

HERITAGE IMPACT ASSESSMENT

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

Proposed grid connection infrastructure to connect the authorised Woodhouse 1 and Woodhouse 2 PV facilities to the Eskom grid near Vryburg, North West Province

SAHRIS Ref:

Prepared by CTS Heritage



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For

Savannah Environmental (Pty) Ltd

July 2021



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EXECUTIVE SUMMARY

1. Site Name:

Woodhouse PV Overhead Line

2. Location:

Approximately 5km southeast of Vryburg in the North West Province

3. Locality Plan:

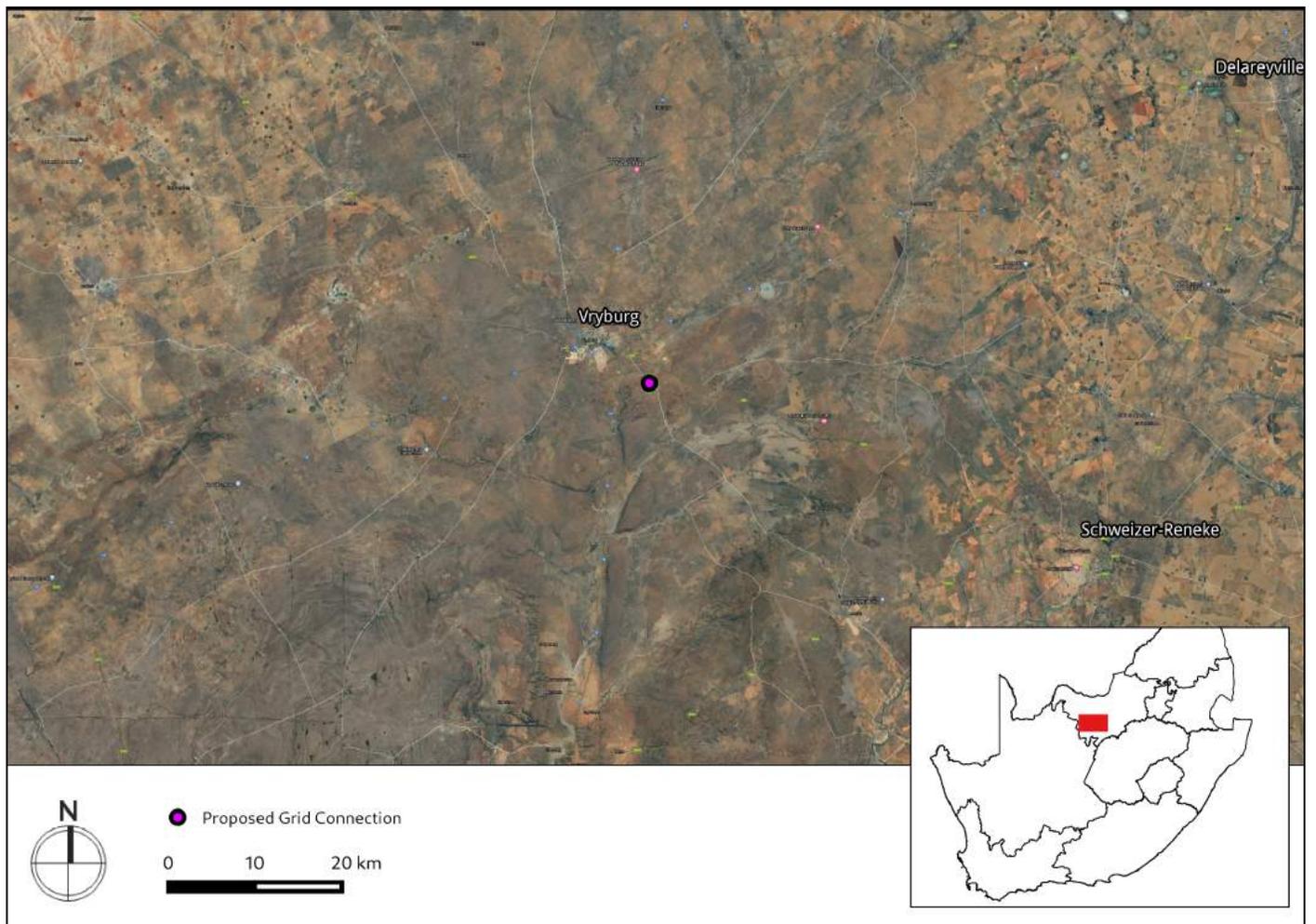


Figure 1: Location of the proposed study area

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4. Description of Proposed Development:

Genesis Eco-Energy Developments is proposing grid connection infrastructure to connect the authorised Woodhouse 1 and Woodhouse 2 PV facilities to the Eskom grid. The project includes the following:

- 1 x collector substations (one at Woodhouse 1 (2 alternatives)) and 1 switching station at Woodhouse 2
- 1 x 132kV overhead line
- Connection from Woodhouse 1 substation to Bophirima Substation

5. Heritage Resources Identified in the study area:

Site No.	Site Name	Description	Co-ordinates		Grading	Mitigation
WH001	Woodhouse 001	Isolated Artefact, ESA or early MSA	-27.0023	24.79759	IIC	Avoid impact
WH002	Woodhouse 002	Artefact scatter, MSA and LSA	-27.0114	24.80922	IIC	Avoid impact
WH003	Woodhouse 003	Artefact scatter, MSA and LSA	-27.0111	24.8088	IIC	Avoid impact
WH004	Woodhouse 004	Isolated Artefact, ESA or early MSA	-27.0159	24.80993	IIC	Avoid impact
WH005	Woodhouse 005	Chert Source	-27.0212	24.81066	IIC	Avoid impact
WH006	Woodhouse 006	Isolated Artefact, ESA or early MSA	-27.0211	24.81057	IIC	Avoid impact
WH007	Woodhouse 007	Isolated Artefact, ESA	-27.0017	24.79684	IIC	Avoid impact
WH008	Woodhouse 008	Isolated Artefact, LSA	-26.9945	24.79093	IIC	Avoid impact
WH009	Woodhouse 009	Isolated Artefact, LSA	-26.9925	24.78933	IIC	Avoid impact

6. Anticipated Impacts on Heritage Resources:

The findings of the archaeology field assessment (Appendix 2) largely correlate with the findings of Van der Walt (2016). The fieldwork identified a number of archaeological resources located within the development area for the overhead powerline. It has been determined that the archaeological resources observed in this assessment are all ex situ, and the potential for finding a dateable *in-situ* archaeological horizon based on current surface

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observations appears to be low. The archaeological resources identified therefore have scientifically LOW-SIGNIFICANCE and are graded IIIC.

As these resources are located within the development area for the OHL, it is likely that these resources will be negatively impacted by the proposed development. Mitigation measures are proposed below in order to limit the negative impact to these resources. Furthermore, it is possible that additional archaeological resources are present below the ground surface which may be impacted by the proposed development.

No built structures or any structures of significance were identified within the development area. The proposed overhead powerline is located in between two approved Solar PV facilities (Woodhouse 1 and 2). This landscape is therefore not pristine and is already anticipated to be dominated by renewable energy infrastructure. As such, no negative impact to a sensitive cultural landscape is anticipated.

As per Becker (2016), “Although trace fossils and plants could be present in the Dwyka Group the likelihood of significant fossil heritage in the Vryburg area is considered to be low. The southern portion of the development footprint consists of the Vryburg Formation, which is considered as unfossiliferous in this area. Therefore, there are no areas located within the development footprint considered as sensitive.” No impact to significant palaeontological heritage is therefore anticipated. However, it is recommended that the attached Chance Fossil Finds Procedure is implemented during the course of construction activities.

