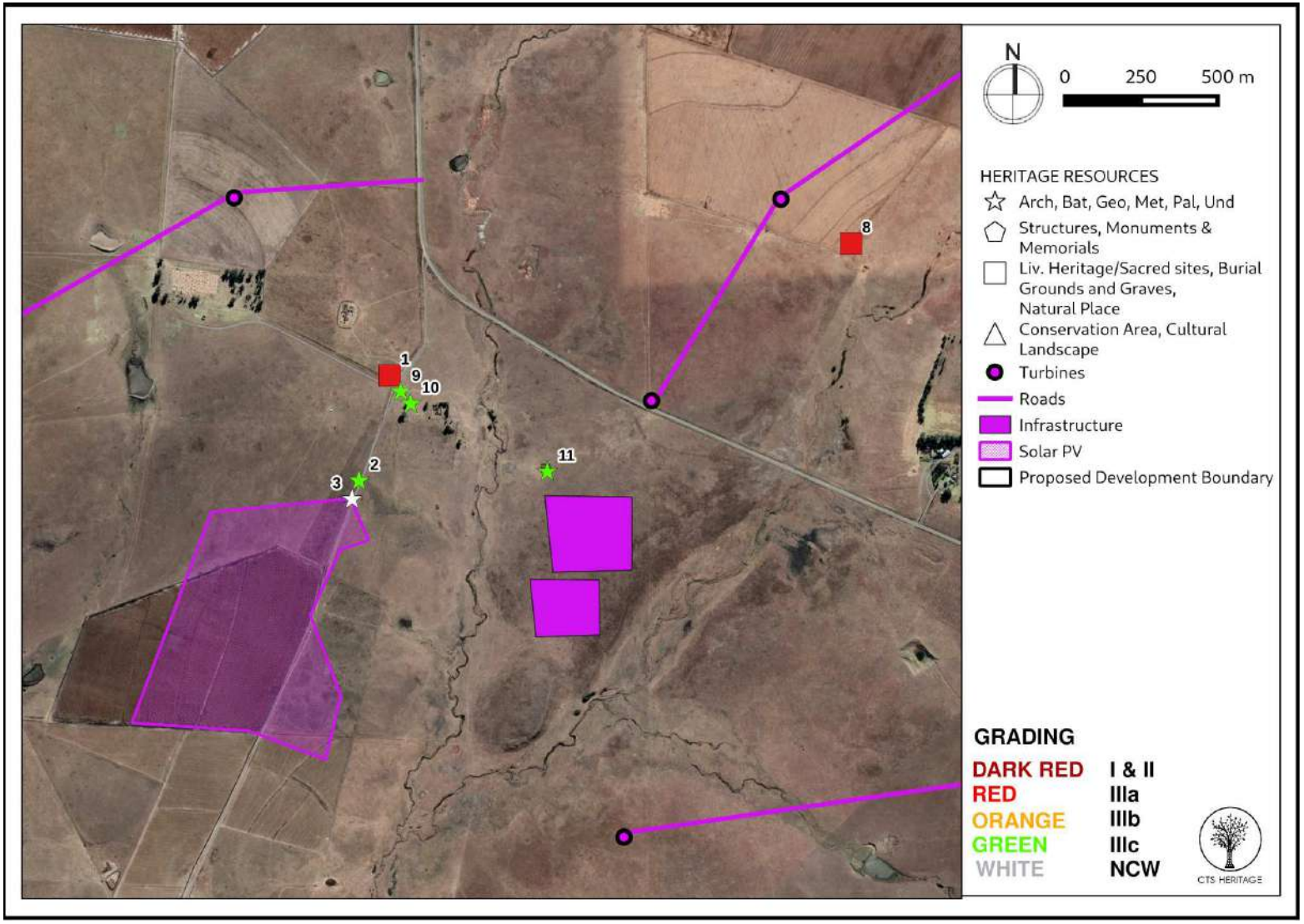

Figure 6.1: Map of all sites and observations noted within the development area - Inset A

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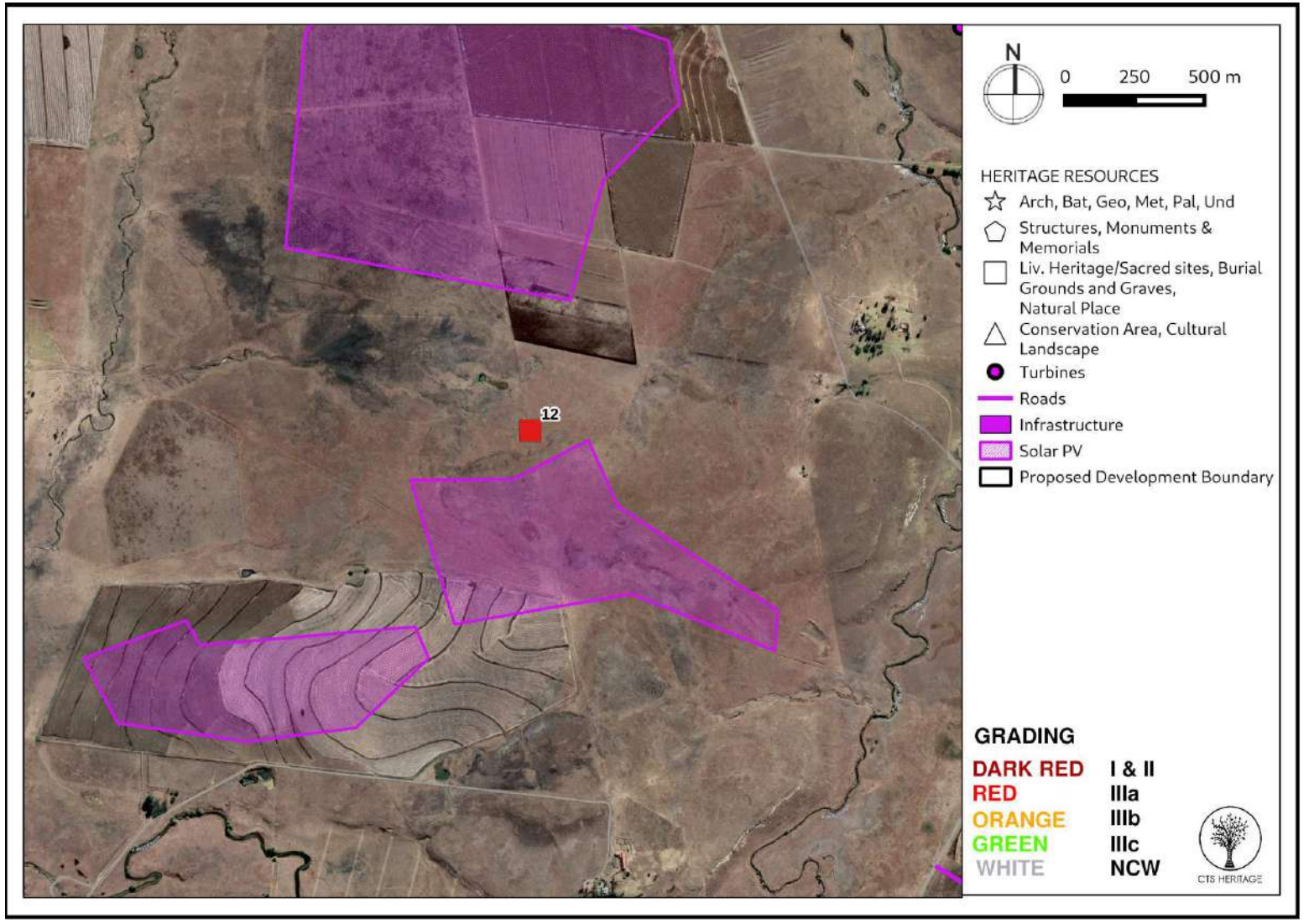

Figure 6.2: Map of all sites and observations noted within the development area - Inset B

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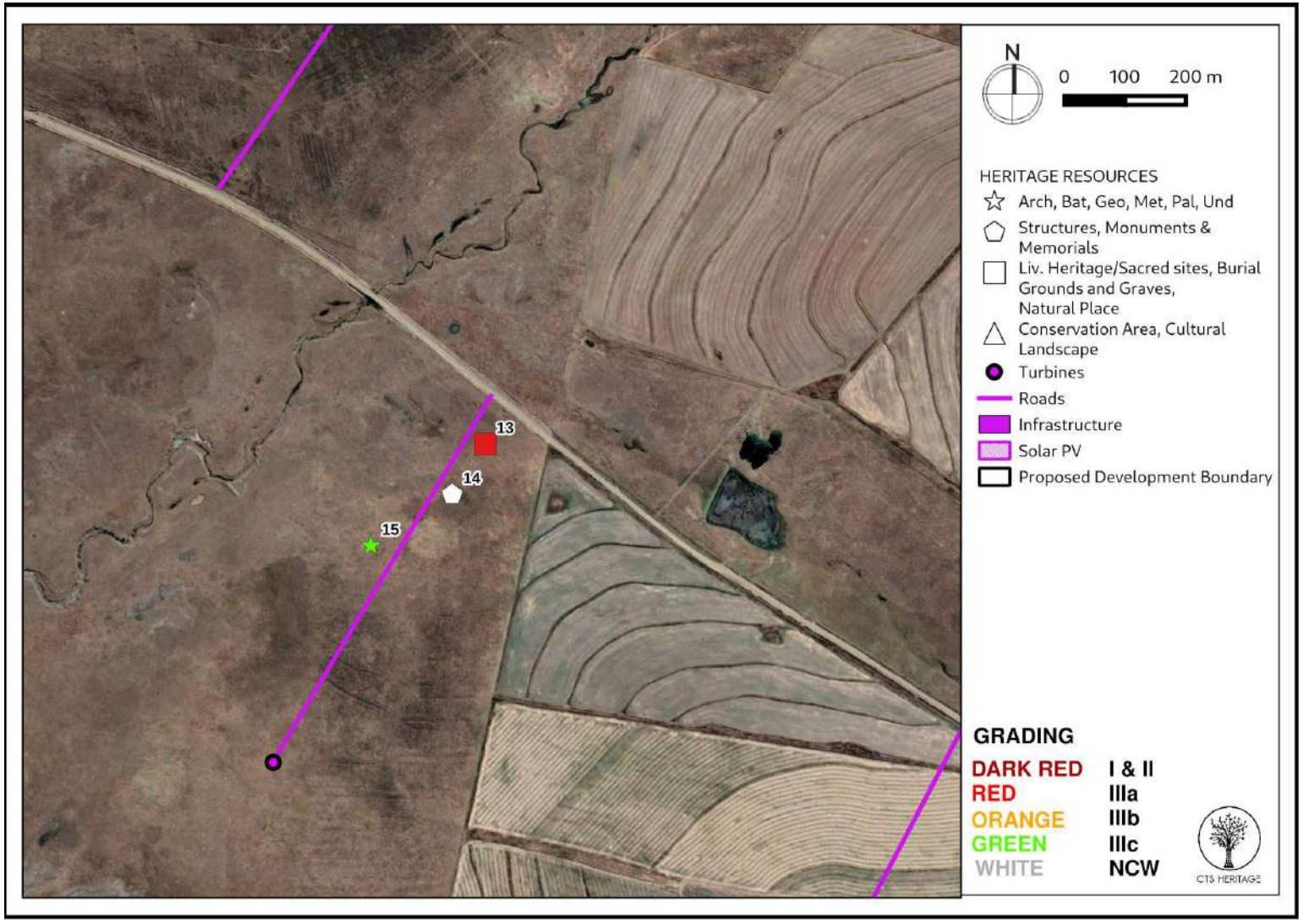

Figure 6.3: Map of all sites and observations noted within the development area - Inset C

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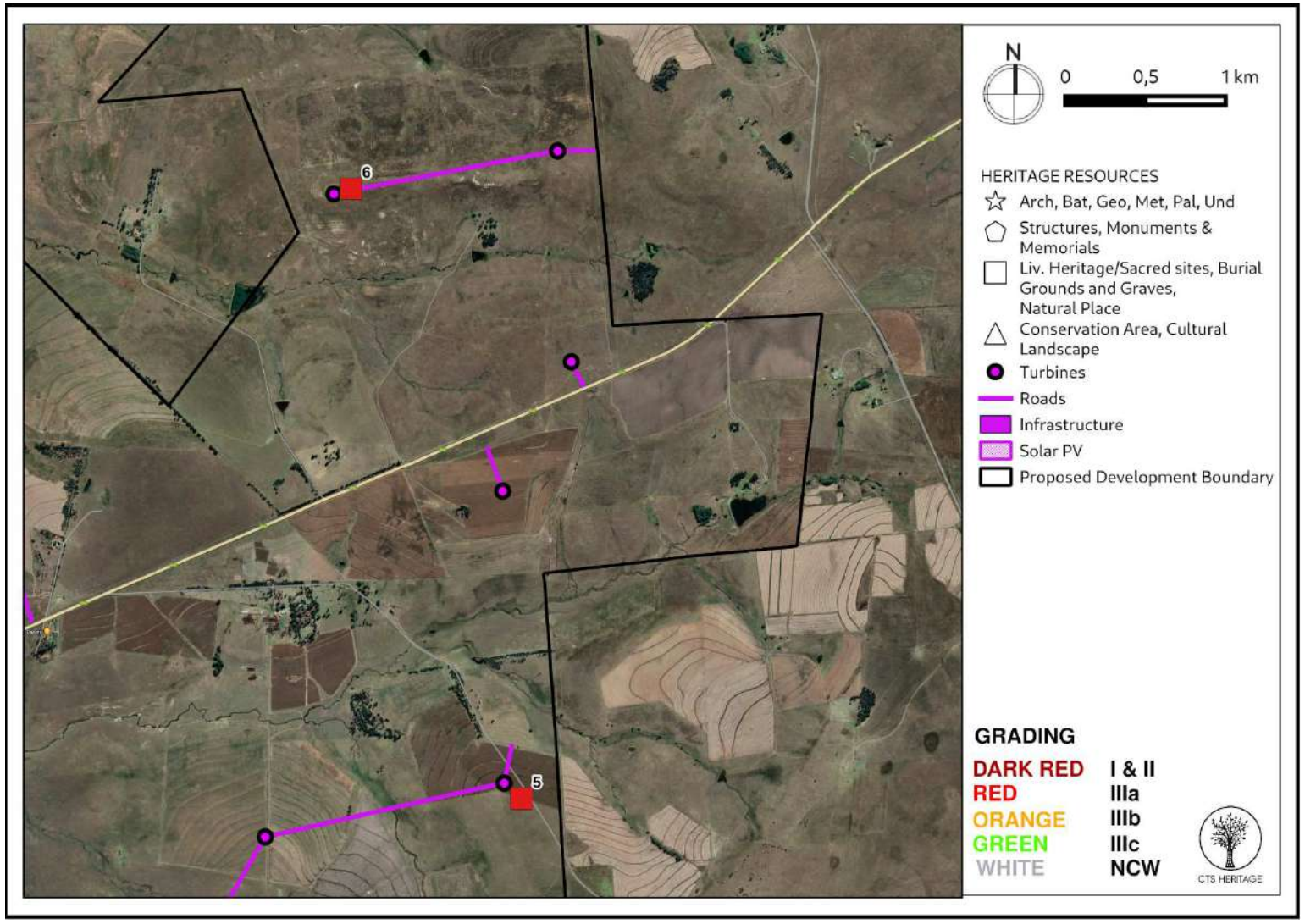

Figure 6.4: Map of all sites and observations noted within the development area - Inset D

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4.3 Selected photographic record

(a full photographic record is available upon request)

Figure 6.1: Observation 001

Figure 6.2: Observation 001

Figure 6.3: Observation 002

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Figure 6.4: Observation 003

Figure 6.5 Observation 004

Figure 6.6 Observation 005

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Figure 6.7 Observation 005

Figure 6.8 Observation 005

Figure 6.9: Observation 005

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Figure 6.10: Observation 006

Figure 6.11: Observation 006

Figure 6.12: Observation 006

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Figures 6.13: Observation 007

Figure 6.14: Observation 007

Figure 6.15: Observation 008

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Figure 6.16: Observation 009

Figure 6.17: Observation 010

Figure 6.18: Observation 010

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Figure 6.19: Observation 011

Figure 6.20: Observation 012

Figure 6.21: Observation 013

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Figure 6.22: Observation 014

Figure 6.23: Observation 015

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5. ASSESSMENT OF THE IMPACT OF THE DEVELOPMENT

5.1 Assessment of impact to Archaeological Resources

The proposed development will not have a substantial negative impact on the archaeological heritage resources identified within the proposed development area for the renewable energy facilities and associated infrastructure. No Stone Age or Iron age archaeology was identified during the field assessment. Some historical ruins and kraals of contextual historic significance, graded IIIC, were identified; however, none of these are likely to be impacted as per the layout provided.

A number of burial grounds and/or graves were identified during the field assessment (Grade IIIA) and some of these fall within areas likely to be impacted as per the proposed layout. Mitigation measures in this regard are provided below. The burial ground recorded as Observation 008 falls away from any proposed infrastructure and is therefore unlikely to be impacted by the development (Figure 7.1). However, it is still recommended that a no-development area of 50m be implemented around this site to ensure that no impact takes place.

Turbines, Infrastructure and Roads

Burial site 5 is located along an existing farm road approximately 140m from the road leading to Turbine 105 (Figure 7.2). This site consist of 41 marked graves No direct impact is anticipated, however the presence of this burial adjacent to a cornfield indicates that more burials may be present in the area and as such, care must be taken in this regard.

Burial site 6 consists of 15 graves and is located on top of the koppie, within the wind turbine footprint (Figure 7.3). It is likely that this burial ground is associated with the nearby Vaalbank farm werf. This site is likely to be directly impacted by the development of Turbine 101 and the road leading up to it. It is recommended that the turbine be relocated 300m east along the road alignment to ensure that no human remains are impacted by the development.

Burial site 13 and historical sites 14 and 15 are located along the road leading from the farm road to Turbine 60 (Figure 7.4). Burial site 13 is described as consisting of approximately 80 graves marked with fieldstone cairns and headstones, painted cement frames and headstones, cement and concrete slabs and headstones. Some of the graves have inscriptions; dates indicated as the 1940s and 1950s. It is likely that this burial ground is associated with the historical observations made at Site 14 and 15. The proposed road alignment falls within 50m of the burial ground and as such, it is recommended that the road be relocated to ensure that a no-development buffer of at least 50m is implemented around the burial site so that no impact takes place.

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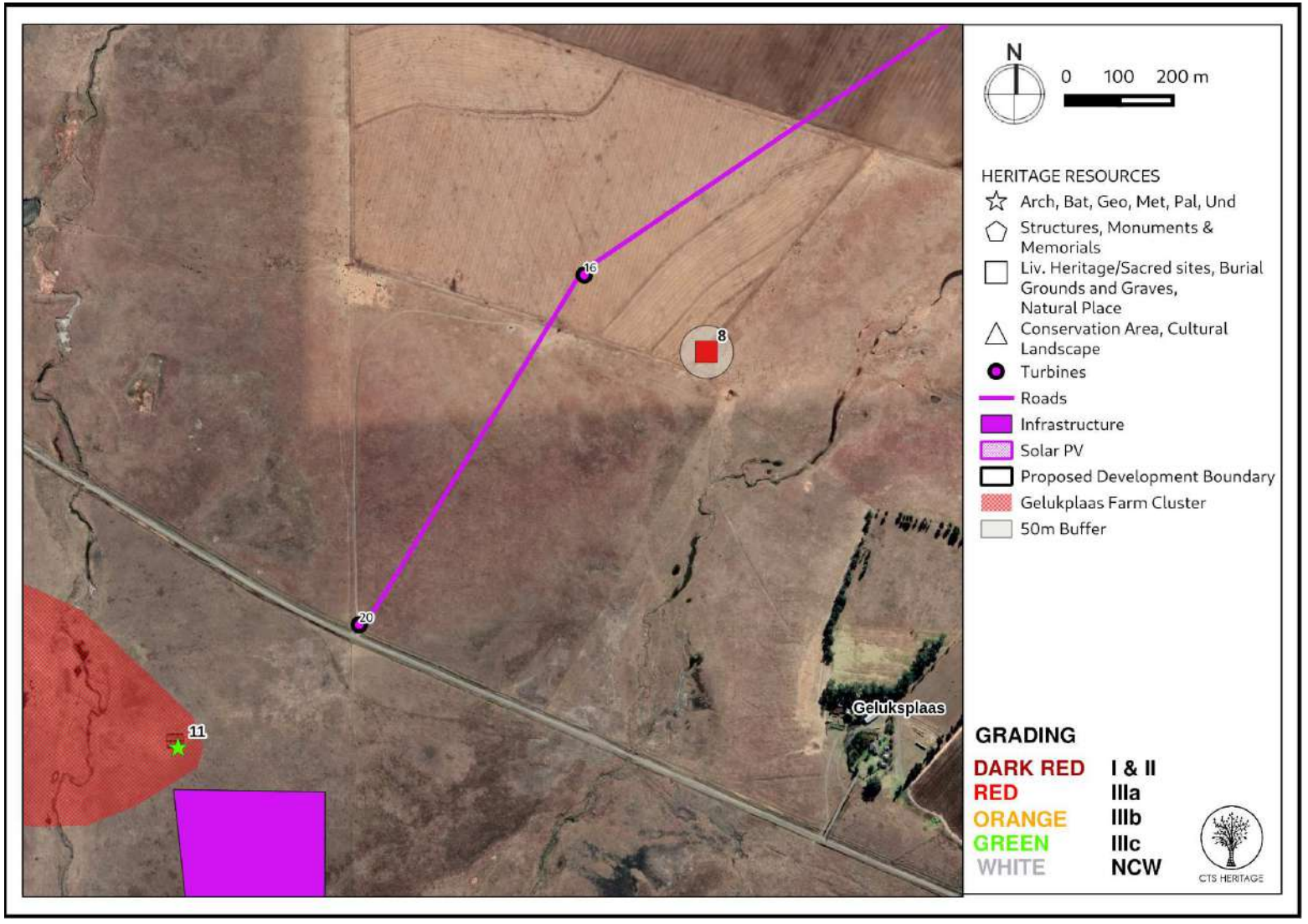

Figure 7.1: Map of heritage resources identified during the field assessment relative to the proposed development footprint - Observation 008

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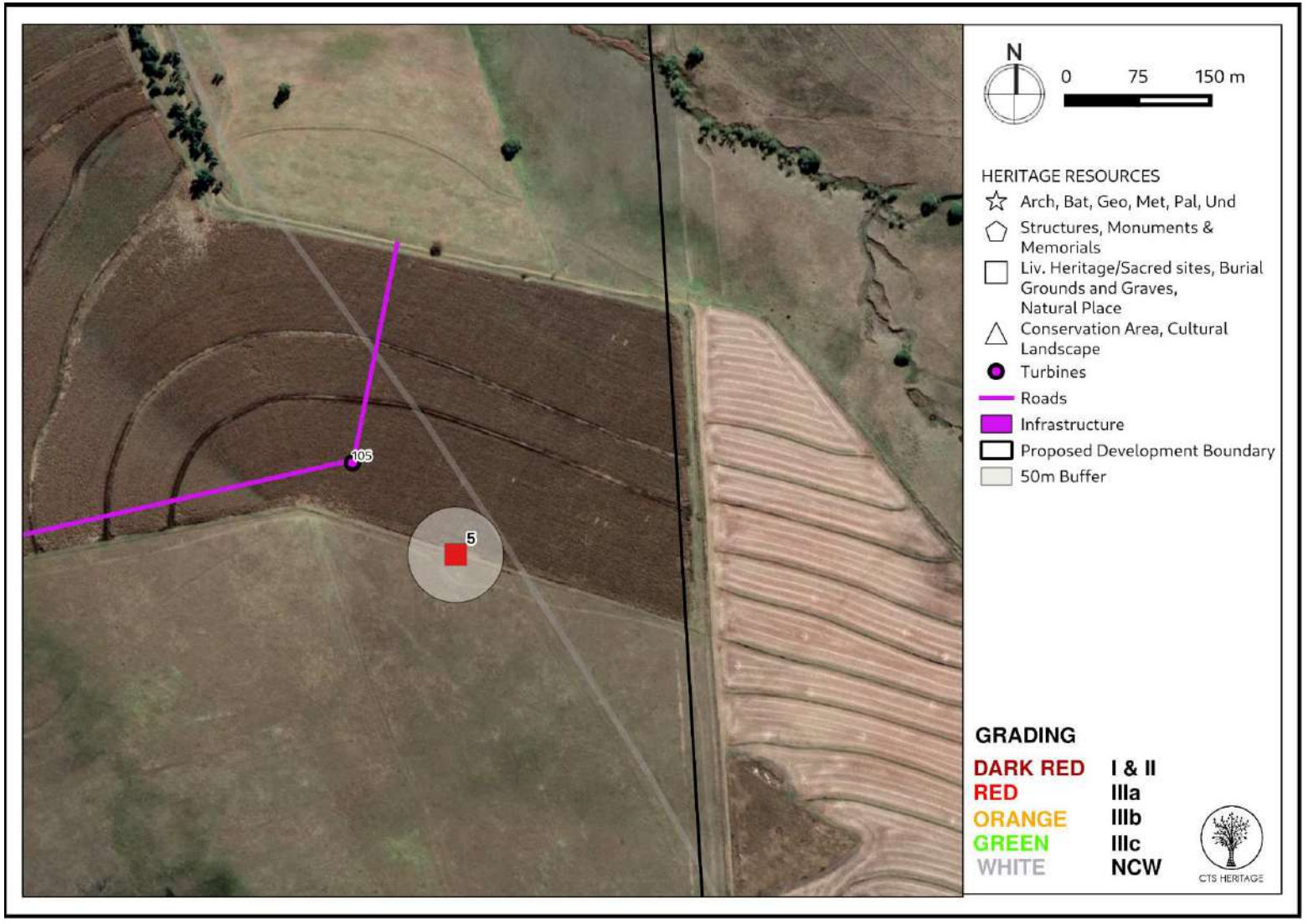

Figure 7.2: Map of heritage resources identified during the field assessment relative to the proposed development footprint - Observation 005

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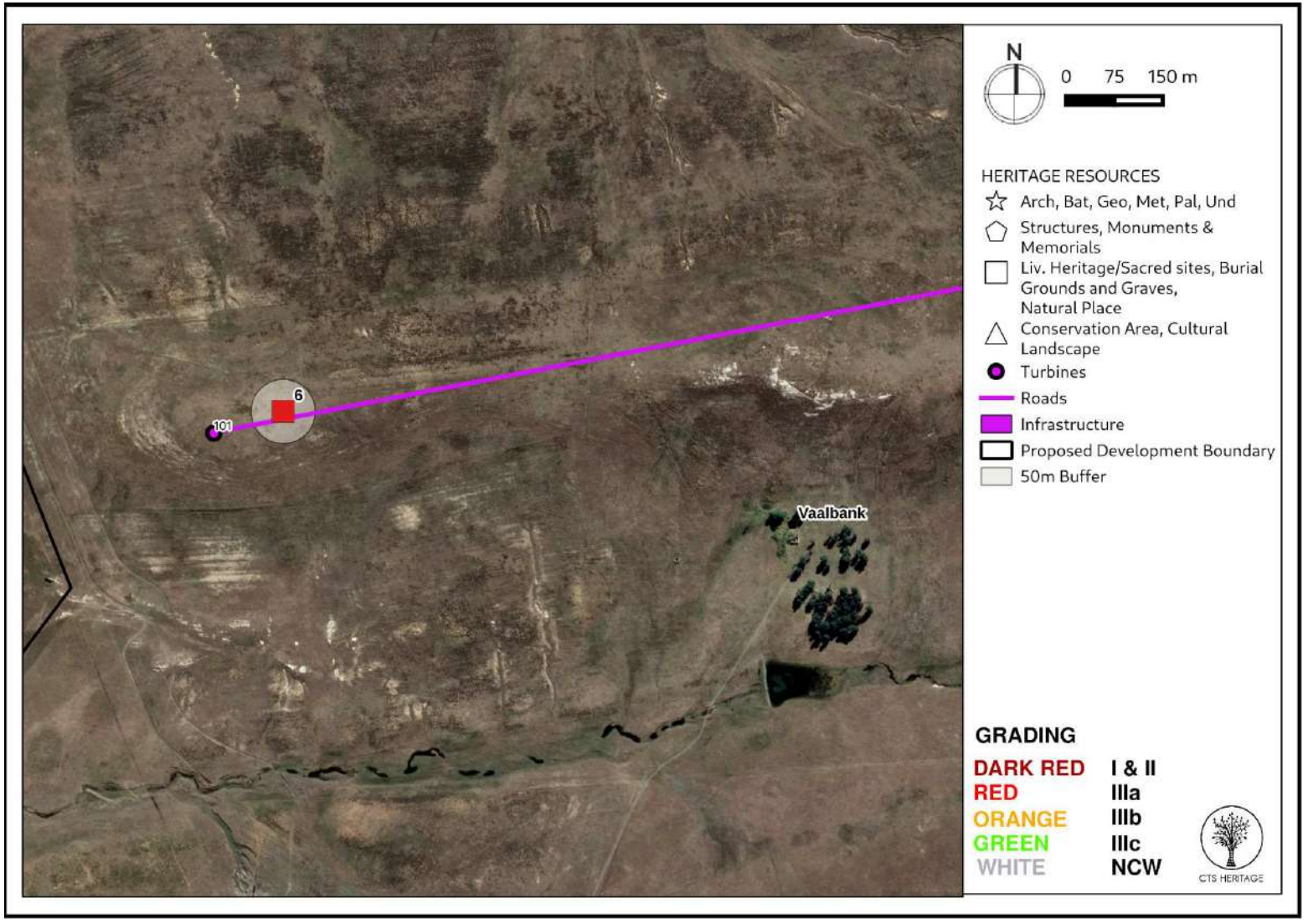

Figure 7.3: Map of heritage resources identified during the field assessment relative to the proposed development footprint - Observation 006

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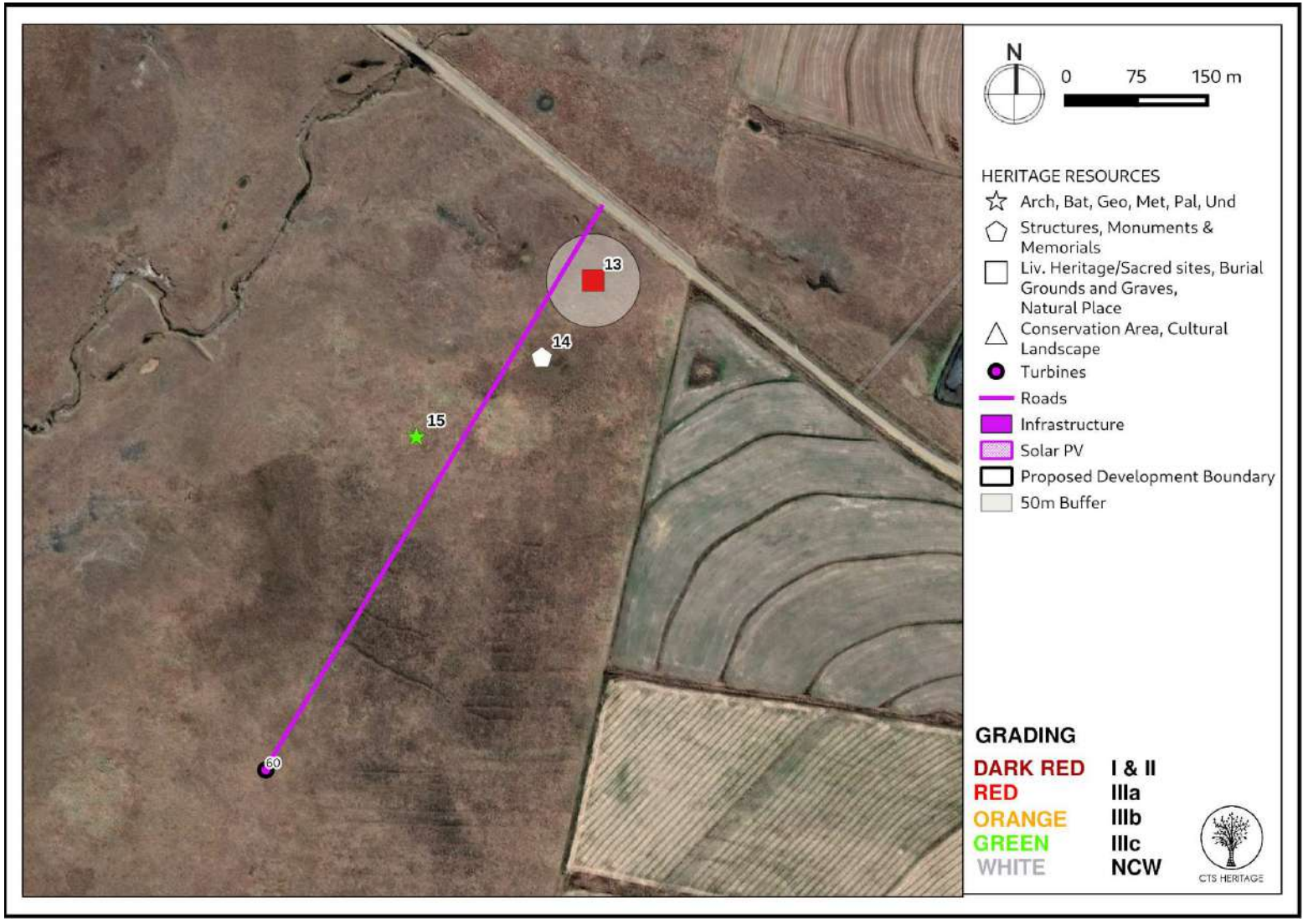

Figure 7.4: Map of heritage resources identified during the field assessment relative to the proposed development footprint - Observation 013, 014 and 015

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Solar PV

Burial ground (Observation 001) and the historic structures (Observations 002, 009, 010 and 011) form part of a cluster of sites that are related to the historic farm werf in this area known as Gelukplaas. This cluster of historic structures and the burial ground, along with the existing farm werf and its infrastructure have been mapped as a "cluster" of sites in Figure 7.5 below. This cluster is graded IIIC and impacts to this cluster should be avoided. In the layout provided, the proposed Solar PV layout avoids impact to this cluster of graded sites. Observation 003 lies on the border of the proposed Solar PV area and although this site has been determined to be Not Conservation-Worthy, it is possible that buried archaeological material associated with this foundation may be located in close proximity to Observation 003. Care must be taken in this regard.

The burial ground recorded as Observation 012 lies in between two proposed Solar PV facilities (Figure 7.6). The provided layout for the Solar PVs respects the recommended 50m buffer area around Observation 012 and as such, no direct impact is anticipated.