7. Recommendations:

There is no objection to the proposed development of the Woodhouse overhead powerline in terms of impacts to heritage resources on condition that:

- The placement of the pylon footings is carefully considered in order to avoid impact to the sites mapped in Figure 5.1 to 5.4.
- The attached Chance Fossil Finds Procedure (Appendix 4) is implemented during the course of construction activities.
- Should any buried archaeological resources or burials be uncovered during the course of development activities, work must cease in the vicinity of these finds. The South African Heritage Resources Agency (SAHRA) must be contacted immediately in order to determine an appropriate way forward.

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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 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 80 Heritage Impact Assessments throughout South Africa.

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1. INTRODUCTION

1.1 Background Information on Project

On 20 September 2016, Environmental Authorisation (EA) was granted for the proposed construction of two commercial photovoltaic (PV) solar energy facilities (known as the Woodhouse Solar 1 and Woodhouse Solar 2 PV Facilities) as well as all associated infrastructure on the Remaining Extent of Farm Woodhouse 729, situated approximately 10km southeast of Vryburg. This application is for the proposed grid connection infrastructure to connect the authorised Woodhouse 1 and Woodhouse 2 PV facilities to the Eskom grid. The area proposed for the Woodhouse Solar 1 and 2 PV Facilities was thoroughly assessed for impacts to heritage resources in an Archaeological Impact Assessment conducted by Van der Walt (2016, SAHRIS NID 374639) and a Palaeontological Impact Assessment by Becker (2016, SAHRIS NID 374641).

Genesis Eco-Energy Developments is proposing grid connection infrastructure to connect the authorised Woodhouse 1 and Woodhouse 2 PV facilities to the Eskom grid. The project includes the following:

- 1 x collector substation (one at Woodhouse 1 (2 alternatives)) and 1 x switching station at Woodhouse 2
- 1 x 132kV overhead line
- Connection from Woodhouse 1 substation to Bophirima Substation

1.2 Description of Property and Affected Environment

The footprint for the proposed grid connection infrastructure is located across 4 properties, including the farms Bernauw 2, 56 as well as Waterloo and Woodhouse, approximately 5km South- East of the town of Vryburg in the North West Province.

The landscape falls within the semi-arid southern African Savannah Biome, and the vegetation is characterized by grassy thornveld which is dense across the majority of the survey area, and is formally characterized as Ghaap Plateux Vaalbosveld (see Mucina et al., 2006). A drainage channel intersects the proposed grid connection, and is oriented roughly from west to east, yielding several isolated *ex-situ* artefacts in close proximity. The topography of the area is characterized by low undulating ridges, with several small pans to the west and south-west of the study area. Bedrock outcrops in several places to the south-east of the footprint, with primary chert outcrops in several locations. Exploitation traces in the form of associated flakes and cores indicate these chert outcrops were sources of raw-material for Pleistocene hunter-gatherer populations in the region. Large low-quality quartzite nodules are present immediately south of the drainage channel with sparse interspersed isolated finds.

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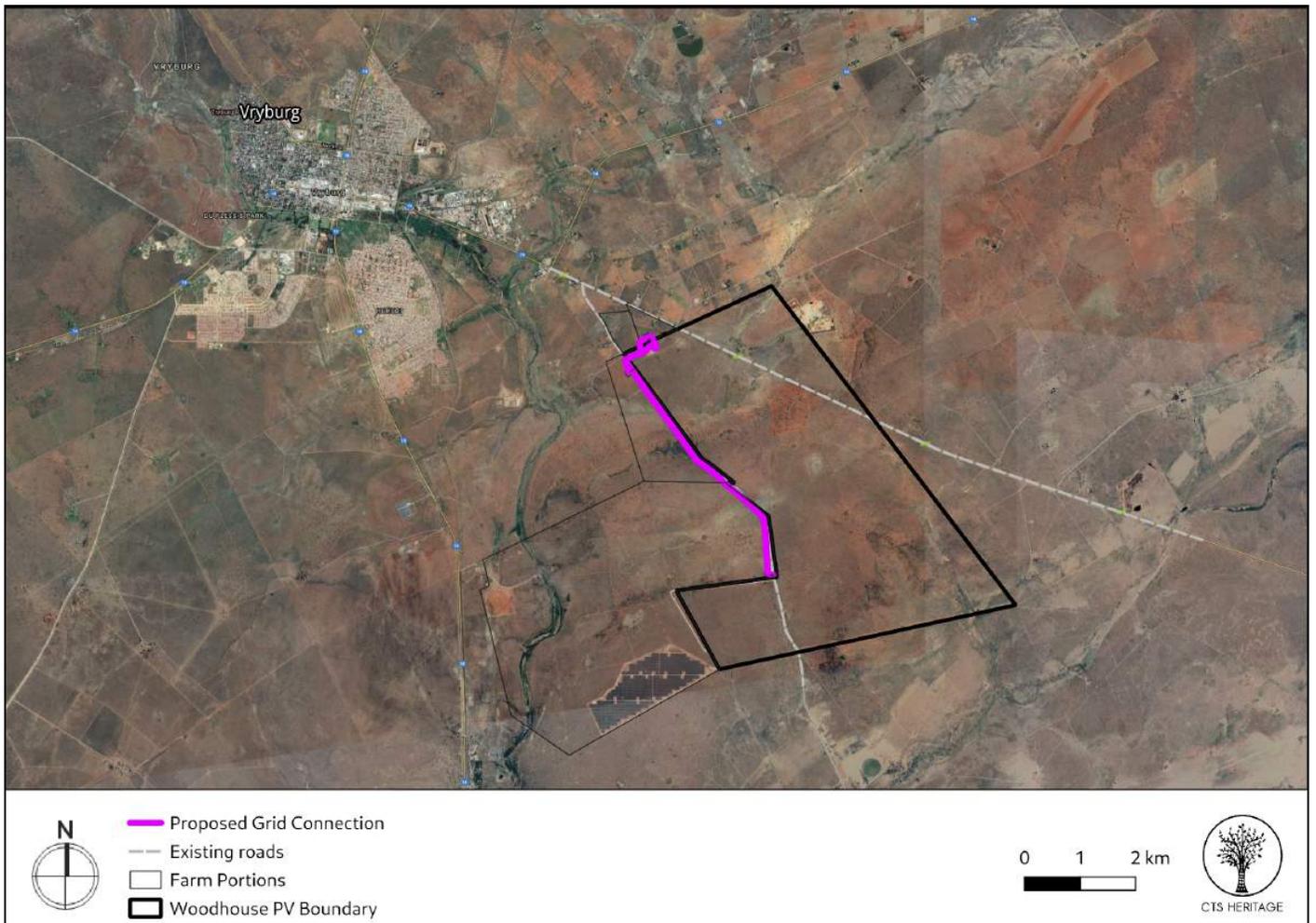
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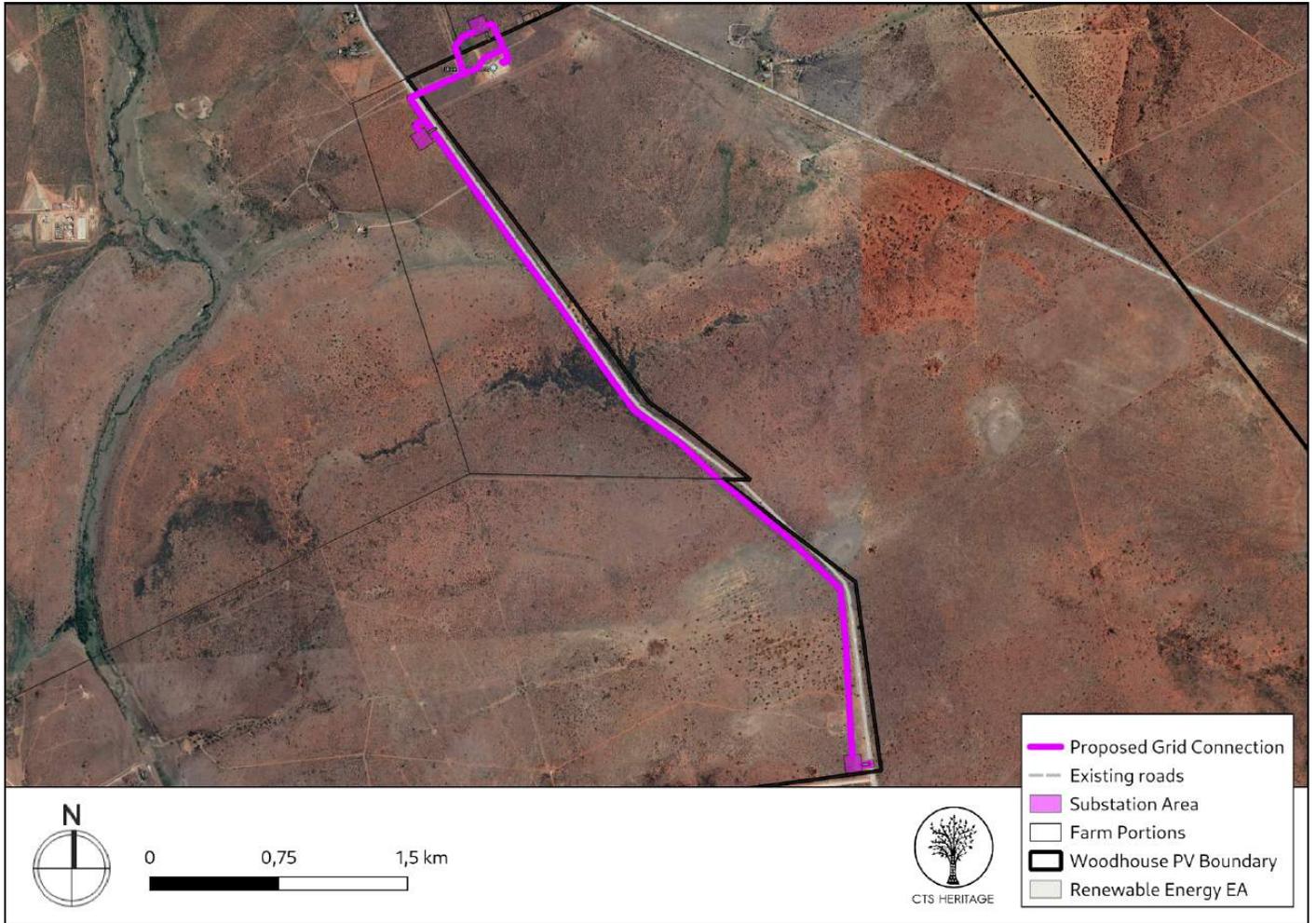
The surface sediments are generally bioturbated sandy soils, which appear to be aeolian in terms of original deposition, although the inclusion of sparse but sizeable quartzite cobbles with riverine cortex (>10cm) in the vicinity of the abovementioned drainage are suggestive of a fluvial component. The appearance of infrequent and isolated rolled stone artefacts, in amongst the cobbles are potentially suggestive of a Pleistocene age of the top soils. Calcretized redeposited pan deposits mixed in with the topsoil are more common to the south, which raises the potential for Pleistocene fossil preservation in the general area (although no fossils were documented).