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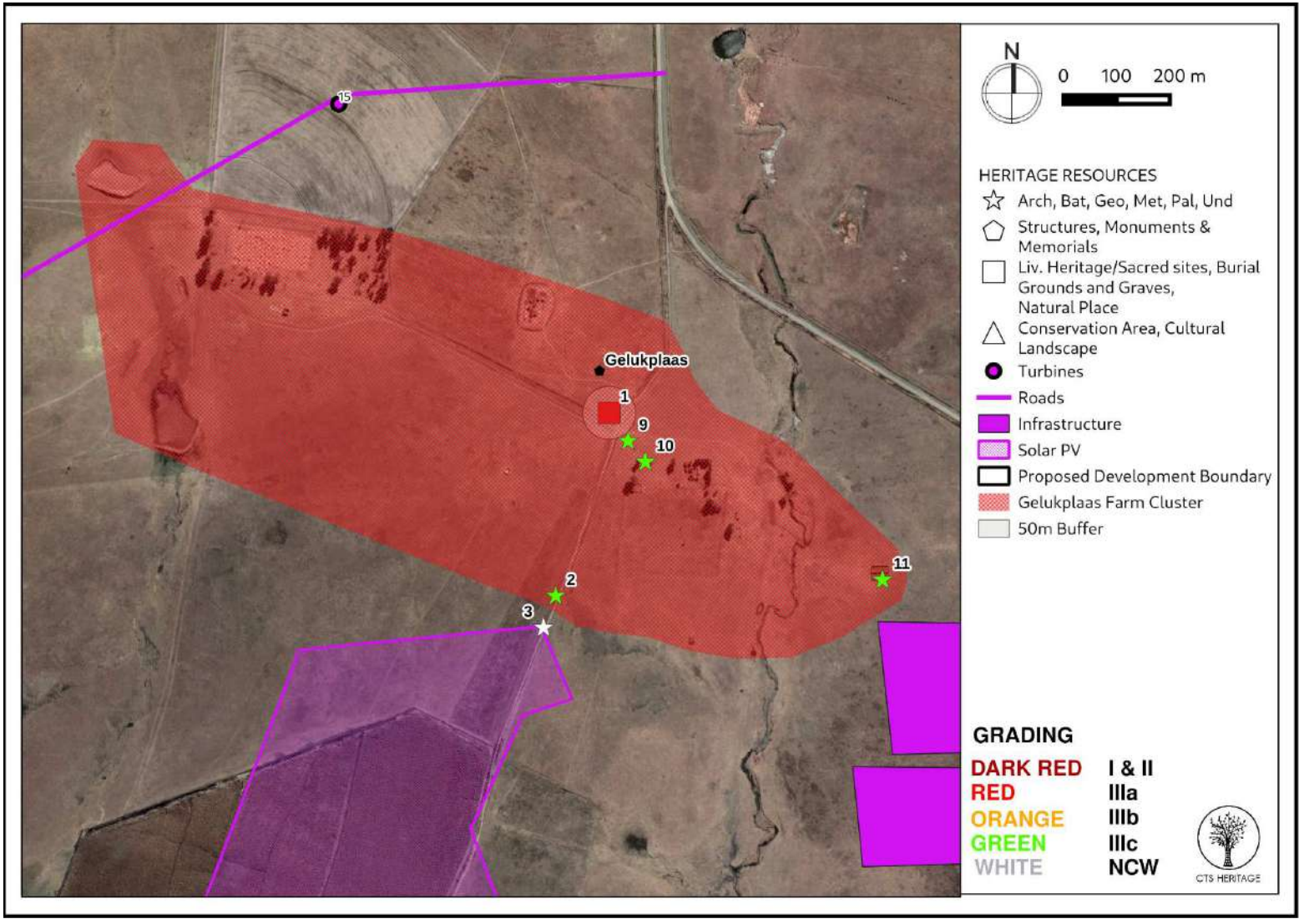

Figure 7.5: Map of heritage resources identified during the field assessment relative to the proposed development footprint - Gelukplaas Cluster

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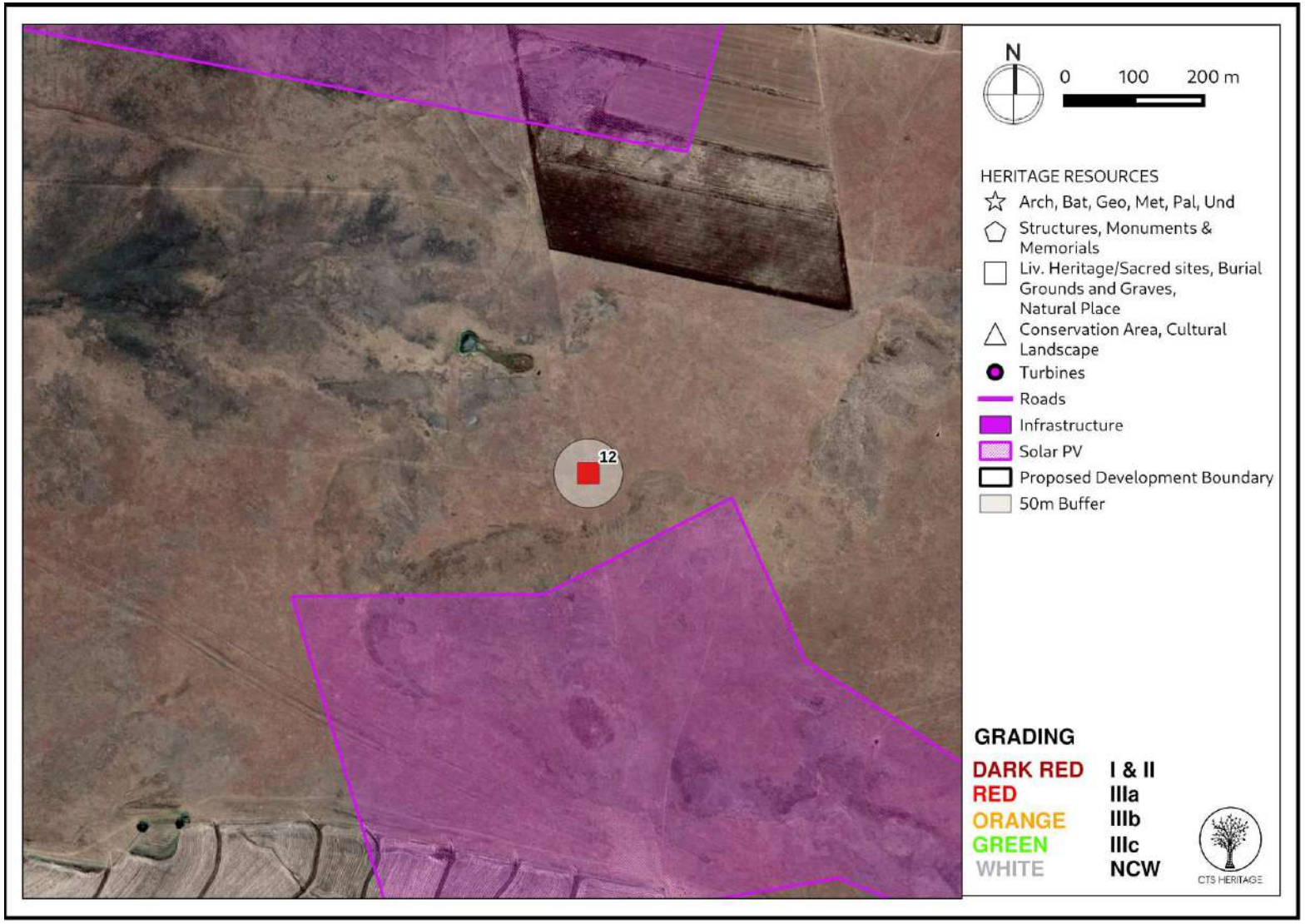

Figure 7.6: Map of heritage resources identified during the field assessment relative to the proposed development footprint for the PV Facilities

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6. CONCLUSION AND RECOMMENDATIONS

Even though the area is rich in history, no significant archaeological heritage resources were identified during the field assessment. No Stone Age or Iron Age heritage resources were identified during the survey. The few heritage resources that were identified consist of the ruins of older farm structures and kraals. Due to the paucity of older farm structures in the area as a result of demolition, it is recommended that the identified ruins and kraals remain untouched and that a safety buffer should exist around all such structures.

The field assessment identified six burial grounds or graves close to or within the proposed development footprints of turbines, roads and the solar PV facility.. All graves are of high local significance as a result of their social and cultural value, and are therefore graded IIIA.

While no Stone Age or Iron Age archaeological resources were identified during the field assessment, it is clear that this landscape is sensitive for impacts to historical archaeology in the form of ruins and kraals, as well as marked and unmarked burial grounds and graves.

Recommendations

Based on the outcomes of this report, it is not anticipated that the proposed development of the renewable energy facilities and its associated grid connection infrastructure will negatively impact on significant archaeological heritage on condition that:

- A 50m no-go development buffer is implemented around all burial ground sites including Observations 001, 005, 006, 008, 012 and 013.
- A Management Plan for the ongoing conservation of these burials is developed prior to construction, along with a Guide on how to identify marked and unmarked burials and how to proceed should previously unidentified burials be uncovered during the construction process.
- The historic farm werf cluster mapped in Figure 7.5 is not impacted by the development.
- Turbine 101 must be relocated 300m east along the road alignment to ensure that no human remains are impacted by the development.
- The road to Turbine 60 must be relocated to ensure that a no-development buffer of at least 50m is implemented around the burial site 013 so that no impact takes place.
- Although all possible care has been taken to identify sites of cultural importance during the investigation of the study area, it is always possible that hidden or subsurface sites could be overlooked during the assessment. If any evidence of archaeological sites or remains (e.g. remnants of stone-made structures, indigenous ceramics, bones, stone artefacts, ostrich eggshell fragments, charcoal and ash concentrations), fossils, burials or other categories of heritage resources are found during the proposed development, work must cease in the vicinity of the find and SAHRA must be alerted immediately to determine an appropriate way forward.

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7. REFERENCES

Heritage Impact Assessments				
Nid	**Report Type**	**Author/s**	**Date**	**Title**
157393	Heritage Statement	Shahzaadee Karodia Khan, Johan Nel	01/02/2014	HERITAGE STATEMENT FOR THE BASIC ASSESSMENT UNDERTAKEN FOR A POWERLINE UPGRADE, SYFERFONTEIN MINE, SECUNDA, MPUMALANGA PROVINCE
358403	HIA Phase 1	Anton van Vollenhoven	10/08/2015	A report on a Cultural Heritage Impact Assessment for the Development of a De-stoning Plan at the New Denmark Colliery, close to Standerton, Mpumalanga Province
5014	AIA Phase 1	Julius CC Pistorius	01/06/2007	A Phase 1 Heritage Impact Assessment Study for the Proposed New 88 kV Power Line Running from the Majuba Power Station near Amersfoort to the Camden Power Station near Ermelo in the Mpumalanga Province
5059	AIA Phase 1	Johnny Van Schalkwyk	01/05/2003	Archaeological Survey of a Section of the Secunda-Mozambique Gas Pipeline Bethal and Highveld Ridge
5700	AIA Phase 1	Johnny Van Schalkwyk	01/10/2002	A Survey of Cultural Resources for the Proposed New Tutuka-Alpha Standerton Power Transmission Line, Standerton District
7920	AIA Phase 1	Johnny Van Schalkwyk	01/02/2004	Heritage Impact Assessment for the Planned Sivukile Extension 4 Township Lekwa Municipality

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CTS HERITAGE

APPENDIX 2: Palaeontological Assessment (2022)

PALAEONTOLOGICAL IMPACT ASSESSMENT (PIA) for the proposed Ummbila Emoyeni Renewable Energy Wind and Solar PV Facilities, Govan Mbeki, Lekwa and Msukaligwa Local Municipalities, Gert Sibande District Municipality, Mpumalanga Province

FOR

CTS Heritage

DATE: 11 July 2022

By

Dr Gideon Groenewald
Cell: 078 713 6377

EXECUTIVE SUMMARY

Dr Gideon Groenewald was appointed to undertake a Phase 1 Palaeontological Assessment Survey and a site visit for the proposed Ummbila Emoyeni Renewable Energy Wind and Solar PV Facilities, Govan Mbeki, Lekwa and Msukaligwa Local Municipalities, Gert Sibande District Municipality, Mpumalanga Province.

This Phase 1 PIA Survey is done to prepare a “Chance Find Protocol” (CFP) document to assist with possible future field visits and to complete a Phase 2 PIA (if required) since the entire development is underlain by geological formations with an inferred Very High sensitivity for Palaeontological Heritage (SAHRIS Database).

This Palaeontological Assessment forms part of the Heritage Impact Assessment (HIA) and complies with the requirements of the South African National Heritage Resource Act No 25 of 1999 (revised 2017). In accordance with Section 38 of the National Resources Act No 25 of 1999 (Heritage Resources Management), a HIA is required to assess any potential impacts to palaeontological heritage within the development footprint.

The development site applicable to the application for the The Ummbila Emoyeni Renewable Energy Wind and Solar PV Facilities falls in the rural area southeast of Bethal in the Govan Mbeki, Lekwa and Msukaligwa Local Municipalities, Gert Sibande District Municipality, Mpumalanga Province. It is underlain by Permian aged sandstone and shale of the Vryheid Formation, Jurassic aged dolerite and quaternary aged alluvium with a very high, very low and moderate palaeontological sensitivity.

Significant fossils are expected in areas where deep excavations (>1,5m) are planned in areas indicated in red on the palaeontological sensitivity map.

Dr Gideon Groenewald, a suitably qualified palaeontologist, was appointed to visit the site of the development on 6th to 8th July 2022. Deep weathering and extensive agricultural disturbance prevented the recording of fossils over most of the inspected areas, but it is significant to note that in the few places where exposures were noticed, highly significant fossils were recorded.

In areas underlain by the Vryheid Formation, the field investigation confirmed the potential for the presence of fossils (Table 2), and most of the

important fossil structures were recorded. If however, more unique examples of these fossils are recorded by the ECO, it will be imperative that a suitably qualified palaeontological specialist be appointed to do a Phase 2 PIA and to upgrade the “Chance Find Protocol” document. The CFP development must then be included as part of the EMPr of this project, to record all unexpected fossils associated with the geological formations on site.

It is recommended that:

- The EAP and ECO must be informed of the fact that a very high palaeontological sensitivity is allocated to areas underlain by the Vryheid Formation.
- Dolerite will not contain any fossils
- No significant fossils were recorded from the moderately sensitive allyvium deposits.
- No further mitigation for palaeontological heritage is recommended for this project, unless excavation of deeper than 1,5m exposes **uniquely well-defined trace fossils as well as fossils of plants**
- Recommendations contained in this Phase 1 PIA must be approved by SAHRA for inclusion in the EMPr of the project.

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INTRODUCTION

Dr Gideon Groenewald was appointed to undertake a Phase 1 Palaeontological Assessment Survey and a site visit for the proposed Ummbila Emoyeni Renewable Energy Wind and Solar PV Facilities, Govan Mbeki, Lekwa and Msukaligwa Local Municipalities, Gert Sibande District Municipality, Mpumalanga Province.

This Phase 1 PIA Survey is done to prepare a “Chance Find Protocol” (CFP) document to assist with possible future field visits and to complete a Phase 2 PIA (if required) since the entire development is underlain by geological formations with an inferred Very High sensitivity for Palaeontological Heritage (SAHRIS Database).

Legal Requirements

This Palaeontological Assessment forms part of the Heritage Impact Assessment (HIA) and complies with the requirements of the South African National Heritage Resource Act No 25 of 1999 (revised 2017). In accordance with Section 38 of the National Resources Act No 25 of 1999 (Heritage Resources Management), a HIA is required to assess any potential impacts to palaeontological heritage within the development footprint.

Categories of heritage resources recognised as part of the National Estate in Section 3 of the Heritage Resources Act, and which therefore fall under its protection, include:

- geological sites of scientific or cultural importance;
- objects recovered from the soil or waters of South Africa, including archaeological and palaeontological objects and material, meteorites and rare geological specimens; and
- objects with the potential to yield information that will contribute to an understanding of South Africa’s natural or cultural heritage.

Aims and Methodology

A Phase 1 site investigation is often the only opportunity to record the fossil heritage within the development footprint. These records are very important to understand the past and form an important part of South Africa’s National Estate.

Following the “*SAHRA APM Guidelines: Minimum Standards for the Archaeological & Palaeontological Components of Impact Assessment Reports*” the aims of the palaeontological impact assessment are:

- to identify exposed and subsurface rock formations that are considered to be palaeontologically significant;
- to asses the level of palaeontological significance of these formations;
- to comment on the impact of the development on these exposed and/or potential fossil resources and
- to make recommendations as to how the developer should conserve or mitigate damage to these resources.

Prior to a field investigation, a preliminary assessment (desktop study) of the topography and geology of the study area was made using appropriate 1:250 000 geological information (2628 East Rand) in conjunction with Google Earth. Potential fossiliferous rock units (groups, formations etc.) are identified within the study area and the known fossil heritage within each rock unit is inventoried from the published scientific literature, previous palaeontological impact studies in the same region and the author's field experience.

Priority palaeontological areas are identified within the development footprint to focus the field investigator's time and resources. The aim of the desktop survey is to document any exposed fossil material and to assess the palaeontological potential of the region in terms of the type and extent of rock outcrop in the area.

The likely impact of the proposed development on local fossil heritage is determined on the basis of the palaeontological sensitivity of the rock units concerned and the nature and scale of the development itself, most notably the extent of fresh bedrock excavation envisaged. The different sensitivity classes used are explained in Table 1 below.