Map 1a: The proposed development relative to Vryburg

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Map 1b: The proposed development area

The general land use in the region appears historically to be predominantly cattle farming, with evidence of larger antelope and burrowing rodents (mole rats and hares) within the footprint which, in combination with the dense vegetation, likely account for the bioturbated nature of the surface sediments. The majority of identified archaeological remains occur within these disturbed upper sandy soil contexts and therefore have limited potential for modern scientific analyses (due to the context and limited possibility of radiometric dating). Even where topsoil has been removed, the artefacts are randomly oriented with several pieces on-end, indicating a redeposited context. However, the potential for *in situ* deposits in sub-surface contexts cannot be discounted.



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) (Appendix 1)
- An archaeologist conducted an assessment of the broader study area in order to determine the archaeological resources likely to be disturbed by the proposed development. The archaeologist conducted his site visit on 17 July 2021 (Appendix 2)
- The identified resources were assessed to evaluate their heritage significance
- 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

Dense grass and thorn tree cover across much of the study area inhibited the potential visibility of surface scatters and the ability to assess some of the footprint area at ground surface level.



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Although permission was acquired to survey the 300m of territory oriented east-north-east in the northern section of the footprint, nobody was available to open the security gate on the day of the survey. This section was therefore reviewed from the neighbouring property, and with visible evidence of substantial dirt road construction is considered to have limited to no potential for *in situ* archaeological remains.

2.5 Savannah Impact Assessment Methodology

Direct, indirect and cumulative impacts of the issues identified through the Basic Assessment process 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.

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- 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:

$$S = (E + D + M) \times P$$

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

On 20 September 2016, Environmental Authorisation (EA) was granted for the proposed construction of two commercial photovoltaic (PV) solar energy facilities (known as the Woodhouse Solar 1 and Woodhouse Solar 2 PV Facilities) as well as all associated infrastructure on the Remaining Extent of Farm Woodhouse 729, situated approximately 10km southeast of Vryburg. This application is for the proposed grid connection infrastructure to connect the authorised Woodhouse 1 and Woodhouse 2 PV facilities to the Eskom grid. The area proposed for the Woodhouse Solar 1 and 2 PV Facilities was thoroughly assessed for impacts to heritage resources in an Archaeological Impact Assessment conducted by Van der Walt (2016, SAHRIS NID 374639) and a Palaeontological Impact Assessment by Becker (2016, SAHRIS NID 374641, Appendix 3). These reports are referred to below in order to determine the likely heritage sensitivity of the area proposed for the development of the grid connection.

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Archaeology and Built Environment Heritage

Vryburg town was established in 1882 as the capital town of the independent Boer Republic of Stellaland. During its short history, the small state became a focal point for conflict between the British Empire and the South African Republic, the two major players vying for control of the territory. After a series of claims and annexations, British fears of Boer expansionism led to its demise and, among other factors, set the stage for the Second Boer War. Before the proclamation of the republic, the area was under the control of competing Korana and Tswana groups, while the United Kingdom laid claim to it as a part of the emerging protectorate of British Bechuanaland. Two of the indigenous groups were under the leadership of chiefs Mankoroane and Montšioa, whom the British regarded as "friendly," and two others under the leadership of chiefs Moshette (a Motswana) and Massouw (a Korana). When a feud erupted between Mankoroane and another chief, each side resorted to recruiting volunteers, promising them land in return for their assistance. After a settlement was negotiated with mediation from the Transvaal Republic, large portions of Mankoroane's land were given to Boer mercenaries who had fought on his adversary's side, and the new inhabitants decided to declare independence and establish the Republic of Stellaland. During the Second Boer War, a concentration camp was established at Vryburg, however the location of this camp is unknown.