Table 1 Palaeontological sensitivity analysis outcome classification

PALAEONTOLOGICAL SIGNIFICANCE/VULNERABILITY OF ROCK UNITS	
The following colour scheme is proposed for the indication of palaeontological sensitivity classes. This classification of sensitivity is adapted from that of Almond et al (2008, 2009) (Groenewald et al., 2014).	
RED	Very high palaeontological sensitivity/ vulnerability. Development will most likely have a very significant impact on the palaeontological heritage of the region. Very high possibility that significant fossil assemblages will be present in all outcrops of the unit. Appointment of professional palaeontologist, desktop survey, Phase I Palaeontological Impact Assessment (PIA) (field survey and recording of fossils) and Phase II PIA (rescue of fossils during construction) as well as application for collection and destruction permit compulsory.
ORANGE	High palaeontological sensitivity/ vulnerability. High possibility that significant fossil assemblages will be present in most of the outcrop areas of the unit. Fossils most likely to occur in associated sediments or underlying units, for example in the areas underlain by Transvaal Supergroup dolomite where Cenozoic cave deposits are likely to occur. Appointment of professional palaeontologist, desktop survey and Phase I palaeontological impact assessment (field survey and collection of fossils) compulsory. Early application for collection permit recommended. Highly likely that a Phase II PIA will be applicable during the construction phase of projects.
GREEN	Moderate palaeontological sensitivity/ vulnerability. High possibility that fossils will be present in the outcrop areas of the unit or in associated sediments that underlie the unit. For example, areas underlain by the Gordonia Formation or undifferentiated soils and alluvium. Fossils described in the literature are visible with the naked eye and development can have a significant impact on the palaeontological heritage of the area. Recording of fossils will contribute significantly to the present knowledge of the development of life in the geological record of the region. Appointment of a professional palaeontologist, desktop survey and Phase I PIA (ground proofing of desktop survey) recommended.
BLUE	Low palaeontological sensitivity/ vulnerability. Low possibility that fossils that are described in the literature will be visible to the naked eye or be recognized as fossils by untrained persons. Fossils of for example small domal Stromatolites as well as micro-bacteria are associated with these rock units.

	Fossils of micro-bacteria are extremely important for our understanding of the development of life, but are only visible under large magnification. Recording of the fossils will contribute significantly to the present knowledge and understanding of the development of life in the region. Where geological units are allocated a blue colour of significance, and the geological unit is surrounded by highly significant geological units (red or orange coloured units), a palaeontologist must be appointed to do a desktop survey and to make professional recommendations on the impact of development on significant palaeontological finds that might occur in the unit that is allocated a blue colour. An example of this scenario will be where the scale of mapping on the 1:250 000 scale maps excludes small outcrops of highly significant sedimentary rock units occurring in larger alluvium deposits. At least one site visit by a competent palaeontologist is compulsory. Collection of a representative sample of potential fossiliferous material is recommended.
GREY	Very low palaeontological sensitivity/ vulnerability. Very low possibility that significant fossils will be present in the bedrock of these geological units. The rock units are associated with intrusive igneous activities and no life would have been possible during intrusion of the rocks. It is however essential to note that the geological units mapped out on the geological maps are invariably overlain by Cenozoic aged sediments that might contain significant fossil assemblages and archaeological material. Examples of significant finds occur in areas underlain by granite, just to the west of Hoedspruit in the Limpopo Province, where significant assemblages of fossils and clay-pot fragments are associated with large termite mounds. Where geological units are allocated a grey colour of significance, and the geological unit is surrounded by very high and highly significant geological units (red or orange coloured units), a palaeontologist must be appointed to do a desktop survey and to make professional recommendations on the impact of development on significant palaeontological finds that might occur in the unit that is allocated a grey colour. An example of this scenario will be where the scale of mapping on the 1:250 000 scale maps excludes small outcrops of highly significant sedimentary rock units occurring in dolerite sill outcrops. It is important that the report should also refer to archaeological reports and possible descriptions of palaeontological finds in Cenozoic aged surface deposits. At least one site visit by a suitably qualified palaeontologist is recommended.

Rocks with very high palaeontological sensitivity are present within the development footprint and palaeontological mitigation measures must be incorporated into the Environmental Management Plan (EMP) for this project. Due to the fact that the 1:250 000 scale vector maps obtained from the Council for Geoscience indicates the rock unit underlying the area applicable to this report as being the Vryheid Formation of the Ecca Group, Karoo Supergroup, the initial assessment is that very distinctive fossils will be present. Field work during this survey as well as literature surveys indicated that the rock units that will be exposed most of the time is the potentially fossiliferous Vryheid Formation, a well-known rock sequence of the Karoo Supergroup that contains highly significant palaeontological heritage (MacRae 1999; McCarthy and Rubidge, 2005; Johnson et at, 2006).

Scope and Limitations of the Phase 1 Investigation

The scope of a Phase 1 Investigation includes:

- an analysis of the area's stratigraphy, age and depositional setting of fossil-bearing units;
- a review of all relevant palaeontological and geological literature, including geological maps, and previous palaeontological impact reports;
- data on the proposed development provided by the developer (e.g. location of footprint, depth and volume of bedrock excavation envisaged); where feasible, location and examination of any fossil collections from the study area (e.g. museums); and
- an on-site investigation to assess the identified palaeontological sensitive areas within the development footprint/ study area, including a formal palaeontological collection if fossils are of collectable quality. The investigation focuses on the bedrock exposure where excavations would most probably require palaeontological monitoring.

The results of the field investigation are used to predict the potential of buried fossil heritage within the development footprint. In some investigations, (as in this study), this involves the examination of similar accessible bedrock exposures, such as road cuttings and quarries, along roads that run parallel to or across the development footprint.

Locality and Proposed Development

The Ummbila Emoyeni Renewable Energy Wind and Solar PV Facilities falls in the rural area southeast of Bethal in the Govan Mbeki, Lekwa and Msukaligwa Local Municipalities, Gert Sibande District Municipality, Mpumalanga Province (Figure 1).

According to the Scoping report supplied “Emoyeni Renewable Energy Farm (Pty) Ltd is proposing the development of renewable energy facilities, collectively known as the Ummbila Emoyeni Renewable Energy Faclility, consisting of a commercial wind farm, solar PV facility and associated grid infrastructure, including a battery energy storage system, located approximately 6km southeast of Bethal in the Mpumalanga Province of South Africa. A preferred project focus area with an extent of 27 819ha has been identified by Emoyeni Renewable Energy Farm (Pty) Ltd as a technically suitable area for the development of the Ummbilla Emoyeni Renewable Energy Farm with a contracted capacity of up to 666MW of wind energy and 150MW of solar energy. This layout, and project capacity, will reduce as the EIA and scoping process identifies environmental constraints that exclude areas for development.

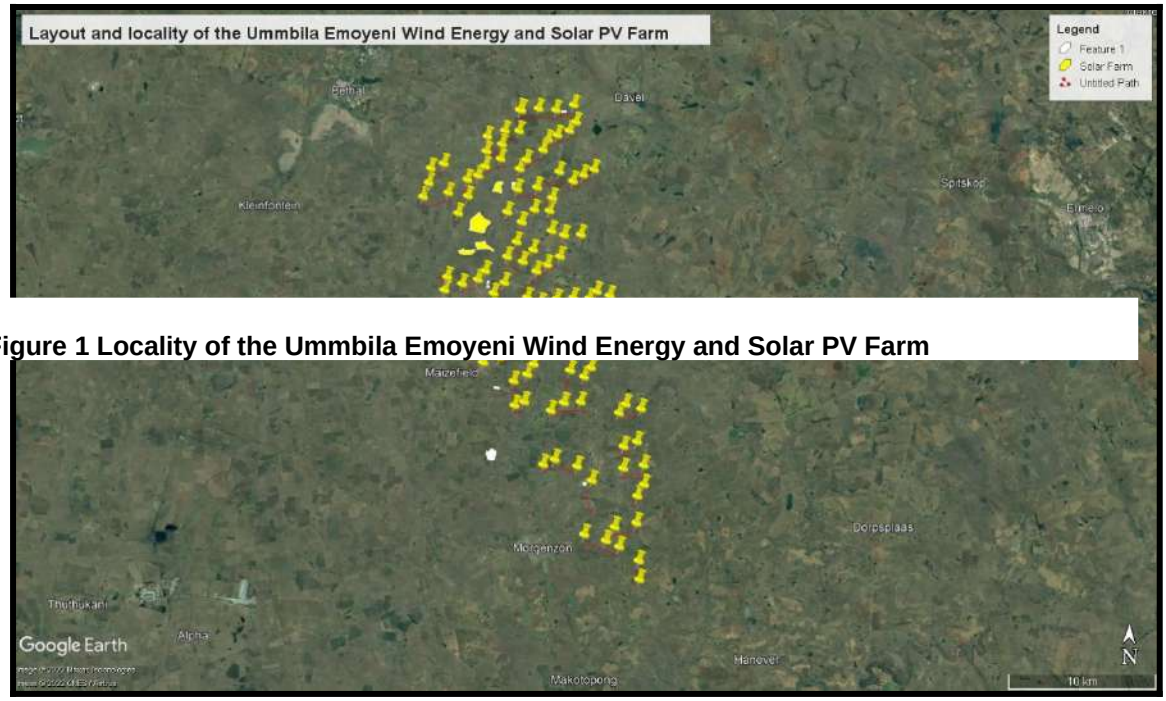


Figure 1 Locality of the Ummbila Emoyeni Wind Energy and Solar PV Farm

The project will include associated grid infrastructure that is required to connect the Ummbila Emoyeni Renewable Energy Facility to the national grid. The grid connection solution entails establishing a 400/132 kV MTS, between Camden and SOL Substations, which will be looped in and out of the existing Camden-Sol 400 kV line1. The location of the MTS will be refined through an ongoing process of communication with Eskom Planning but will be within close proximity to the 400kV line in order to cut into this line.”

GEOLOGY

The study area is underlain predominantly by Permian and Jurassic aged rocks of the, Ecca Group and the Karoo Supergroup (Figure 2).

The sedimentary rocks of this specific study area is the coal-rich part of the Permian aged Vryheid Formation of the Ecca Group, as well as Jurassic aged dolerite.of the Karoo Supergroup (Johnson et al, 2006).

Karoo Supergroup

Ecca Group

Vryheid Formation (Pv)

The Permian aged Vryheid Formation is dominated by extensive and thick coarse-grained feldspathic sandstone (arkose) with interbedded carbonaceous shale and coal beds.(MacRae, 1999; McCarthy and Rubidge, 2005; Johnson et al

Figure 2 The study area is underlain by sandstone and shale of the coal-rich Vryheid Formation (Pv) and dolerite (Jd)

2006). The depositional environment has been studied in great detail (Cairncross, 19…) and there is convincing evidence that the formation represents a near-shore and longshore deposit of deltaic and coastal sandstones and shale with dominantly washed in plant material that were concentrated along the long-shore zones and inter-dune areas to form the extensive coal deposits of this formation.

Dolerite

Extensive intrusions of Jurassic aged Karoo dolerite sills and dykes (Jd) underlies large parts of the study area. These igneous intrusions represent the major volcanic episode during the breakup of Gondwana (Johnson et al, 2006).

PALAEONTOLOGY

Following the summaries of Groenewald et al (2014) the study area has an overall very low and very high sensitivity for Palaeontological heritage (Figure 3). The following discussion refers to available literature surveys and summaries in terms of the fossil heritage of the Vryheid Formation, underlying the Ummbila Emoyeni Wind Energy and Solar PV development.

Valuable palaeo-environmental information that can be gained from studies of the plant fossils in the Vryheid Formation. The information gained contributes significantly towards our understanding of the geological history of the study area (MacRae, 1999; McCarthy and Rubidge, 2005).

Karoo Supergroup,

Ecca Group

Vryheid Formation

The Vryheid Formation is well-known for the occurrence of coal beds that resulted from the accumulation of plant material over long periods of time. Plant fossils described by Bamford (2011) from the Vryheid Formation are; *Azaniodendron fertile, Cyclodendron leslii, Sphenophyllum hammanskraalensis, Annularia sp., Raniganjia sp., Asterotheca spp., Liknopetalon enigmata, Glossopteris > 20 species, Hirsutum 4 spp., Scutum 4 spp., Ottokaria 3 spp., Estcourtia sp., Arberia 4 spp., Lidgetonnia sp., Noeggerathiopsis sp. and Podocarpidites sp.*

According to Bamford (2011) “Little data have been published on these potentially fossiliferous deposits. Around the coalmines there is most likely to be good material and yet in other areas the exposures may be too poor to be of interest. When they do occur fossil plants are usually abundant and it would not be feasible to preserve and maintain all the sites, however, in the interests of heritage and science such sites should be well recorded, sampled and the fossils kept in a suitable institution.

Although no vertebrate fossils have been recorded from the Vryheid Formation, invertebrate trace fossils have been described in some detail by Mason and Christie (1985). It should be noted, however, that the aquatic reptile, *Mesosaurus*, which is the earliest known reptile from the Karoo Basin, as well as fish (*Palaeoniscus capensis*), have been recorded in equivalent-

aged strata in the Whitehill Formation in the southern part of the basin (MacRae, 1999; Modesto, 2006). Indications are that the Whitehill Formation in the main basin might be correlated with the mid-Vryheid Formation. If this assumption proves correct, there is a possibility that Mesosaurus could be found in the Vryheid Formation (Catuneanu et al 2005).

The late Carboniferous to early Jurassic Karoo Supergroup of South Africa includes economically important coal deposits within the Vryheid Formation of Mpumalanga. These Karoo aged sediments are almost entirely lacking in body fossils but ichnofossils (trace fossils) are locally abundant. Modern sedimentological and ichnofaunal studies suggest that the north-eastern part of the Karoo basin was marine. In the study area a shallow basin margin accommodated a prograding fluviodeltaic complex forming a broad sandy platform on which coal-bearing sediments were deposited. Ichnofossils include U-burrows (formerly *Corophioides*) which are assigned to ichnogenus *Diplocraterion* (Mason and Christie, 1985).

PRELIMINARY ASSESSMENT RESULTS

The palaeontological sensitivity was predicted after identifying potentially fossiliferous rock units; ascertaining the fossil heritage from the literature and evaluating the nature and scale of the development itself. The palaeontological sensitivity was predicted as very highly significant, due to the potential abundance of Permian aged fossils in the Vryheid Formation.

FIELD INVESTIGATIONS

Dr Gideon Groenewald, experienced fieldworker, and Elsabé Groenewald visited the site of the proposed Ummbila Emoyeni Renewable Energy Wind and Solar PV Facilities on Wednesday 6th July to Friday 8th July 2022.

The topography of the area is typically slightly undulating with very broad valleys and extended middle slopes that give an impression of a “flat” landscape. Isolated dolerite capped hills are the only sites with obviously more rugged topography where the vegetation changes from pure grassland to rocky small woody vegetation.

Field investigation confirmed that excavations for the new developments will expose carbonaceous shale and feldspathic coarse-grained sandstone of the

Vryheid Formation as well as deeply weathered dolerite. Our observations are that significant trace fossils are present in the shales of the Vryheid Formation (Figure 3).

Photographic recordings of geological information and fossils occurring in the outcrops at specific localities (Figure 4) are presented in Table 2 below. These photographic recordings might be the only records of Palaeontological heritage for this project. In cases where deep excavation (>1,5m) are planned for solar panel stands (geotechnical reports), the author expects that the chance find of well-preserved, significant fossils in this environment is high.

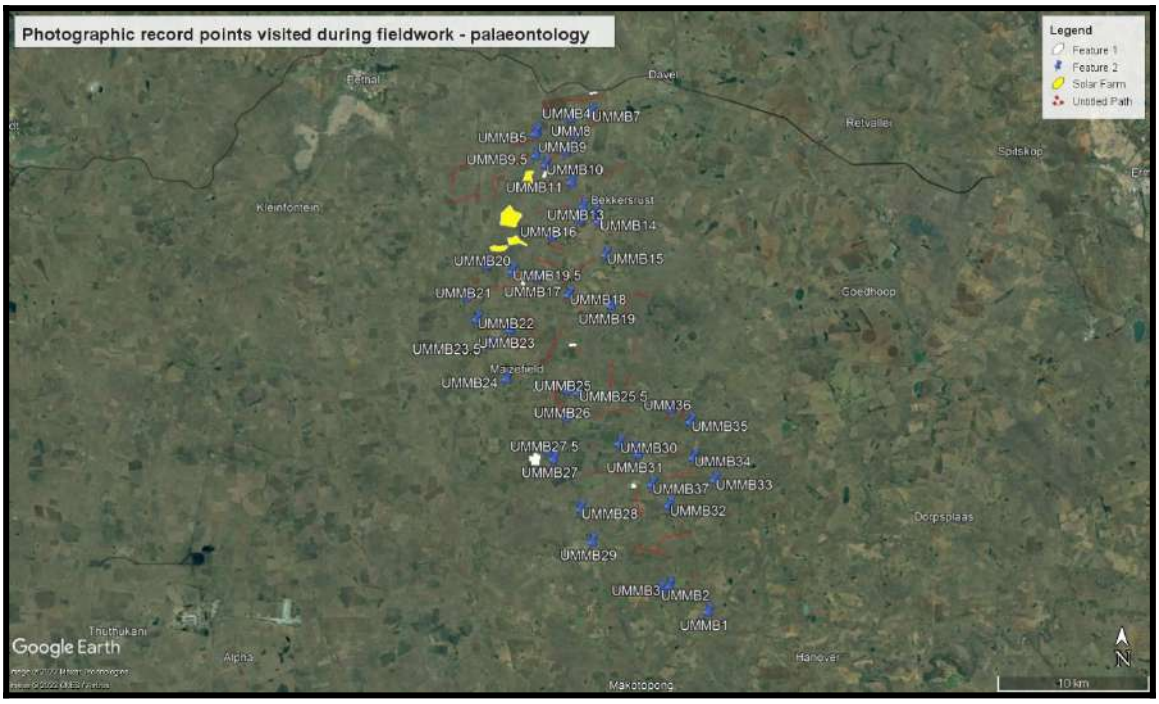


Figure 4 Localities of observation points for Photographic records (UMMB1-36). See Table 2.