No known built environment or historically significant heritage resources are known to be located in close proximity to the proposed grid connection corridor and as such, negative impact is unlikely.

As noted above, the area proposed for the Woodhouse Solar 1 and 2 PV Facilities was thoroughly assessed for impacts to heritage resources in an Archaeological Impact Assessment conducted by Van der Walt (2016, SAHRIS NID 374639). According to Van der Walt (2016); "MSA (Middle Stone Age) artefacts are observed in low densities scattered over most of the study area (for the Woodhouse Solar 1 and 2 PV Facilities), but identified the most significant resources within the area proposed for Woodhouse PV 1. In most areas, the artefacts are covered by apedal soils and more artefacts could occur sub-surface. Low density (less than 2 artefacts per 5m²) isolated artefacts were recorded as find spots although discrete stone age sites were also recorded. In the southwestern portion of the study area, several rectangular stone ruins were recorded with associated stone cairns". These finds have been mapped relative to the proposed development in Figures 3a and 3b. Sites 407 and 408 recorded by Van der Walt (2016) mark a dense scatter of MSA and LSA (Later Stone Age) lithics. As the MSA and LSA are not well dated in this area, Van der Walt (2016) argued that these sites have higher heritage significance as they are located within a dateable context. The stone cairns (Sites 405, 411 and 416) identified by Van der Walt (2016) could be grave markings and as such are treated as human remains (Grade IIIA). None of these identified

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resources are anticipated to be negatively impacted by the proposed development of the grid connection.

Archaeological resources of significance have been identified in the area immediately adjacent to the proposed grid connection corridor and as such, it is likely that additional archaeological resources of significance may be located within the proposed grid connection corridor.

Table 1: Sites previously identified in and near the broader study area

SAHRIS ID	Site No.	Site Name	Site Type	Grading
134428	ZRM003A	ZONDEREINDE MINE - Site 3	Stone walling	Grade IIIb
134431	ZRM003B	ZONDEREINDE MINE - Site 3	Stone walling	Grade IIIb
134433	ZRM004A	ZONDEREINDE MINE - Site 4	Stone walling	Grade IIIb
134434	ZRM004B	ZONDEREINDE MINE - Site 4	Stone walling	Grade IIIb
134435	ZRM004C	ZONDEREINDE MINE - Site 4	Stone walling	Grade IIIb
134436	ZRM004D	ZONDEREINDE MINE - Site 4	Stone walling	Grade IIIb
134438	ZRM004E	ZONDEREINDE MINE - Site 4	Stone walling	Grade IIIb
134443	ZRM005A	ZONDEREINDE MINE - Site 5	Stone walling	Grade IIIa
134444	ZRM005B	ZONDEREINDE MINE - Site 5	Stone walling	Grade IIIa
134445	ZRM005C	ZONDEREINDE MINE - Site 5	Stone walling	Grade IIIa
134446	ZRM005D	ZONDEREINDE MINE - Site 5	Stone walling	Grade IIIa
134448	ZRM005E	ZONDEREINDE MINE - Site 5	Stone walling	Grade IIIa
134422	ZRM001	ZONDEREINDE MINE	Burial Grounds & Graves	Grade IIIa
134425	ZRM002	ZONDEREINDE MINE	Burial Grounds & Graves	Grade IIIa

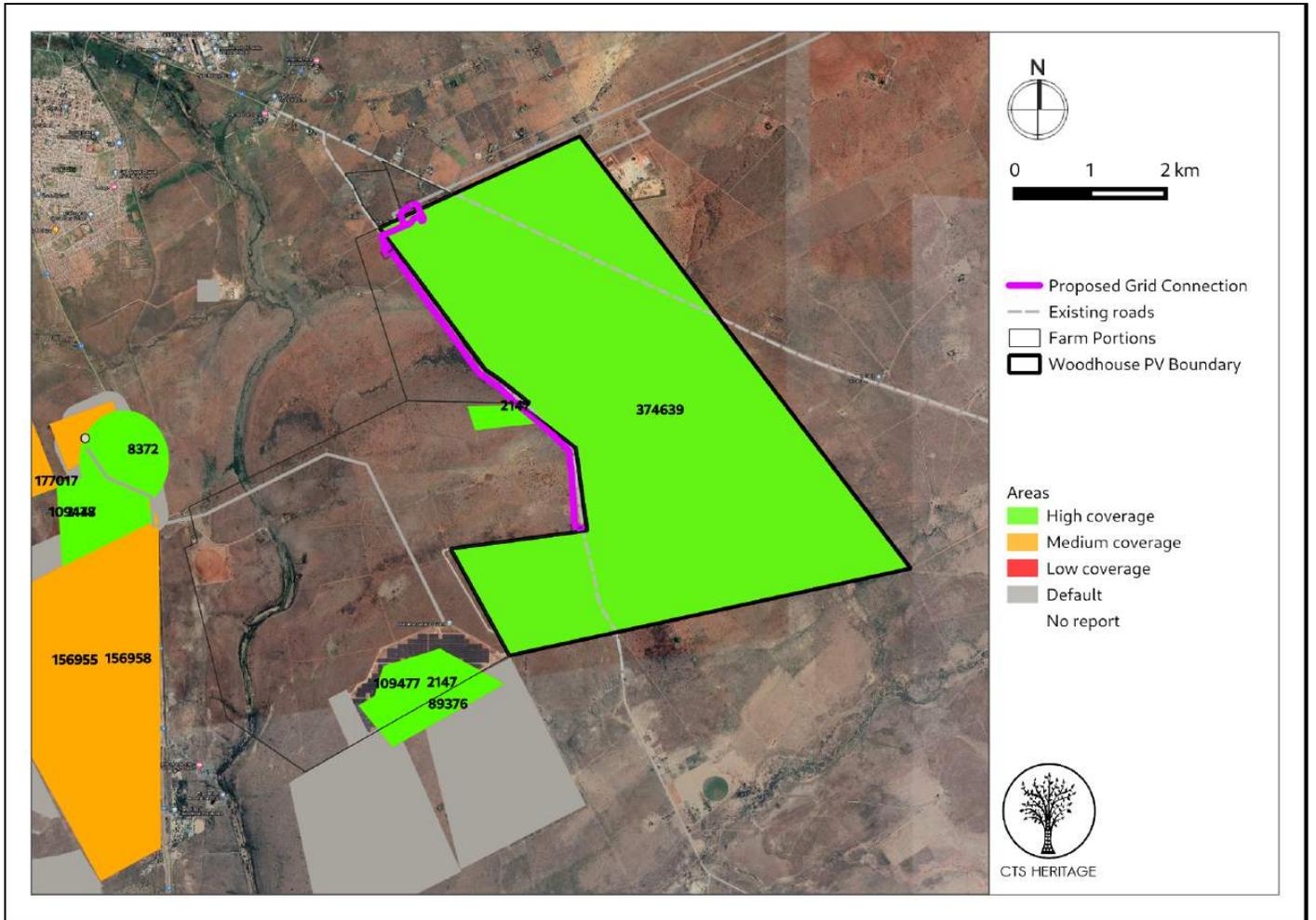
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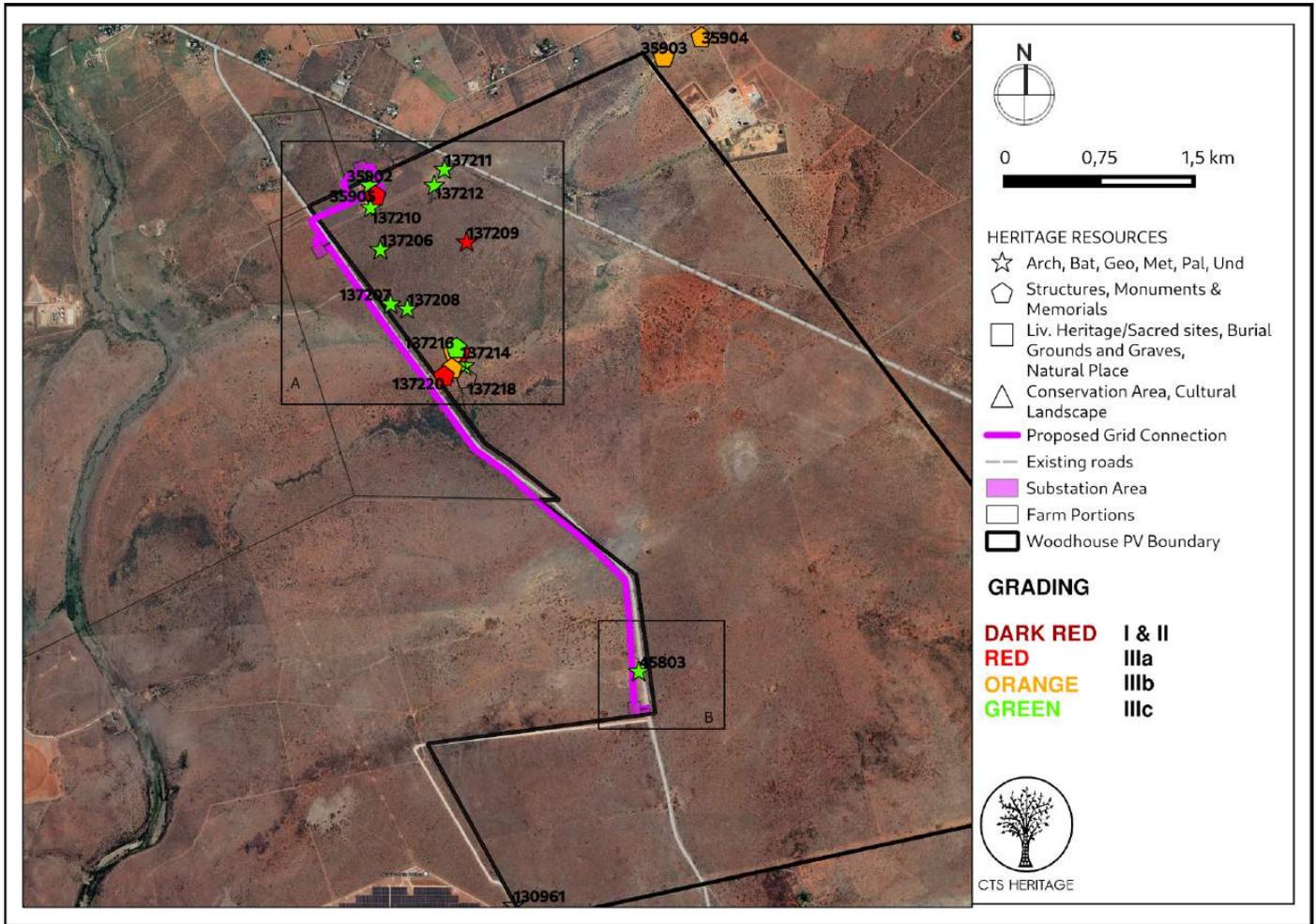
Map 2.2: Spatialisation of heritage assessments conducted in proximity to the broader study area