Table 2 Photographic recordings in the study area

Photo	(GPS station) Coordinates	Comments	Photographic Record
UMMB1	26.773037° S 29.694596° E	The study site is characterised by open plain grassland, underlain by deeply weathered dolerite with resulting rolling topography and dolerite capped high ground. Dolerite will not contain fossils	

UMMB2	26.760301°S 29.662739°E	The southern part of the study area with extensive agricultural land being cultivated due to deep, arable soils on dolerite. Dolerite will not contain fossils	
UMMB3	26.757735°S 29.668789°E	Dolerite sills underlying large parts of the study area where wind tubines will be placed on high ground. Note the position of the experimental tower on dolerite sill outcrop Doleirte will not be fossiliferous.	
Ummb4	26.480580° S 29.603650°E	Extensive grassland in the northern sections of the study area with very few outcrops. No exposures and no fossils observed	
UMMB4	26.480580° S 29.603650°E	Large stretches of arable land on deeply weathered sandstone and shale of the Vryheid Formation in the northern sections of the study area with very few outcrops. No exposures and no fossils observed.	

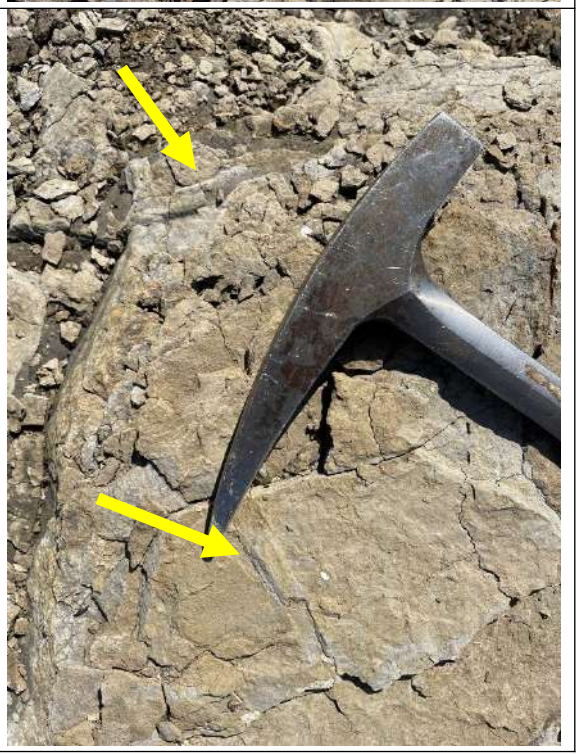
UMMB5	26.489870° S 29.580380° E	Large stretches of arable land on deeply weathered sandstone and shale of the Vryheid Formation in the northern sections of the study area with very few outcrops. No exposures and no fossils observed	
UMMB6	26.488664° S 29.581608° E	Large stretches of arable land on deeply weathered sandstone and shale of the Vryheid Formation in the northern sections of the study area with very few outcrops. No exposures and no fossils observed	
UMMB7	26.477390° S 29.617250° E	Very deeply weathered sediments of the Vryheid Formation. Deep, sandy soils with very few outcrops. No fossils observed during this field survey.	
UMMB7	26.477390° S 29.617250° E	Very deeply weathered sediments of the Vryheid Formation. Deep, sandy soils with very few outcrops. No fossils observed during this field survey.	

UMMB8	26.491010° S 29.606630° E	Weathered shale and sandstone exposed during ploughing of very shallow soils on the Vryheid Formation in the northern part of the study area. Excavation for turbine foundations will expose shale and sandstone with a high chance of fossil finds.	
UMMB8	26.491010° S 29.606630° E	Weathered shale and sandstone exposed during ploughing of very shallow soils on the Vryheid Formation in the northern part of the study area. Excavation for turbine foundations will expose shale and sandstone with a high chance of fossil finds.	
UMMB9	26.500560° S 29.600780° E	Outcrop of quartzite on contact of Vryheid Formation with a dolerite sill structure in the northern regions. No fossils were observed but fossils are expected in excavations for turbine foundations	
UMMB9.5	26.502869° S 29.580863° E	Outcrops of sandstone, Vryheid Formation, that underlies large parts of the study area towards the north	

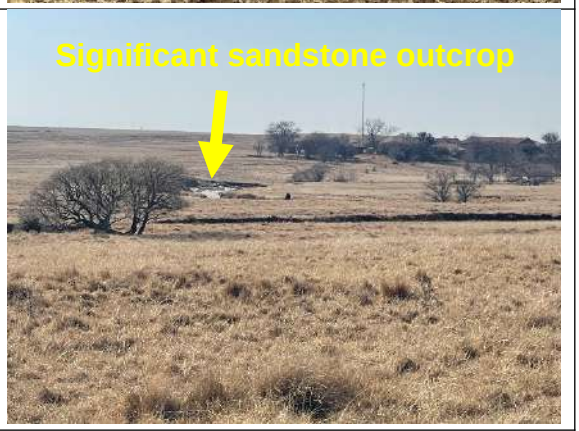
UMMB10	26.508400° S 29.587170° E	Open grassland with very few outcrops of Vryheid Formation sandstone. Excavation for turbine foundations will expose sandstone and shale of the formation.	
UMMB10	26.508400° S 29.587170° E	Outcrops of coarse-grained sandstone of the Vryheid Formation. No fossils observed	
UMMB10	26.508400° S 29.587170° E	Coarse-grained feldspathic sandstone of the Vryheid Formation. Large-scale trough cross-bedding.	
UMMB11	26.518600° S 29.604130° E	Typical open plain landscape on Vryheid Formation and dolerite with deep soil formation over the larger part of the study area. No outcrop, no fossils observed.	

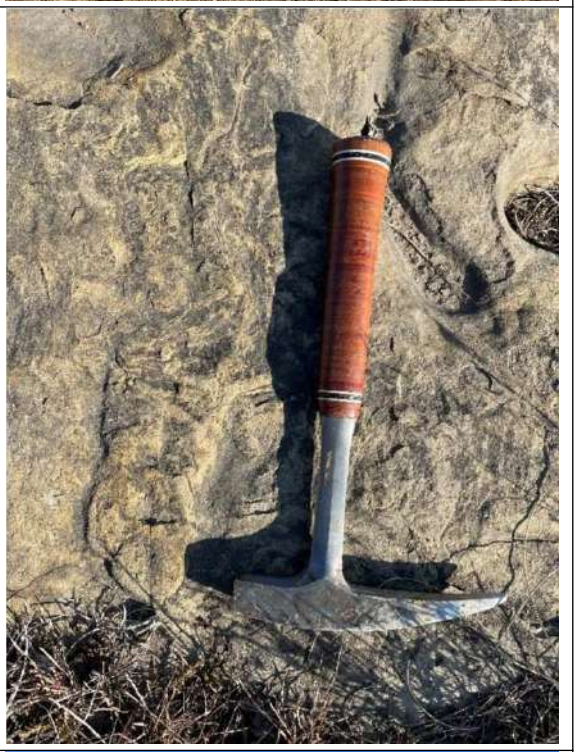
UMMB12	26.532960° S 29.612100° E	Coarse-grained sandstone of the Vryheid Formation. No fossils observed	
UMMB13.5	26.536393° S 29.619449° E	Typical outcrop of dolerite in the study area. Dolerite will not contain fossils	
UMMB14	26.541760° S 29.622410° E	Well-developed deep sandy soils on the Vryheid Formation. This region in the development area, underlain by sedimentary rocks of the Vryheid Formation. Fossils will most likely be exposed during excavation for turbine foundations	
UMMB15	26.561600° S 29.626950° E	Open valleys and landscape with very extensive footslopes, underlain by sedimentary rocks of the Vryheid Formation. Very few outcrops but it is expected that deep excavation for turbine foundations will expose significant fossils in these areas	

UMMB15	26.561600° S 29.626950° E	Open valleys and landscape with very extensive footslopes, underlain by sedimentary rocks of the Vryheid Formation. Very few outcrops but it is expected that deep excavation for turbine foundations will expose significant fossils in these areas	
UMMB16	26.550580° S 29.591510°E	Sandstone outcrops of the Vryheid Formation. Fossils are abundantly present when rocks of this formation is exposed. The chance find of significant plant and trace fossils during deep (>1,5m) excavations is very high	
UMMB16	26.550580° S 29.591510°E	Sandstone outcrops of the Vryheid Formation. Fossils are abundantly present when rocks of this formation is exposed. The chance find of significant plant and trace fossils during deep (>1,5m) excavations is very high	

UMMB16	26.550580° S 29.591510°E	Trace fossils, as reported on by Mason and Christie (1985) is abundantly present in the siltstone and shale of the Vryheid Formation	
UMMB16	26.550580° S 29.591510°E	Trace fossils, as reported on by Mason and Christie (1985) is abundantly present in the siltstone and shale of the Vryheid Formation	

UMMB16	26.550580° S 29.591510°E	Trace fossils, as reported on by Mason and Christie (1985) is abundantly present in the siltstone and shale of the Vryheid Formation	
UMMB16	26.550580° S 29.591510°E	Thin coal beds are present in the outcrops on site at UMMB16. The outcrops are poor, but, considering the number of fossils recorded in this isolated outcrop, it is our professional opinion that all excavations for turbine foundations that expose sedimentary rocks of the Vryheid Formation will expose significant fossils.	

UMMB17	26.575660° S 29.581240° E	Deeply weathered sediments of the Vryheid Formation, leading to deep, fertile soils and a rolling landscape. Excavation of turbine foundations will most probably expose significant fossils	
UMBB18	26.585270° S 29.602480° E	Typical sub-outcrop of Vryheid Formation sandstone in grassland ecosystem. Excavation of turbine foundations will most probably expose significant fossils.	
UMMB19	26.591720°S 29.630220°E	Typical sub-outcrop of Vryheid Formation sandstone in grassland ecosystem. Excavation of turbine foundations will most probably expose significant fossils.	
UMMB19.5	26.571383° S 29.565132°E	Typical sub-outcrop of Vryheid Formation sandstone in grassland ecosystem. Excavation of turbine foundations will most probably expose significant fossils.	

UMMB20	26.567690°S 29.548060°° E	Extensive agricultural development on Vryheid Formation	
UMMB20.5	26.567758° S 29.539098° E	Soft sediment deformation or possible trace fossil (feeding trail?) in sandstone of the Vryheid Formation	
UMMB21	26.586850° S 29.535390° E	Open grassland on Vryheid Formation geology. Chance find of fossils in deep excavation sites is very high	

UMMB21.5	26.596917° S 29.540253° E		
UMMB22	26.599920° S 29.541650° E	Relatively flat landscape with very few outcrops. Geology dominated by suboutcrop of Vryheid Formation and dolerite	
UMMB23.5	26.614996° S 29.550181° E	Extended grassveld with very few outcrops. Assumption that most of this part of the development site is underlain by highly fossiliferous strata of the Vryheid Formation	
UMMB24	26.634910° S 29.561460° E	Extended grassveld with very few outcrops. Assumption that most of this part of the development site is underlain by highly fossiliferous strata of the Vryheid Formation and in some cases, dolerite.	

UMMB25	26.641730° S 29.601200° E	Extended grassveld with very few outcrops. Assumption that most of this part of the development site is underlain by highly fossiliferous strata of the Vryheid Formation and in some cases, dolerite.	
UMMB25.5	26.643051°S 29.608825°E	Examples of extensive deposits of Vryheid Formation sandstone. No fossils were observed, but it is our opinion that excavation for foundations will result in the discovery of significant plant and trace fossils	
UMMB27.5	26.677692°S 29.589031° E	Dolerite capping most of the hills in this region	
UMMB27.5	26.677692°S 29.589031° E	Prominent coarse-grained feldspathic sandstone of the Vryheid Formation underlying the study area. Excavation of foundations for turbines will most probably expose some significant fossils in these sandstone layers on site	

UMMB28	26.712170° S 29.610220° E	Grassland underlain by deeply weathered sedimentary rocks or dolerite. No fossils observed	
UMMB30	26.673350° S 29.636040° E	Grassland underlain by deeply weathered sedimentary rocks or dolerite. No fossils observed	
UMMB31	26.679650° S 29.648580° E	Open valleys underlain by prominent sandstone deposits of the Vryheid Formation	
UMMB31.5	26.676811° S 29.645976° E	High lying areas underlain by dolerite. No fossils expected.	

UMMB31.5	26.676811° S 29.645976° E	Dolerite outcrop. This igneous rock unit will not contain fossils	
UMMB32	26.710230° S 29.668610° E	The high lying areas underlain by dolerite. Soils are clay-rich but highly productive, leading to extensive agricultural development	
UMMB33	26.694930° S 29.698990° E	High lying areas dominantly underlain by dolerite.	
UMMB34	26.681620° S 29.684820° E	Valley floor in this part of the study area is underlain by deeply weathered shale and sandstone of the Vryheid Formation with very few outcrops	

UMMB35	26.660420° S 29.682820° E	High lying areas underlain by dolerite and lower lying areas by the Vryheid Formation with dominant sandstone	
UMMB36	26.653170° S 29.670040° E	Very little outcrop but large parts of the undulating landscape is underlain by the Vryheid Formation and dolerite, two distinctively different units in terms of potential fossil content. Dolerite cannot contain any fossils.	

PALAEONTOLOGICAL IMPACT AND MITIGATION

The predicted palaeontological impact (Figure 5) of the development is based on the initial mapping assessment and literature reviews, as well as information gathered during the field investigation (Table 2).

Geological units range from very highly sensitive sandstone and shale of the Vryheid Formation of the Ecca Group to moderately sensitive, recent, alluvium and very low sensitive dolerite.

Following observations during the filed investigation as well as data obtained from previous palaeontological impact assessments in this region, it is our professional opinion that significant plant and trace fossils from the Ecca Goup are abundantly present in this area.

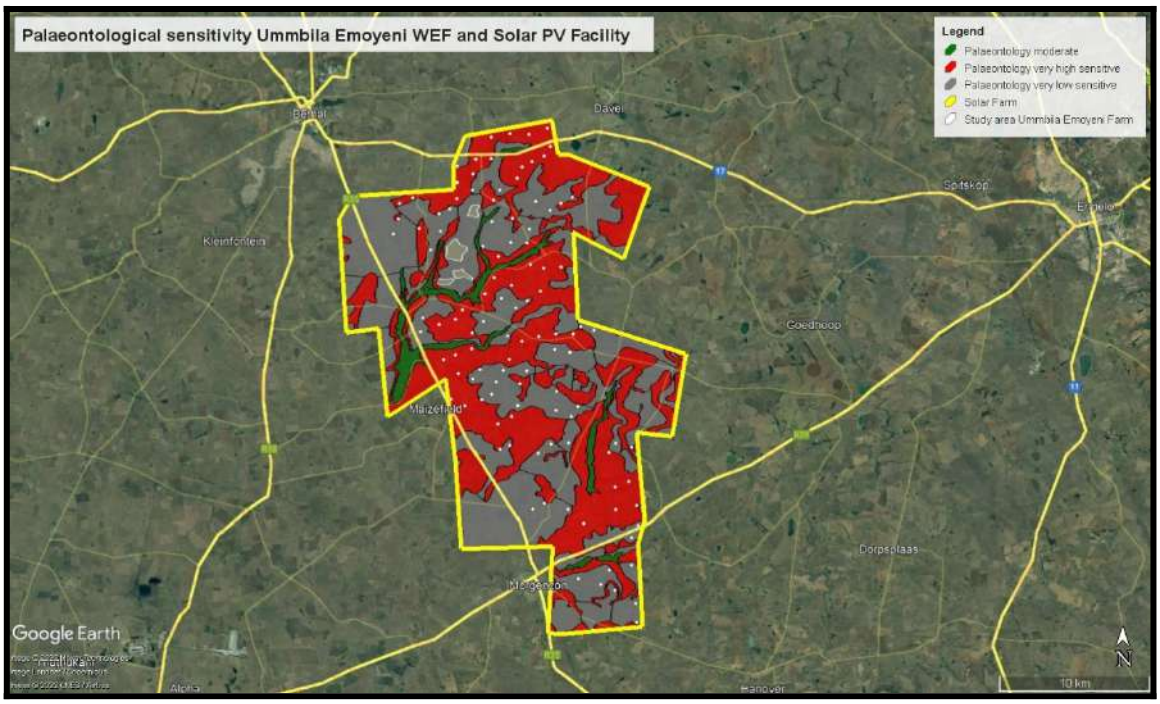


Figure 5 The palaeontological sensitivity refers to the chance find of significant palaeontological heritage items or information. For explanation of colour used, see Table 1

The excavations for the construction of the proposed Ummbila Emoyeni Renewable Energy Wind and Solar PV Facilities will most probably expose some sediments that are very highly sensitive geological formations and some sites revealed evidence of very highly significant remains of fossils. A significant part of the excavation project will cut into rocks of the Vryheid Formation, Ecca Group opf the Karoo Supergroup. This unit has a very high sensitivity for

palaeontological heritage and the ECO must be on the lookout for significant remains of plants as well as trace fossils.

CONCLUSIONS

The development site applicable to the application for the The Ummbila Emoyeni Renewable Energy Wind and Solar PV Facilities falls in the rural area southeast of Bethal in the Govan Mbeki, Lekwa and Msukaligwa Local Municipalities, Gert Sibande District Municipality, Mpumalanga Province. It is underlain by Permian aged sandstone and shale of the Vryheid Formation, Jurassic aged dolerite and quaternary aged alluvium with a very high, very low and moderate palaeontological sensitivity.

Significant fossils are expected in areas where deep excavations (>1,5m) are planned in areas indicated in red on the palaeontological sensitivity map.

Dr Gideon Groenewald, a suitably qualified palaeontologist, was appointed to visit the site of the development on 6th to 8th July 2022. Deep weathering and extensive agricultural disturbance prevented the recording of fossils over most of the inspected areas, but it is significant to note that in the few places where exposures were noticed, highly significant fossils were recorded.

In areas underlain by the Vryheid Formation, the field investigation confirmed the potential for the presence of fossils (Table 2), and most of the important fossil structures were recorded. If however, more unique examples of these fossils are recorded by the ECO, it will be imperative that a suitably qualified palaeontological specialist be appointed to do a Phase 2 PIA and to upgrade the “Chance Find Protocol” document. The CFP development must then be included as part of the EMPr of this project, to record all unexpected fossils associated with the geological formations on site.

It is recommended that:

- The EAP and ECO must be informed of the fact that a very high palaeontological sensitivity is allocated to areas underlain by the Vryheid Formation.
- Dolerite will not contain any fossils
- No significant fossils were recorded from the moderately sensitive allyvium deposits.
- No further mitigation for palaeontological heritage is recommended for this project, unless excavation of deeper than 1,5m exposes **uniquely well-defined trace fossils as well as fossils of plants**

- Recommendations contained in this Phase 1 PIA must be approved by SAHRA for inclusion in the EMPr of the project.

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QUALIFICATIONS AND EXPERIENCE OF THE AUTHOR

Dr Gideon Groenewald has a PhD in Geology from the University of Port Elizabeth (Nelson Mandela Metropolitan University) (1996) and the National Diploma in Nature Conservation from Technicon RSA (the University of South Africa) (1989). He specialises in research on South African Permian and Triassic sedimentology and macrofossils with an interest in biostratigraphy, and palaeo-ecological aspects. He has extensive experience in the locating of fossil material in the Karoo Supergroup and has more than 20 years of experience in locating, collecting and curating fossils, including exploration field trips in search of new localities in the southern, western, eastern and north-eastern parts of the country. His publication record includes multiple articles in internationally recognized journals. Dr Groenewald is accredited by the Palaeontological Society of Southern Africa (society member for 25 years).

DECLARATION OF INDEPENDENCE

I, Gideon Groenewald, declare that I am an independent specialist consultant and have no financial, personal or other interest in the proposed development, nor the developers or any of their subsidiaries, apart from fair remuneration for work performed in the delivery of palaeontological heritage assessment services. There are no circumstances that compromise the objectivity of my performing such work.

Dr Gideon Groenewald
Geologist

APPENDIX 3: Chance Fossil Finds Procedure

CTS HERITAGE

CHANCE FINDS OF PALAEONTOLOGICAL MATERIAL

(Adopted from the HWC Chance Fossils Finds Procedure: June 2016)

Introduction

This document is aimed to inform workmen and foremen working on a construction and/or mining site. It describes the procedure to follow in instances of accidental discovery of palaeontological material (please see attached poster with descriptions of palaeontological material) during construction/mining activities. This protocol does not apply to resources already identified under an assessment undertaken under s. 38 of the National Heritage Resources Act (no 25 of 1999).

Fossils are rare and irreplaceable. Fossils tell us about the environmental conditions that existed in a specific geographical area millions of years ago. As heritage resources that inform us of the history of a place, fossils are public property that the State is required to manage and conserve on behalf of all the citizens of South Africa. Fossils are therefore protected by the National Heritage Resources Act and are the property of the State. Ideally, a qualified person should be responsible for the recovery of fossils noticed during construction/mining to ensure that all relevant contextual information is recorded.

Heritage Authorities often rely on workmen and foremen to report finds, and thereby contribute to our knowledge of South Africa's past and contribute to its conservation for future generations.

Training

Workmen and foremen need to be trained in the procedure to follow in instances of accidental discovery of fossil material, in a similar way to the Health and Safety protocol. A brief introduction to the process to follow in the event of possible accidental discovery of fossils should be conducted by the designated Environmental Control Officer (ECO) for the project, or the foreman or site agent in the absence of the ECO It is recommended that copies of the attached poster and procedure are printed out and displayed at the site office so that workmen may familiarise themselves with them and are thereby prepared in the event that accidental discovery of fossil material takes place.

Actions to be taken

One person in the staff must be identified and appointed as responsible for the implementation of the attached protocol in instances of accidental fossil discovery and must report to the ECO or site agent. If the ECO or site agent is not present on site, then the responsible person on site should follow the protocol correctly in order to not jeopardize the conservation and well-being of the fossil material.

Once a workman notices possible fossil material, he/she should report this to the ECO or site agent.Procedure to follow if it is likely that the material identified is a fossil:

- The ECO or site agent must ensure that all work ceases immediately in the vicinity of the area where the fossil or fossils have been found;
- The ECO or site agent must inform SAHRA of the find immediately. This information must include photographs of the findings and GPS co-ordinates;
- The ECO or site agent must compile a Preliminary Report and fill in the attached Fossil Discoveries: Preliminary Record Form within 24 hours without removing the fossil from its original position. The Preliminary Report records basic information about the find including:
    - The date
    - A description of the discovery
    - A description of the fossil and its context (e.g. position and depth of find)
    - Where and how the find has been stored
    - Photographs to accompany the preliminary report (the more the better):
        - A scale must be used
        - Photos of location from several angles
        - Photos of vertical section should be provided
        - Digital images of hole showing vertical section (side);
        - Digital images of fossil or fossils.

Upon receipt of this Preliminary Report, SAHRA will inform the ECO or site agent whether or not a rescue excavation or rescue collection by a palaeontologist is necessary.

- Exposed finds must be stabilised where they are unstable and the site capped, e.g. with a plastic sheet or sand bags. This protection should allow for the later excavation of the finds with due scientific care and diligence. SAHRA can advise on the most appropriate method for stabilisation.
- If the find cannot be stabilised, the fossil may be collect with extreme care by the ECO or the site agent and put aside and protected until SAHRA advises on further action. Finds collected in this way must be safely and securely stored in tissue paper and an appropriate box. Care must be taken to remove the all fossil material and any breakage of fossil material must be avoided at all costs.

No work may continue in the vicinity of the find until SAHRA has indicated, in writing, that it is appropriate to proceed.

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FOSSIL DISCOVERIES: PRELIMINARY RECORDING FORM		
Name of project:		
Name of fossil location:		
Date of discovery:		
Description of situation in which the fossil was found:		
Description of context in which the fossil was found:		
Description and condition of fossil identified:		
GPS coordinates:	*Lat:*	*Long:*
If no co-ordinates available then please describe the location:		
Time of discovery:		
Depth of find in hole		
Photographs (tick as appropriate and indicate number of the photograph)	*Digital image of vertical section (side)*	
	Fossil from different angles	
	Wider context of the find	
Temporary storage (where it is located and how it is conserved)		
Person identifying the fossil Name:		
Contact:		
Recorder Name:		
Contact:		
Photographer Name:		
Contact:		

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APPENDIX 4: Heritage Screening Assessment

CTS HERITAGE

HERITAGE SCREENER

CTS Reference Number:	**CTS21_274**
SAHRIS Reference:	
Client:	**Savannah Environmental (Pty) Ltd**
Date:	**March 2022**
Title:	**UMMBILA EMOYENI RENEWABLE ENERGY WIND AND SOLAR PV FACILITIES, MPUMALANGA PROVINCE**

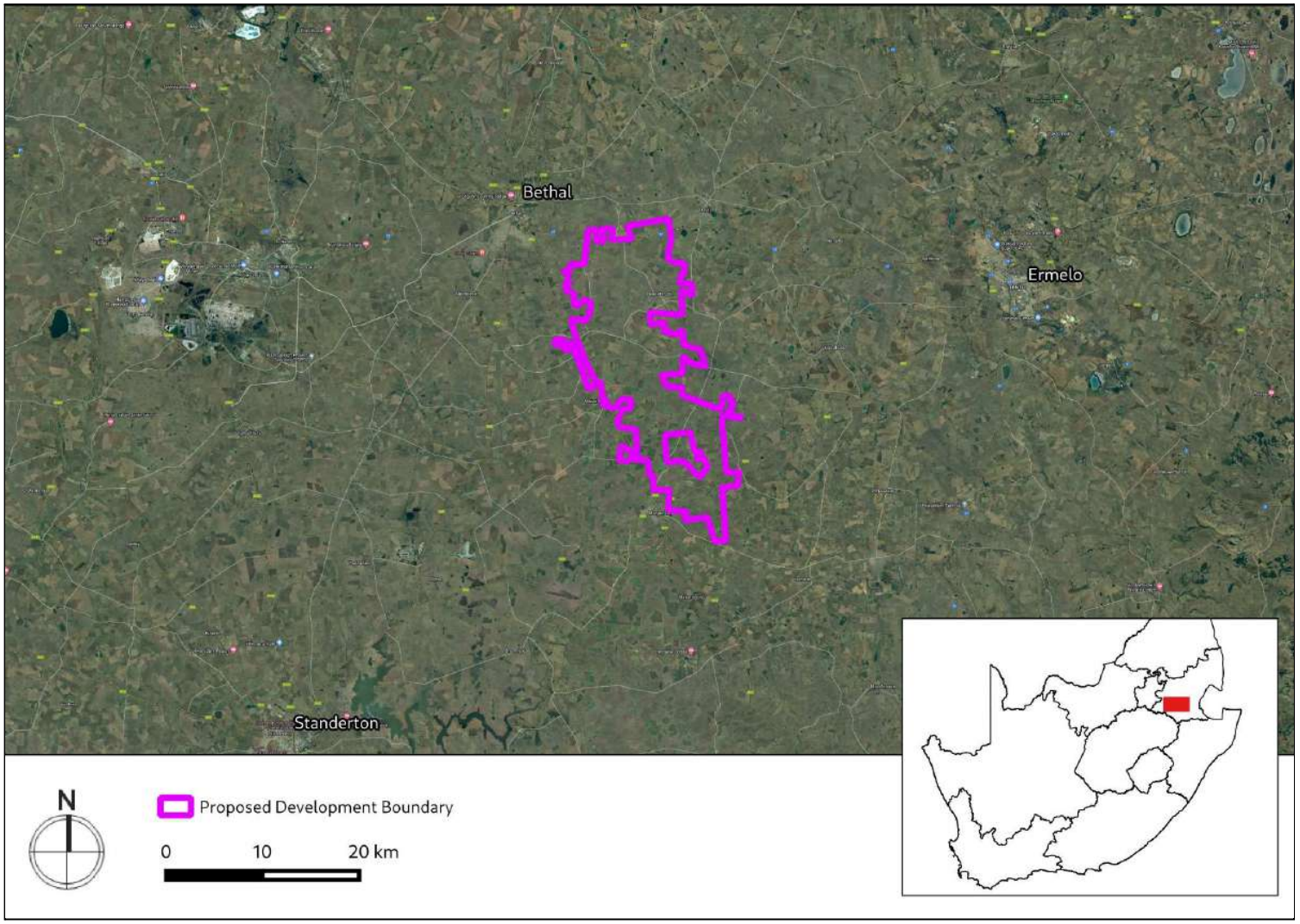

Figure 1a. Satellite map indicating the location of the proposed development in the Mpumalanga Province

CTS HERITAGE

1. Proposed Development Summary

Emoyeni Renewable Energy Farm (Pty) Ltd is proposing the development of renewable energy facilities, collectively known as the Ummbila Emoyeni Renewable Energy Faclility, consisting of a commercial wind farm, solar PV facility, and associated grid infrastructure, including a battery energy storage system, located approximately 6km southeast of Bethal in the Mpumalanga Province of South Africa.

A preferred project focus area with an extent of 27 819ha been identified by Emoyeni Renewable Energy Farm (Pty) Ltd as a technically suitable area for the development of the Ummbilla Emoyeni Renewable Energy Farm with a contracted capacity of up to 666MW of wind energy and 150MW of solar energy. This layout, and project capacity, will reduce as the EIA and scoping process identifies environmental constraints that exclude areas for development.

The project site comprises the following farm portions:

Parent Farm Number	**Farm Portions**
Farm 261 – Naudesfontein	15, 21
Farm 264 – Geluksplaats	0, 1, 3, 4, 5, 6, 8, 9, 11, 12
Farm 268 – Brak Fontein Settlement	6,7,10,11,12
Farm 420 – Rietfontein	8,9,10,11,12,15,16,18,19,22,32
Farm 421 - Sukkelaar	2, 2, 7, 9, 9 10, 10 11, 11 12, 12 22 ,25, 34, 35, 36, 37, 37, 38, 39, 40, 42, 42
Farm 422 – Klipfontein	0, 2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 13, 14, 16, 17, 18, 19, 20, 21, 22, 23
Farm 423 – Bekkerust	0, 1, 2, 4, 5, 6, 10, 11, 12, 13 14, 15, 17, 19, 20, 22, 23, 2425
Farm 452 – Brakfontein	5
Farm 454 – Oshoek	4, 13, 18
Farm 455 – Ebenhaezer	0, 1, 2, 3
Farm 456 – Vaalbank	1, 2, 3, 4, 7, 8, 13, 15, 16, 17, 18, 19
Farm 457 – Roodekrans	0, 1, 4, 7, 22, 23, 23

Farm 458 – Goedgedacht	0, 2, 4, 4, 5, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 21, 21, 22, 25, 26, 27, 28, 29, 31, 32, 33, 34, 35, 37, 39
Farm 467 – Twee Fontein	0, 1, 4, 5, 6, 7, 8, 10
Farm 469 – Klipkraal	5, 6, 7, 8
Farm 548 – Durabel	0

The wind farm is proposed to accommodate the following infrastructure:

- Up to 111 wind turbines with a maximum hub height of up to 200m. The tip height of the turbines will be up to 300m.
- 33kV / 132kV onsite collector substations
- Battery Energy Storage System (BESS)
- Cabling between turbines, to be laid underground where practical
- Laydown and O&M hub (approximately 300m x 300m):
    - Batching plant of 4ha to 7ha
    - Construction compound (temporary) of 6 Ha approximately
    - Operation and Maintenance office of 1.5Ha approximately ,
- Laydown and crane hardstand areas (approximately 75m x 120m)
- Access roads of 12-13m wide, with 12m at turning circles.

The solar PV facility is proposed to accommodate the following infrastructure:

- PV modules and mounting structures with a capacity per panel of 350W to 450W and dependent on optimization and cost.
- Inverters and transformers
- 33kV/132kV onsite collector substation
- Battery Energy Storage System (BESS)
- Cabling between project components
- Laydown and O&M hub (approximately 300m x 300m):
    - Construction compound (temporary),
    - Maintenance office
- Access roads (up to 12m wide)

The project will include associated grid infrastructure that is required to connect the Ummbila Emoyeni Renewable Energy Facility to the national grid. The grid connection solution entails establishing a 400/132 kV MTS, between Camden and SOL Substations, which will be looped in and out of the existing Camden-Sol 400 kV line[1]. The location of the MTS will be refined through an ongoing process of communication with Eskom Planning but will be within close proximity to the 400kV line in order to cut into this line.

It is anticipated that the power generated by the project will be bid into the REIPPPP tender process (DMRE) and/or into private off take opportunities. The LILO corridor will intersect with either the Camden-Zeus 1 400kV, Camden-Zeus 2 400kV or Camden-Tutuka 400kV power line.

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2. Application References

Name of relevant heritage authority(s)	SAHRA
Name of decision making authority(s)	DFFE

3. Property Information

Latitude / Longitude	26°36'25.92"S 29°36'26.38"E
Local Municipality	Govan Mbeki
District Municipality	Gert Sibande
Province	Mpumalanga
Current Use	Agricultural
Current Zoning	Agricultural

4. Nature of the Proposed Development

Total Area	Approximately 1900ha
Depth of excavation (m)	TBA
Height of development (m)	300m

5. Category of Development

x	**Triggers: Section 38(8) of the National Heritage Resources Act**
	Triggers: Section 38(1) of the National Heritage Resources Act
	1. Construction of a road, wall, powerline, pipeline, canal or other similar form of linear development or barrier over 300m in length.
	2. Construction of a bridge or similar structure exceeding 50m in length.