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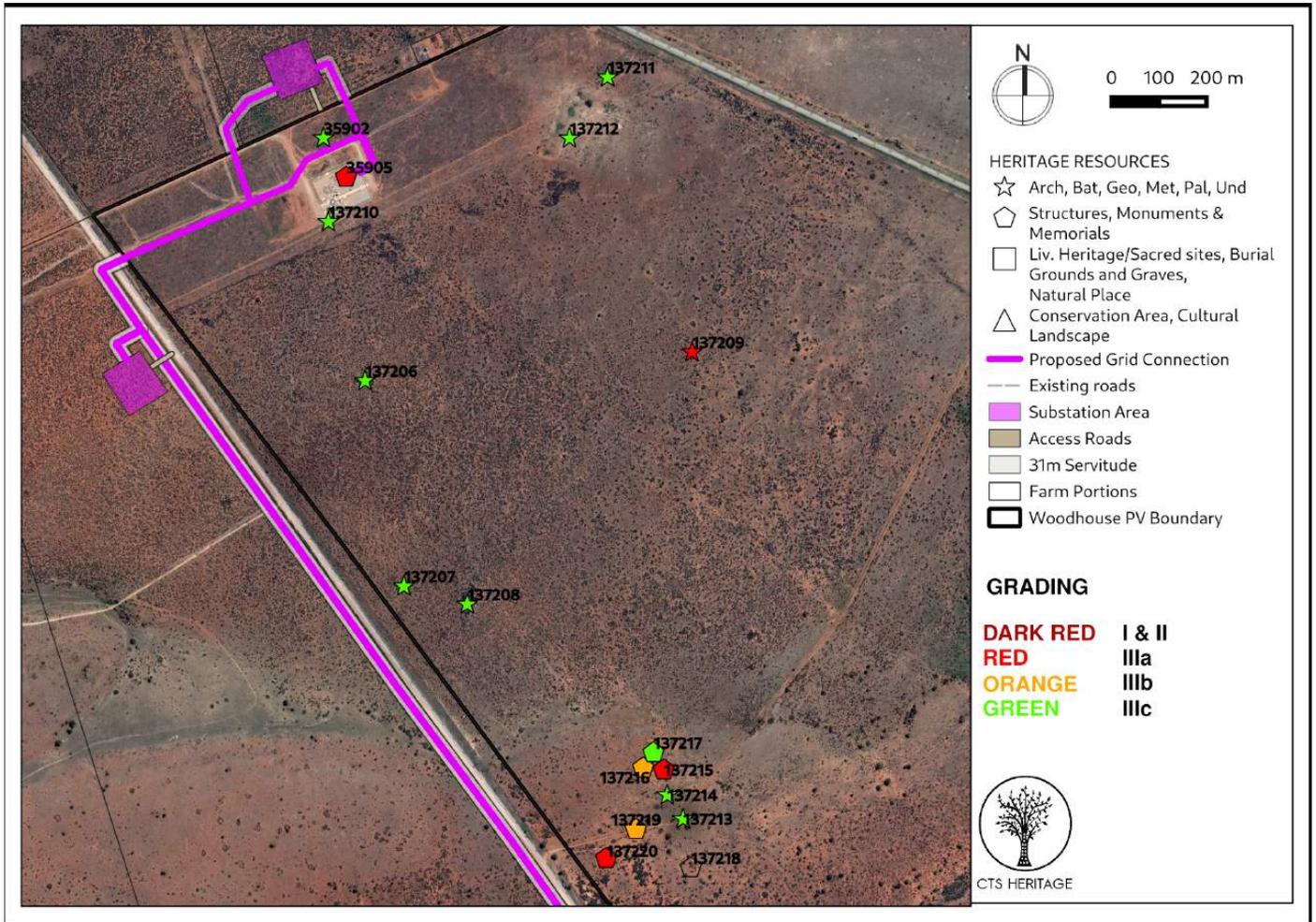
Map 2.3: Spatialisation of heritage resources known in proximity to the broader study area