	3. Any development or activity that will change the character of a site-
x	a) exceeding 5 000m^2 in extent
	b) involving three or more existing erven or subdivisions thereof
	c) involving three or more erven or divisions thereof which have been consolidated within the past five years
	4. Rezoning of a site exceeding 10 000m^2
	5. Other (state):

6. Additional Infrastructure Required for this Development

See project description

7. Mapping (please see Appendix 3 and 4 for a full description of our methodology and map legends)

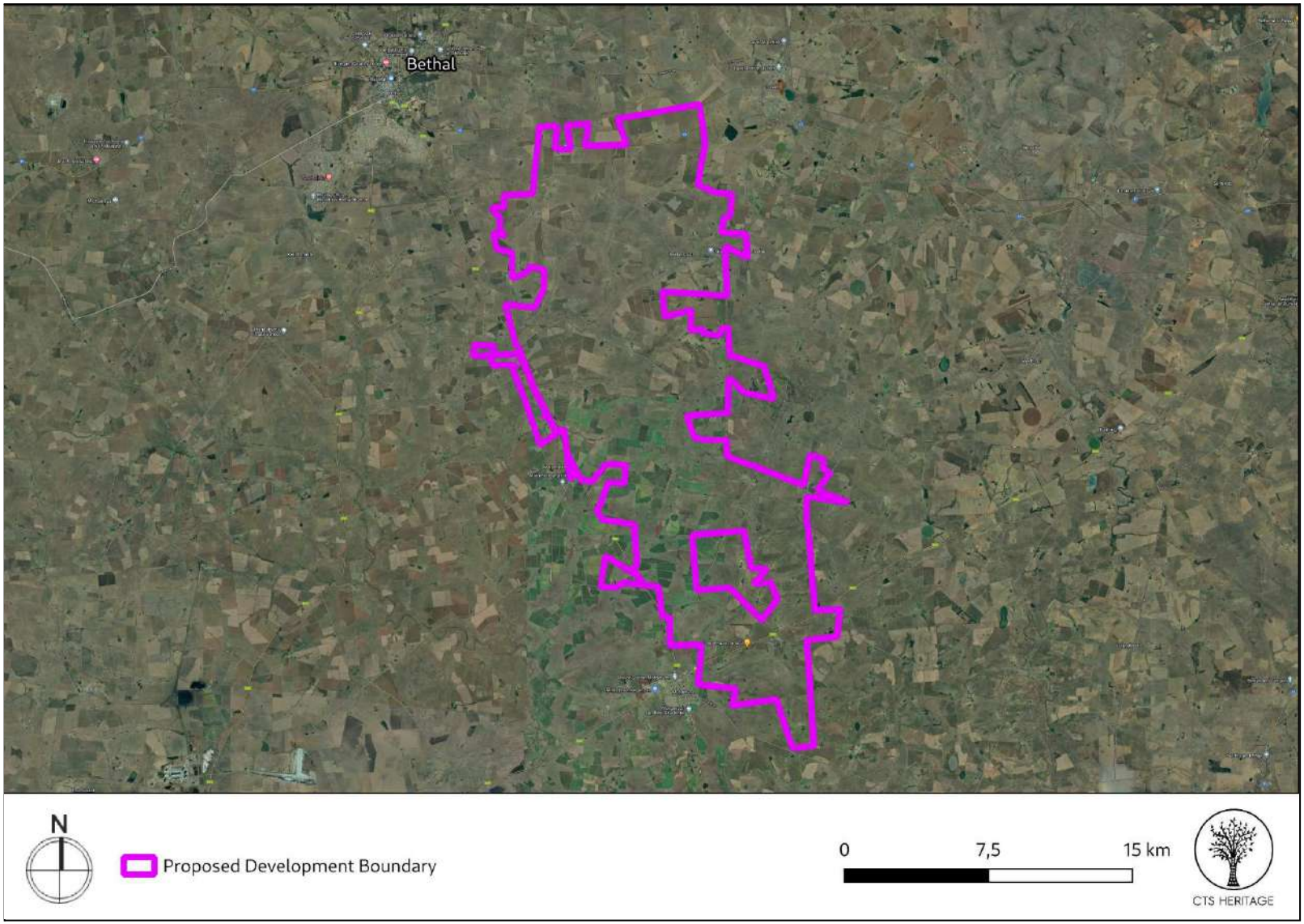

Figure 1b. Overview Map. Satellite image (2020) indicating the proposed development area relative to Bethal

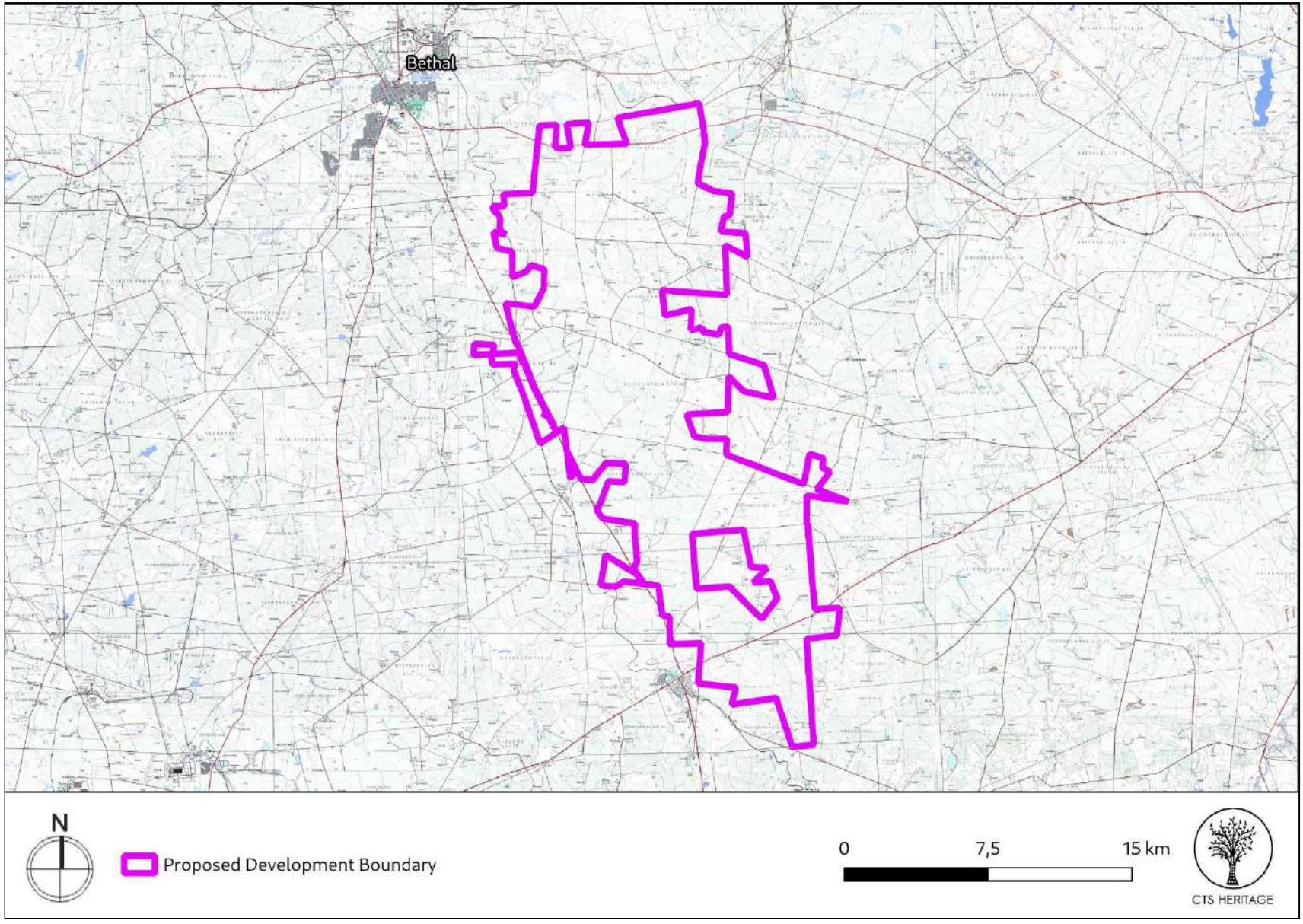

Figure 1c. Overview Map. 1:50 000 Topo Map indicating the proposed development area

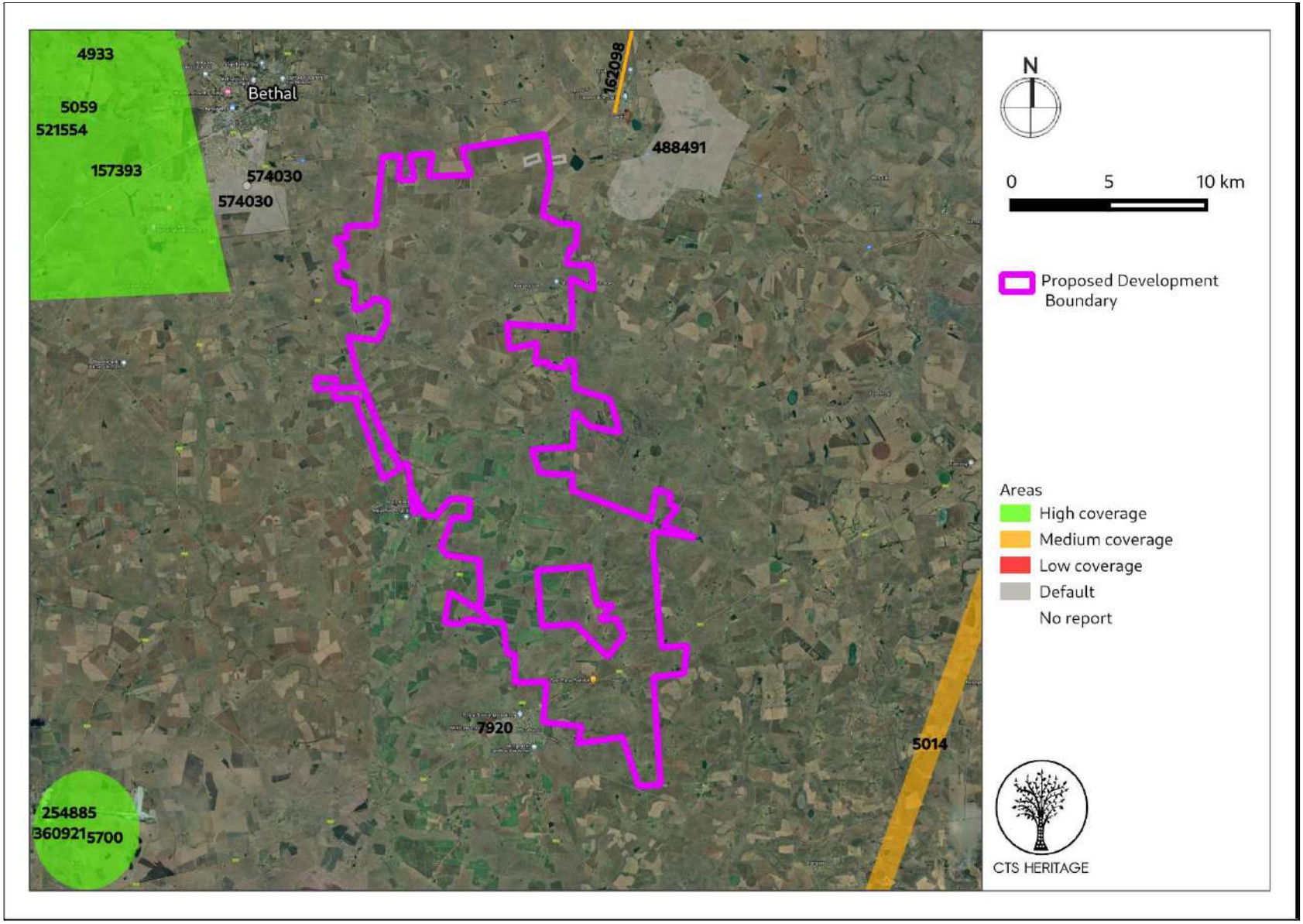

Figure 2a. Previous HIAs Map. Previous Heritage Impact Assessments covering the proposed development area with SAHRIS NIDS indicated. Please see Appendix 2 for a full reference list.

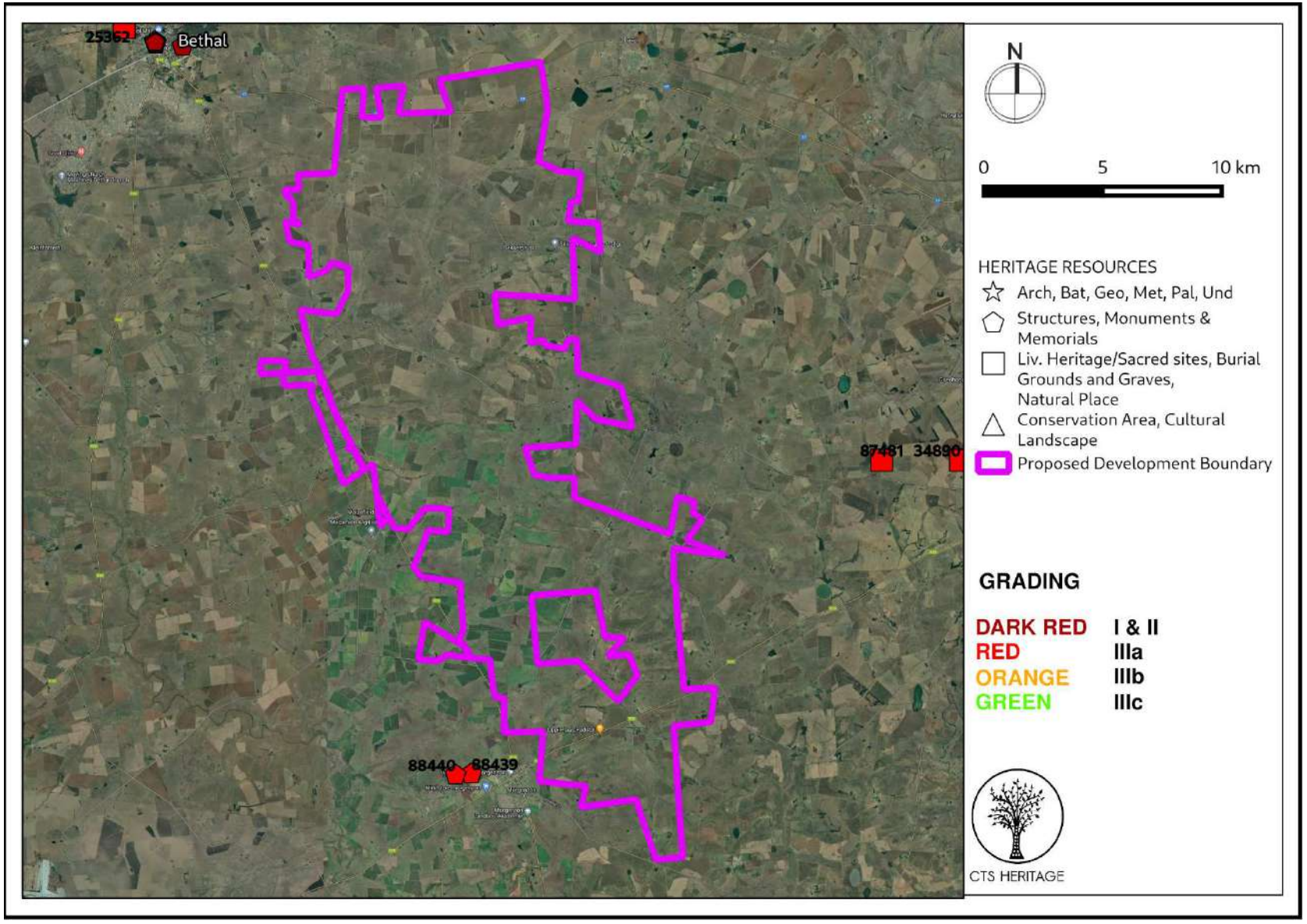

Figure 3. Heritage Resources Map. Heritage Resources previously identified within the study area, with SAHRIS Site IDs indicated in the insets below. Please See Appendix 4 for a full description of heritage resource types.

Figure 4a. Palaeosensitivity Map. Indicating fossil sensitivity underlying the study area. Please See Appendix 3 for a full guide to the legend.

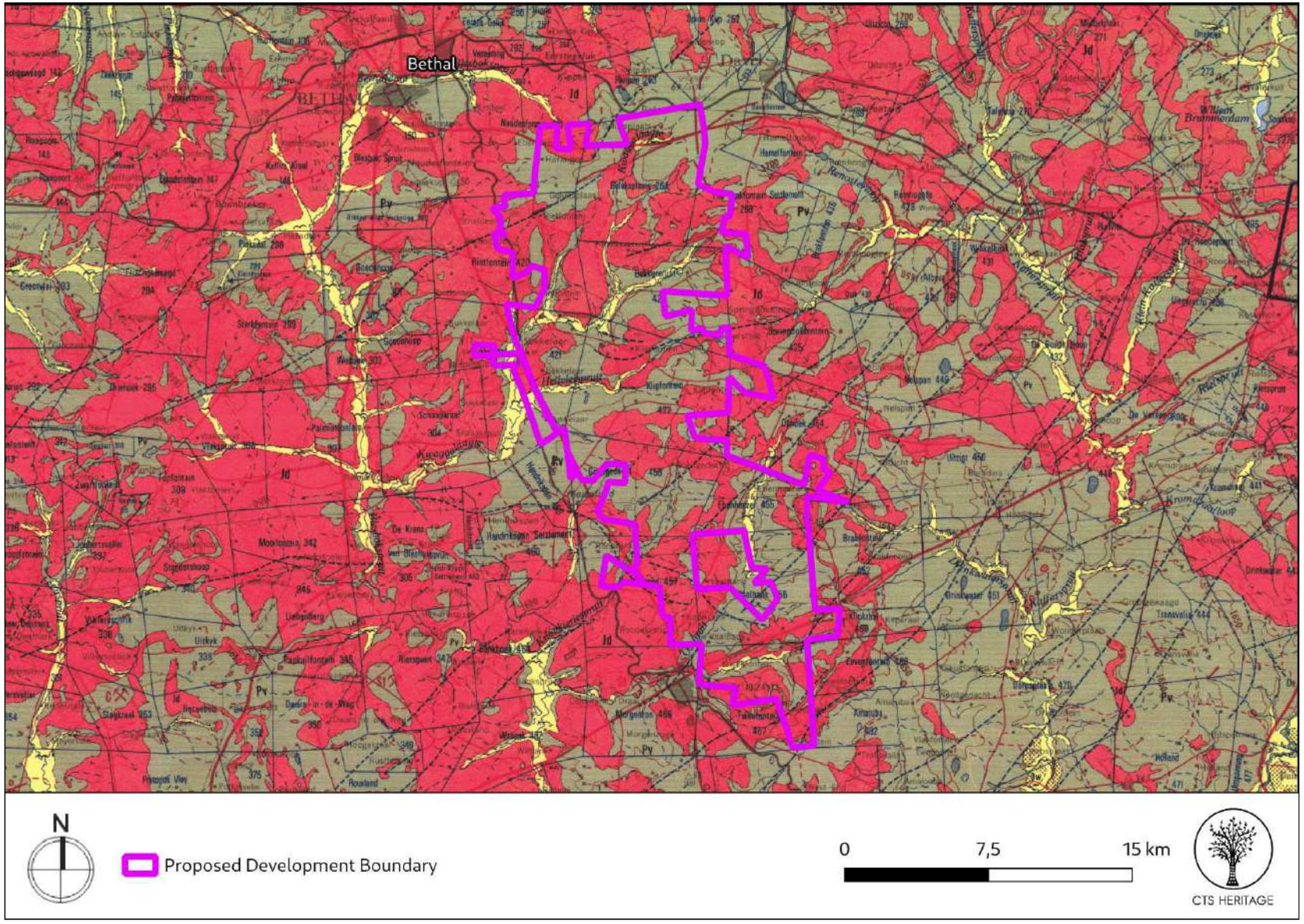

Figure 4b. Geology Map. Extract from the CGS 2628 East Rand Map indicating that the development area for the REF development is underlain by sediments of Pv: Vryheid Formation of the Ecca Group and Jd: Jurassic Dolerite as well as Quaternary Sands

Figure 5a. Google Street View. Indicating views of the development area facing east from the R35

Figure 5b. Google Street View. Indicating views of the development area facing north from the R39

Figure 5b. Google Street View. Indicating views of the development area facing south from the R39

8. Heritage Assessment

The area proposed for this Renewable Energy Development is located immediately south of Bethal, west of Ermelo and East of Secunda. This area is known for its rolling hills and extensive coal mine infrastructure.

Cultural Landscape

Van Vollenhoven (2015) described the broader assessment area in his assessment completed for a de-stoning plan located adjacent to this proposed development area. Van Vollenhoven (2015) describes the environment as "disturbed by recent human activities, mainly agriculture. This consists of maize fields. Other disturbance visible is mining infrastructure…, a railway track… and power lines... Signs of old fields were also present which could be seen in the pioneer plant species consisting of weeds and grass. Almost half of the surveyed area consists of natural grassland. The vegetation cover varies between short and long grass... The topography of the area forms part of the rolling hills of the surrounding landscape."

Van Vollenhoven (2015) notes that "At the beginning of the 19th century the Phuthing, a South Sotho group, stayed in the vicinity of modern day Bethal. During the Difaquane they fled to the south (Bergh 1999: 10-11; 109). In 1829 the traveller Robert Scoon passed through an area to the north of Bethal (Bergh 1999: 13). The first white farmers only settled here during the late 1850's. By the 1890's this area was inhabited by many white farmers (Bergh 1999: 18-20). The town of Standerton was established in 1879 although it already was a district in 1878. Bethal was established in 1880 and it became an independent district in 1898 (Bergh 1999: 20-21). During the Anglo-Transvaal War (1880-1881) the British garrison in Standerton was beleaguered by the Boer forces (Bergh 1999: 46). The Highveld areas also saw much action consisting of various skirmishes between Boer and Brit during the Anglo-Boer War (1899-1902). It includes skirmishes on the farms Oshoek (4 December 1901), Trigaardsfontein (10 December 1901), Witbank (11 January 1902) and Nelspan (26 January 1902) (Bergh 1999: 51, 54)... At Standerton there was both a concentration camp for white and for black people (Bergh 1999: 54)."

This brief history points to the layered cultural landscape that is present in this area. Due to the scale of the proposed development, it is likely to change the sense of place associated with this landscape, and may impact the way that this historic landscape reads by obscuring layers of the past. Cognisance must be taken of this unique cultural landscape, consisting of farm werfs etc in the proposed layout.

Archaeology

None of the area proposed for development has been previously assessed in any heritage impact assessment process. Heritage Impact Assessments have been completed nearby for projects in Secunda and these can be used to infer the archaeological sensitivity in the development area. Van Vollenhoven (2015) notes that the geographical area around the towns of Standerton and Bethal is not known to conserve Stone Age archaeology. He notes that "No such sites are indicated on maps contained in a historical atlas of this area (Bergh 1999: 4-5). However this may only be since no research has actually been done in this area. The closest known Stone Age occurrences are a Late Stone Age site at the town of Ermelo and rock art sites far to the west of Standerton (Bergh 1999: 4-5)." Van Vollenhoven (2015) noted no natural shelters during the survey; however, the good vegetation in the surrounding area and the rivers indicate that ample grazing and water may have been available, making it a prime spot for hunting in the past. Therefore one may assume that Stone Age people probably would have moved through the area. Late Iron Age sites are found in a large area around the towns of Bethal and Standerton and number at least 585 such sites.

In the heritage assessment of a powerline upgrade at the nearby Syferfontein Mine, Nel & Karodia (2013), noted that "*a heritage assessment was conducted in 2000 by the National Cultural History Museum and included in the Syferfontein Mine EMP in 2010. During the survey, a few Stone Age artefacts were identified. These artefacts were not considered to have any primary context and therefore were interpreted to have low significance value. No Early Iron Age sites were identified. The Late Iron Age sites found here conform to those identified in the literature for the Southern Highveld area (former southern Transvaal, northern Orange Free State) as Type V sites. As the soil is mostly turf, Iron Age settlement usually took place on the various dolerite outcrops. The added benefit of choosing these locations was that it was located at the source of building material used in constructing the settlements. One such site shows interesting features as the living units were actually excavated to obtain enough building material for the surrounding walls. A few of the farmsteads*

dating to early part of this century were identified as possibly having historical-architectural significance. A number of abandoned homesteads are located in the areas that were investigated. These seem to belong to farm labourers and were all abandoned within the last few years. They are therefore not viewed to be of cultural or historical significance. However, some graves are located in the vicinity of the homesteads and it is possible that more graves will be located nearby".

None of the sites identified in the assessment referenced are located within or near the development area, however the text provides a good assessment of resources that may be present. However, it is clear that the development area has not previously been assessed. It is therefore possible that the proposed development will impact negatively on archaeological resources associated with the Late Iron Age, burial grounds and graves as well as stone age archaeological resources. Further investigation of the archaeological significance of the development area is recommended.

Palaeontology

According to the SAHRIS Palaeosensitivity Map, the area proposed for development is underlain by sediments of zero, moderate and very high palaeontological sensitivity (Figure 4a). According to the extract from the Council of Science Map for East Rand 2628 (Figure 4b), the palaeontologically sensitive geology of the area is ascribed to the Vryheid Formation of the Ecca Group of sediments. Groenewald (2014, SAHRIS NID 167013) completed a field-based palaeontological assessment for the Waaihoek WEF in which he interrogates the palaeontological sensitivity of this formation. In this assessment, Groenewald (2014) notes that "The Vryheid Formation consists of interbedded very coarse-grained sandstone and mudstone that yields plant and trace fossils as well as some prominent coal seams." In this assessment, Groenewald (2014) made the following recommendations for the WEF development within the Vryheid Formation "The PEA and CEO be made aware of the possibility of finding fossils in the Vryheid and Volksrust Formation sediments during excavation of the foundations for the turbines and other infrastructure. A professional palaeontologist is appointed to monitor possible palaeontological finds during excavation of turbine foundations and infrastructure where turbine positions and infrastructure fall on Vryheid and Volksrust Formation sediments." The sediments underlying the development area have very high levels of palaeontological sensitivity, the nature of the excavations associated with Renewable Energy facilities tends to be deep and as such, the likelihood of impacting intact Vryheid Formation sediments is high. Further investigation of the palaeontological sensitivity of the development area is recommended.

9. Scoping Assessment

Impact Destruction of significant heritage resources			
Issue	**Nature of Impact**	**Extent of Impact**	**No-go Areas**
Destruction of archaeological heritage	Direct impact to archaeological heritage of scientific significance	Within project boundary	None identified at this stage
Destruction of palaeontological heritage	Direct impact to palaeontological heritage of scientific significance	Within project boundary	None identified at this stage
Negative impact to significant cultural landscapes	Indirect impact to significant cultural landscapes and cultural landscape elements including historic farm werfs	Regional	Buffer areas identified around farm werfs - 1km recommended
Description of expected significance of impact Field assessment will determine the significance of the resources likely to be impacted. Impacts can be minimised through the implementation of appropriate mitigation measures.			
Gaps in knowledge & recommendations for further study The project area and the area more broadly have not been subjected to many heritage impact assessments and therefore substantial gaps in knowledge exist. Field assessment will fill these gaps.			
Recommendations with regards to general field surveys Archaeological field surveys must provide sufficient ground-coverage of the areas to be developed to be able to determine the nature of the resources likely to be impacted. Palaeontological and cultural landscape field surveys will target sensitive geological and cultural landscape features.			

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APPENDIX 1

List of heritage resources within close proximity to the development area

Site ID	Site no	Full Site Name	Site Type	Grading
26961	9/2/206/0001	Old Magistrate's Office, Market Street, Bethal	Building	Grade II
26962	9/2/206/0004	Dutch Reformed Church, Vermooten Street, Bethal	Building	Grade II
87481	STRY029	Strybult 542/ 029	Burial Grounds & Graves	Grade IIIa
88439	MORG001	Morgenzon 466-IS/ 001	Structures	Grade IIIa
88440	MORG002	Morgenzon 466-IS/ 002	Structures	Grade IIIa
34890	SYN018	Synfuels 018	Burial Grounds & Graves	Grade IIIa
135911	DC30/NAMM/0005	Nokuthula Orela Simelane Statue, Gedenk Ave, Bethal	Monuments & Memorials	

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APPENDIX 2

Reference List with relevant AIAs and PIAs

Heritage Impact Assessments				
Nid	**Report Type**	**Author/s**	**Date**	**Title**
157393	Heritage Statement	Shahzaadee Karodia Khan, Johan Nel	01/02/2014	HERITAGE STATEMENT FOR THE BASIC ASSESSMENT UNDERTAKEN FOR A POWERLINE UPGRADE, SYFERFONTEIN MINE, SECUNDA, MPUMALANGA PROVINCE
358403	HIA Phase 1	Anton van Vollenhoven	10/08/2015	A report on a Cultural Heritage Impact Assessment for the Development of a De-stoning Plan at the New Denmark Colliery, close to Standerton, Mpumalanga Province
5014	AIA Phase 1	Julius CC Pistorius	01/06/2007	A Phase 1 Heritage Impact Assessment Study for the Proposed New 88 kV Power Line Running from the Majuba Power Station near Amersfoort to the Camden Power Station near Ermelo in the Mpumalanga Province
5059	AIA Phase 1	Johnny Van Schalkwyk	01/05/2003	Archaeological Survey of a Section of the Secunda-Mozambique Gas Pipeline Bethal and Highveld Ridge
5700	AIA Phase 1	Johnny Van Schalkwyk	01/10/2002	A Survey of Cultural Resources for the Proposed New Tutuka-Alpha Standerton Power Transmission Line, Standerton District
7920	AIA Phase 1	Johnny Van Schalkwyk	01/02/2004	Heritage Impact Assessment for the Planned Sivukile Extension 4 Township Lekwa Municipality

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APPENDIX 3 - Keys/Guides

Key/Guide to Acronyms

AIA	Archaeological Impact Assessment
DARD	Department of Agriculture and Rural Development (KwaZulu-Natal)
DEA	Department of Environmental Affairs (National)
DEADP	Department of Environmental Affairs and Development Planning (Western Cape)
DEDEAT	Department of Economic Development, Environmental Affairs and Tourism (Eastern Cape)
DEDECT	Department of Economic Development, Environment, Conservation and Tourism (North West)
DEDT	Department of Economic Development and Tourism (Mpumalanga)
DEDTEA	Department of economic Development, Tourism and Environmental Affairs (Free State)
DENC	Department of Environment and Nature Conservation (Northern Cape)
DMR	Department of Mineral Resources (National)
GDARD	Gauteng Department of Agriculture and Rural Development (Gauteng)
HIA	Heritage Impact Assessment
LEDET	Department of Economic Development, Environment and Tourism (Limpopo)
MPRDA	Mineral and Petroleum Resources Development Act, no 28 of 2002
NEMA	National Environmental Management Act, no 107 of 1998
NHRA	National Heritage Resources Act, no 25 of 1999
PIA	Palaeontological Impact Assessment
SAHRA	South African Heritage Resources Agency
SAHRIS	South African Heritage Resources Information System
VIA	Visual Impact Assessment

Full guide to Palaeosensitivity Map legend

	RED:	VERY HIGH - field assessment and protocol for finds is required
	ORANGE/YELLOW:	HIGH - desktop study is required and based on the outcome of the desktop study, a field assessment is likely
	GREEN:	MODERATE - desktop study is required
	BLUE/PURPLE:	LOW - no palaeontological studies are required however a protocol for chance finds is required
	GREY:	INSIGNIFICANT/ZERO - no palaeontological studies are required
	WHITE/CLEAR:	UNKNOWN - these areas will require a minimum of a desktop study.

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APPENDIX 4 - Methodology

The Heritage Screener summarises the heritage impact assessments and studies previously undertaken within the area of the proposed development and its surroundings. Heritage resources identified in these reports are assessed by our team during the screening process.

The heritage resources will be described both in terms of **type**:

- Group 1: Archaeological, Underwater, Palaeontological and Geological sites, Meteorites, and Battlefields
- Group 2: Structures, Monuments and Memorials
- Group 3: Burial Grounds and Graves, Living Heritage, Sacred and Natural sites
- Group 4: Cultural Landscapes, Conservation Areas and Scenic routes

and **significance** (Grade I, II, IIIa, b or c, ungraded), as determined by the author of the original heritage impact assessment report or by formal grading and/or protection by the heritage authorities.

Sites identified and mapped during research projects will also be considered.

DETERMINATION OF THE EXTENT OF THE INCLUSION ZONE TO BE TAKEN INTO CONSIDERATION

The extent of the inclusion zone to be considered for the Heritage Screener will be determined by CTS based on:

- the size of the development,
- the number and outcome of previous surveys existing in the area
- the potential cumulative impact of the application.

The inclusion zone will be considered as the region within a maximum distance of 50 km from the boundary of the proposed development.

DETERMINATION OF THE PALAEONTOLOGICAL SENSITIVITY

The possible impact of the proposed development on palaeontological resources is gauged by:

- reviewing the fossil sensitivity maps available on the South African Heritage Resources Information System (SAHRIS)
- considering the nature of the proposed development
- when available, taking information provided by the applicant related to the geological background of the area into account

DETERMINATION OF THE COVERAGE RATING ASCRIBED TO A REPORT POLYGON

Each report assessed for the compilation of the Heritage Screener is colour-coded according to the level of coverage accomplished. The extent of the surveyed coverage is labeled in three categories, namely low, medium and high. In most instances the extent of the map corresponds to the extent of the development for which the specific report was undertaken.

Low coverage will be used for:

- desktop studies where no field assessment of the area was undertaken;
- reports where the sites are listed and described but no GPS coordinates were provided.
- older reports with GPS coordinates with low accuracy ratings;
- reports where the entire property was mapped, but only a small/limited area was surveyed.
- uploads on the National Inventory which are not properly mapped.

Medium coverage will be used for

- reports for which a field survey was undertaken but the area was not extensively covered. This may apply to instances where some impediments did not allow for full coverage such as thick vegetation, etc.
- reports for which the entire property was mapped, but only a specific area was surveyed thoroughly. This is differentiated from low ratings listed above when these surveys cover up to around 50% of the property.

High coverage will be used for

- reports where the area highlighted in the map was extensively surveyed as shown by the GPS track coordinates. This category will also apply to permit reports.

RECOMMENDATION GUIDE

The Heritage Screener includes a set of recommendations to the applicant based on whether an impact on heritage resources is anticipated. One of three possible recommendations is formulated:

(1) The heritage resources in the area proposed for development are sufficiently recorded - The surveys undertaken in the area adequately captured the heritage resources. There are no known sites which require mitigation or management plans. No further heritage work is recommended for the proposed development.

This recommendation is made when:

- enough work has been undertaken in the area
- it is the professional opinion of CTS that the area has already been assessed adequately from a heritage perspective for the type of development proposed

(2) The heritage resources and the area proposed for development are only partially recorded - The surveys undertaken in the area have not adequately captured the heritage resources and/or there are sites which require mitigation or management plans. Further specific heritage work is recommended for the proposed development.

This recommendation is made in instances in which there are already some studies undertaken in the area and/or in the adjacent area for the proposed development. Further studies in a limited HIA may include:

- improvement on some components of the heritage assessments already undertaken, for instance with a renewed field survey and/or with a specific specialist for the type of heritage resources expected in the area
- compilation of a report for a component of a heritage impact assessment not already undertaken in the area

- undertaking mitigation measures requested in previous assessments/records of decision.

(3) The heritage resources within the area proposed for the development have not been adequately surveyed yet - Few or no surveys have been undertaken in the area proposed for development. A full Heritage Impact Assessment with a detailed field component is recommended for the proposed development.

Note:
The responsibility for generating a response detailing the requirements for the development lies with the heritage authority. However, since the methodology utilised for the compilation of the Heritage Screeners is thorough and consistent, contradictory outcomes to the recommendations made by CTS should rarely occur. Should a discrepancy arise, CTS will immediately take up the matter with the heritage authority to clarify the dispute.

APPENDIX 5 -Summary of Specialist Expertise

Jenna Lavin, an archaeologist with an MSc in Archaeology and Palaeoenvironments, and currently completing an MPhil in Conservation Management , heads up the heritage division of the organisation since 2016, and has a wealth of experience in the heritage management sector. Jenna's previous position as the Assistant Director for Policy, Research and Planning at Heritage Western Cape has provided her with an in-depth understanding of national and international heritage legislation. Her 8 years of experience at various heritage authorities in South Africa means that she has dealt extensively with permitting, policy formulation, compliance and heritage management at national and provincial level and has also been heavily involved in rolling out training on SAHRIS to the Provincial Heritage Resources Authorities and local authorities.

Jenna is on the Executive Committee of the Association of Professional Heritage Practitioners (APHP), and is also an active member of the International Committee on Monuments and Sites (ICOMOS) as well as the International Committee on Archaeological Heritage Management (ICAHM). In addition, Jenna has been a member of the Association of Southern African Professional Archaeologists (ASAPA) since 2009. Recently, Jenna has been responsible for conducting training in how to write Wikipedia articles for the Africa Centre's WikiAfrica project.

Since 2016, Jenna has drafted over 100 Heritage Impact Assessments and Screening Assessments throughout South Africa.