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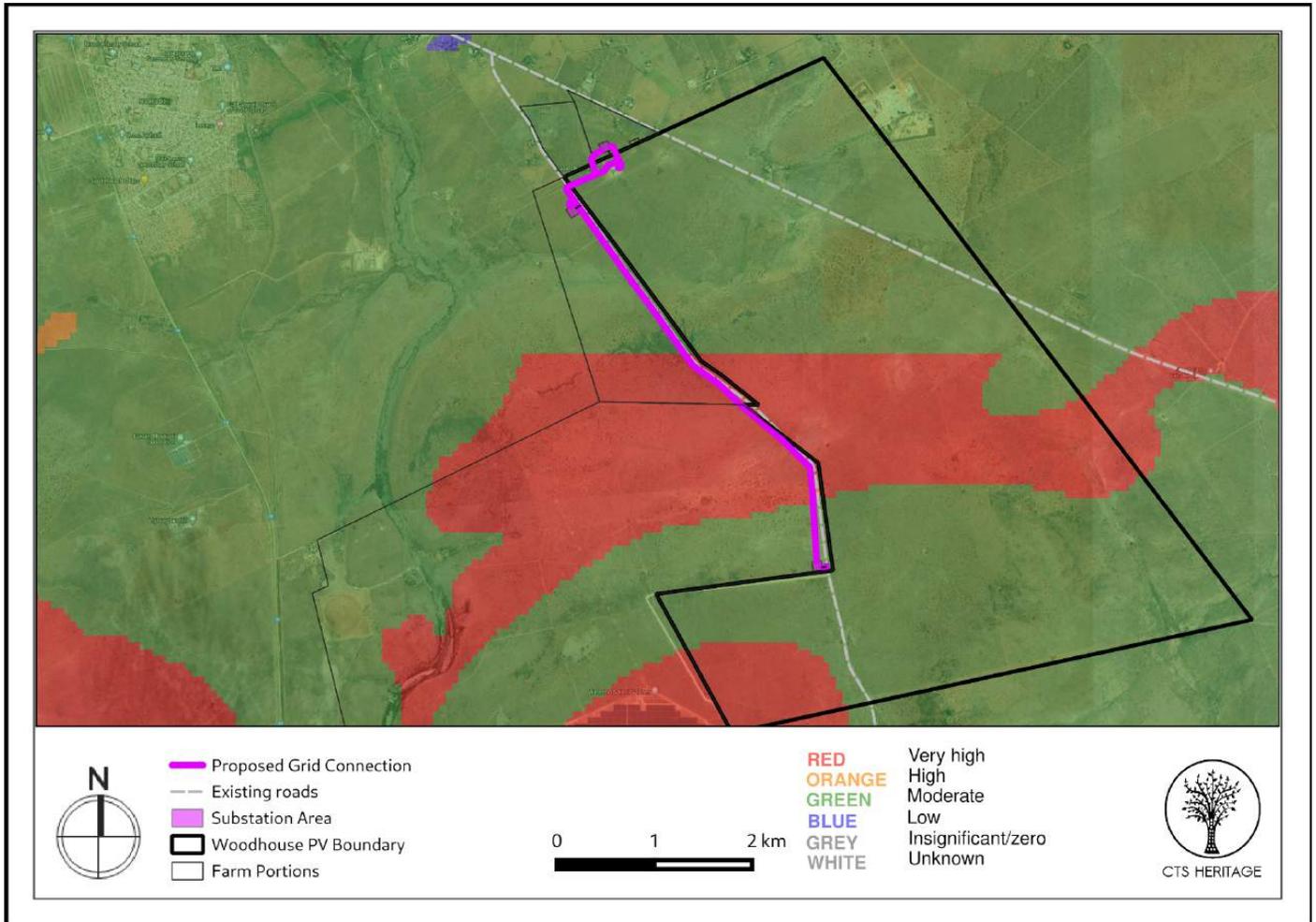
Map 2.4: Spatialisation of heritage resources known in proximity to the broader study area

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Map 3.1: Palaeontological sensitivity of the area surrounding the broader study area

3.2 Palaeontology

According to the SAHRIS Palaeosensitivity Map, the area proposed for the grid connection corridor is underlain by sediments of very high and moderate palaeontological sensitivity (Figure 4a). According to the extract from the CGS 2724 Christiana Map indicating that the development area is underlain by sediments of the Vryburg Formation (Ghaap Group) and Dwyka Group of the Karoo Supergroup.

As indicated above, the area proposed for the Woodhouse Solar 1 and 2 PV Facilities was thoroughly assessed for impacts to palaeontological heritage in a Palaeontological Impact Assessment by Becker (2016, SAHRIS NID 374641). According to Becker (2016); “The geologically older Vryburg Formation (2.6 billion year-old) consists of

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fluvial and shallow marine quartzites, mudrocks and conglomerates, while the Dwyka Group [317 Million years] consists of Permo-carboniferous glacial sediments. The Dwyka Group (Karoo Supergroup) is represented by small outcrops in the north of the development footprint.”

Becker (2016) concludes that “Although trace fossils and plants could be present in the Dwyka Group the likelihood of significant fossil heritage in the Vryburg area is considered to be low. The southern portion of the development footprint consists of the Vryburg Formation, which is considered as unfossiliferous in this area. Therefore, there are no areas located within the development footprint considered as sensitive.” These findings directly pertain to the proposed grid connection corridor and as such, it is recommended that no additional specialist palaeontological assessment is required.

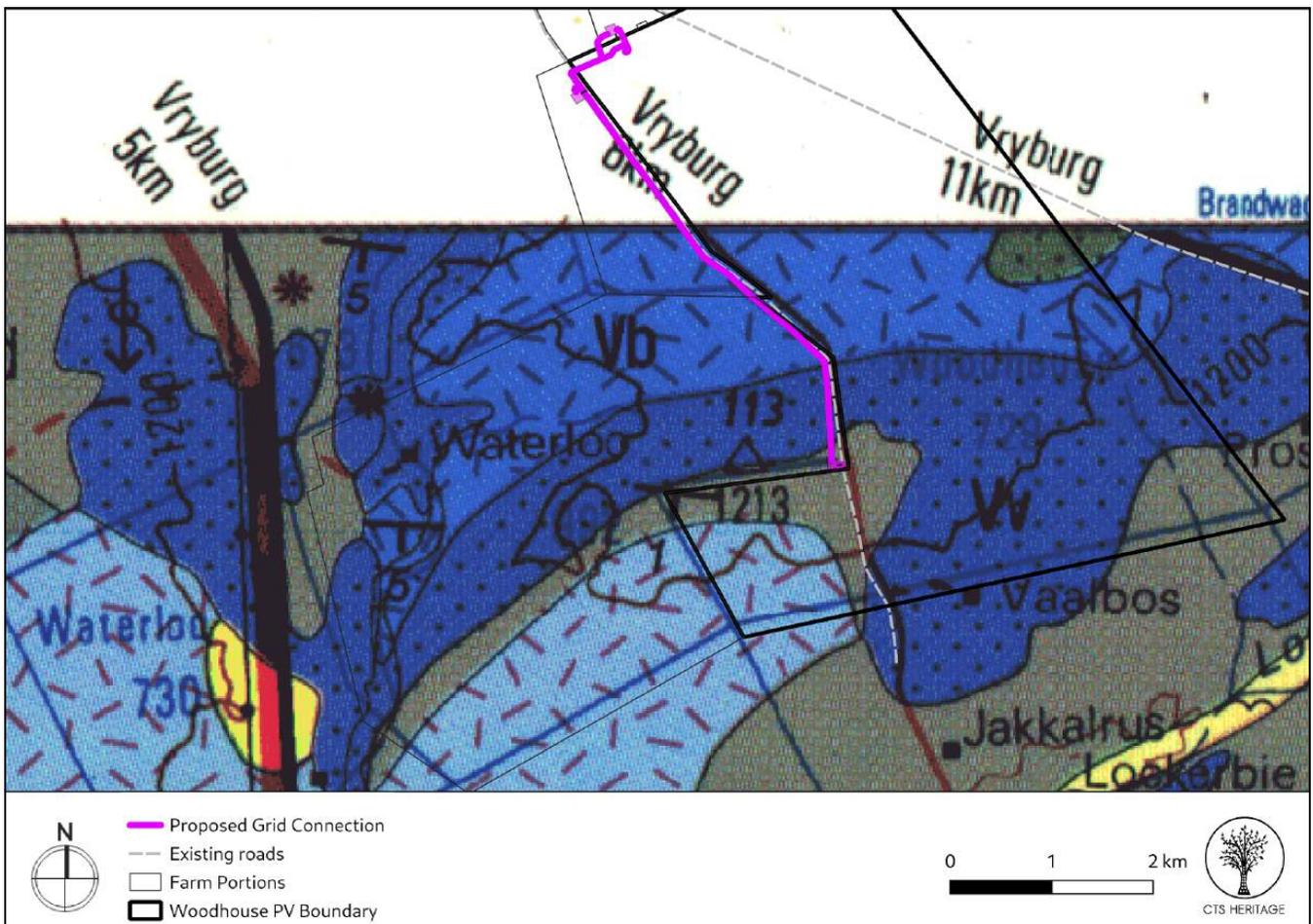


Figure 3.2 Geology Map. Extract from the CGS 2724 Christiana Map indicating that the development area for the Woodhouse Solar Energy Facility as well as the development area is underlain by Vb (Boomplaas Formation), C-Pd (Dwyka Group sediments) and the Vv (Vryberg Formation).



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4. IDENTIFICATION OF HERITAGE RESOURCES

4.1 Summary of findings of Specialist Reports

The archaeological assessment (Appendix 2) noted that it is likely that the area was occupied or traversed intermittently by Stone Age groups potentially throughout much of the Pleistocene. Artefacts typical of the Middle Stone Age (MSA) and the Later Stone Age (LSA) were documented within the vicinity or close to the vicinity of the connecting line footprint, whereas large isolated simple rotated cores that would fit within the African Earlier Stone Age (ESA) or generalized earlier MSA were also identified, including a large prepared core that would fit within the so-called 'Victoria West' industry characteristic of the nearby Northern Cape ESA.

The raw-materials exploited were predominantly quartzite rocks (ESA occurrences), a mix of chert and quartzite for the MSA finds and exclusively chert for the LSA artefacts including microlithics. Indeed, the presence of primary and secondary sources of quartzite and chert in association with what were likely seasonal pans to the east of the proposed connecting line, are suggestive of the landscape resources that probably drew Stone Age groups to the region over an extended expanse of human evolutionary history.

All findings were documented in *ex-situ* contexts, which is further supported by the palimpsest of MSA and LSA artefacts at scatters 1 and 2. The potential for finding a dateable *in-situ* archaeological horizon based on current surface observations appears to be low. The archaeological resources identified therefore have scientifically LOW-SIGNIFICANCE and are graded IIIc. These findings largely correlate with the findings of van der Walt (2016).

As noted by Becker (2016) "Although trace fossils and plants could be present in the Dwyka Group the likelihood of significant fossil heritage in the Vryburg area is considered to be low. The southern portion of the development footprint consists of the Vryburg Formation, which is considered as unfossiliferous in this area. Therefore, there are no areas located within the development footprint considered as sensitive."



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4.2 Heritage Resources identified

Table 2: Heritage resources identified in the study area

Site No.	Site Name	Description	Co-ordinates		Grading	Mitigation
WH001	Woodhouse 001	Isolated Artefact, ESA or early MSA	-27.0023	24.79759	IIIC	Avoid impact
WH002	Woodhouse 002	Artefact scatter, MSA and LSA	-27.0114	24.80922	IIIC	Avoid impact
WH003	Woodhouse 003	Artefact scatter, MSA and LSA	-27.0111	24.8088	IIIC	Avoid impact
WH004	Woodhouse 004	Isolated Artefact, ESA or early MSA	-27.0159	24.80993	IIIC	Avoid impact
WH005	Woodhouse 005	Chert Source	-27.0212	24.81066	IIIC	Avoid impact
WH006	Woodhouse 006	Isolated Artefact, ESA or early MSA	-27.0211	24.81057	IIIC	Avoid impact
WH007	Woodhouse 007	Isolated Artefact, ESA	-27.0017	24.79684	IIIC	Avoid impact
WH008	Woodhouse 008	Isolated Artefact, LSA	-26.9945	24.79093	IIIC	Avoid impact
WH009	Woodhouse 009	Isolated Artefact, LSA	-26.9925	24.78933	IIIC	Avoid impact

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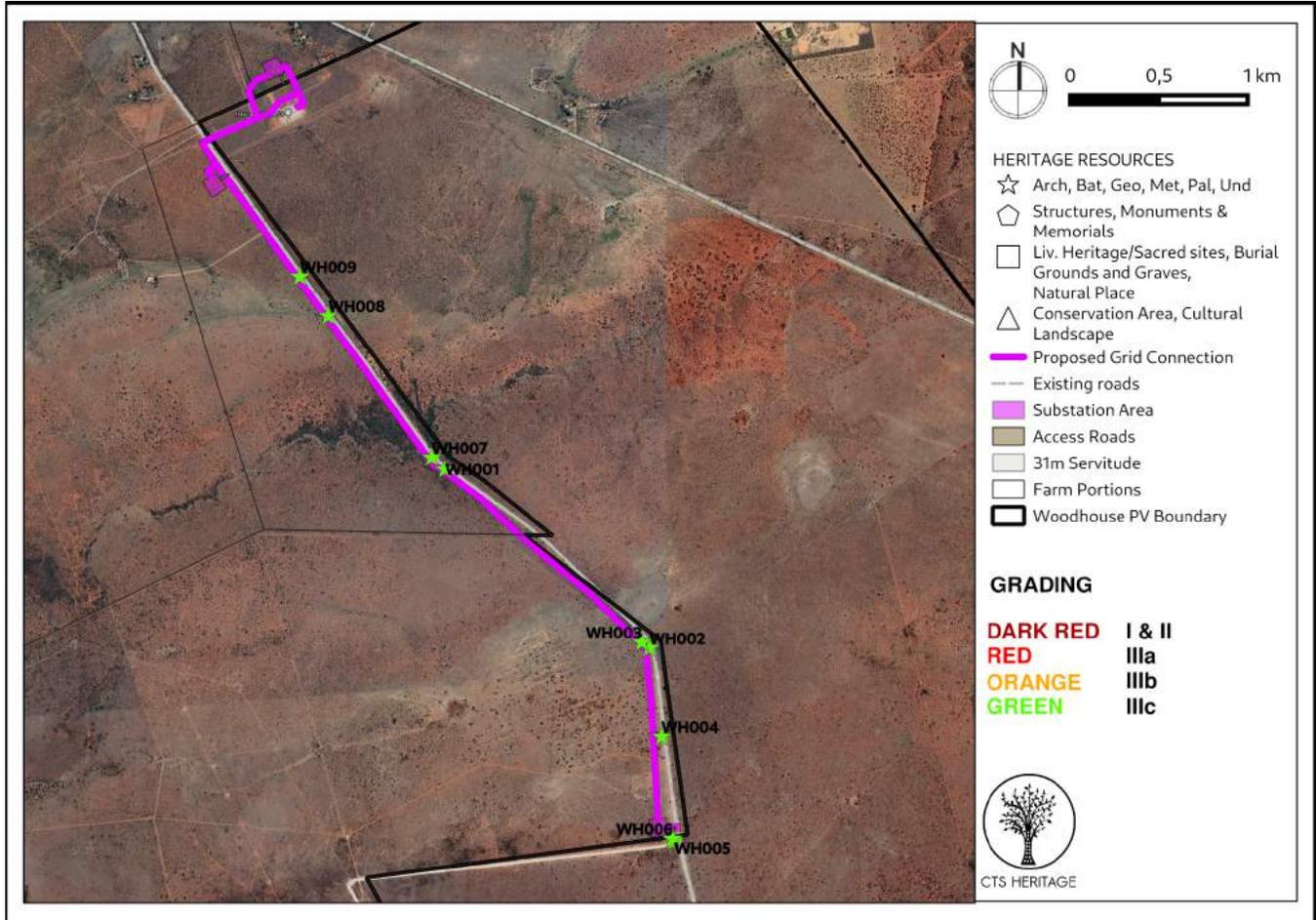
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4.3 Mapping and spatialisation of heritage resources



Map 4: Map of heritage resources identified during the field assessment, relative to the proposed development



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5. ASSESSMENT OF THE IMPACT OF THE DEVELOPMENT

5.1 Assessment of impact to Heritage Resources

The findings of the archaeology field assessment (Appendix 2) largely correlate with the findings of Van der Walt (2016). The fieldwork identified a number of archaeological resources located within the development area for the overhead powerline. It has been determined that the archaeological resources observed in this assessment are all *ex situ*, and the potential for finding a dateable *in-situ* archaeological horizon based on current surface observations appears to be low. The archaeological resources identified therefore have scientifically LOW-SIGNIFICANCE and are graded IIIC.

As these resources are located within the development area for the OHL, it is likely that these resources will be negatively impacted by the proposed development. Mitigation measures are proposed below in order to limit the negative impact to these resources. Furthermore, it is possible that additional archaeological resources are present below the ground surface which may be impacted by the proposed development.

No built structures or any structures of significance were identified within the development area. The proposed overhead powerline is located in between two approved Solar PV facilities (Woodhouse 1 and 2). This landscape is therefore not pristine and is already anticipated to be dominated by renewable energy infrastructure. As such, no negative impact to a sensitive cultural landscape is anticipated.

As per Becker (2016), “Although trace fossils and plants could be present in the Dwyka Group the likelihood of significant fossil heritage in the Vryburg area is considered to be low. The southern portion of the development footprint consists of the Vryburg Formation, which is considered as unfossiliferous in this area. Therefore, there are no areas located within the development footprint considered as sensitive.” No impact to significant palaeontological heritage is therefore anticipated. However, it is recommended that the attached Chance Fossil Finds Procedure is implemented during the course of construction activities.

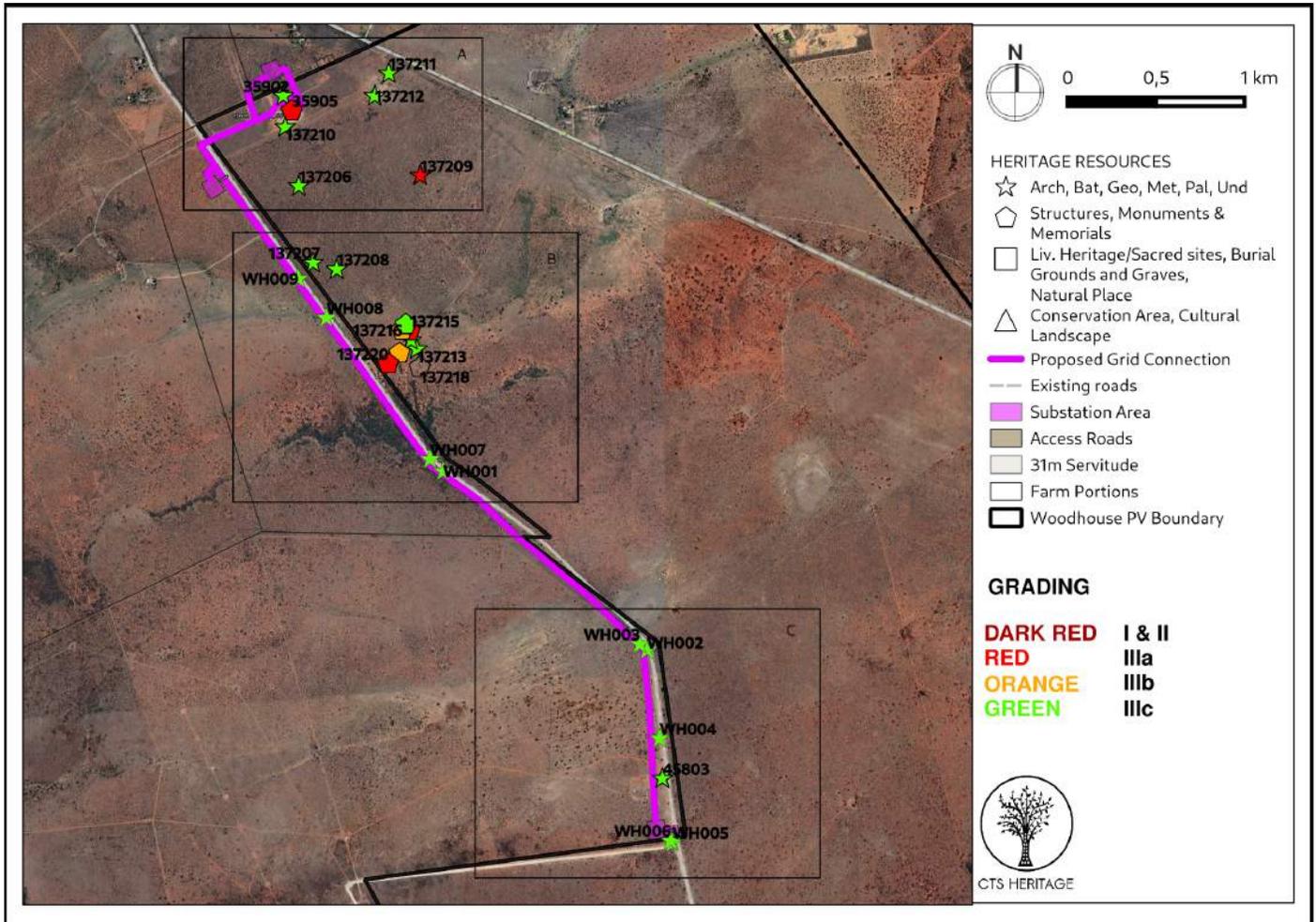
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Map 5: Map of heritage resources identified during the field assessment, relative to the study area and associated archaeological sensitivity



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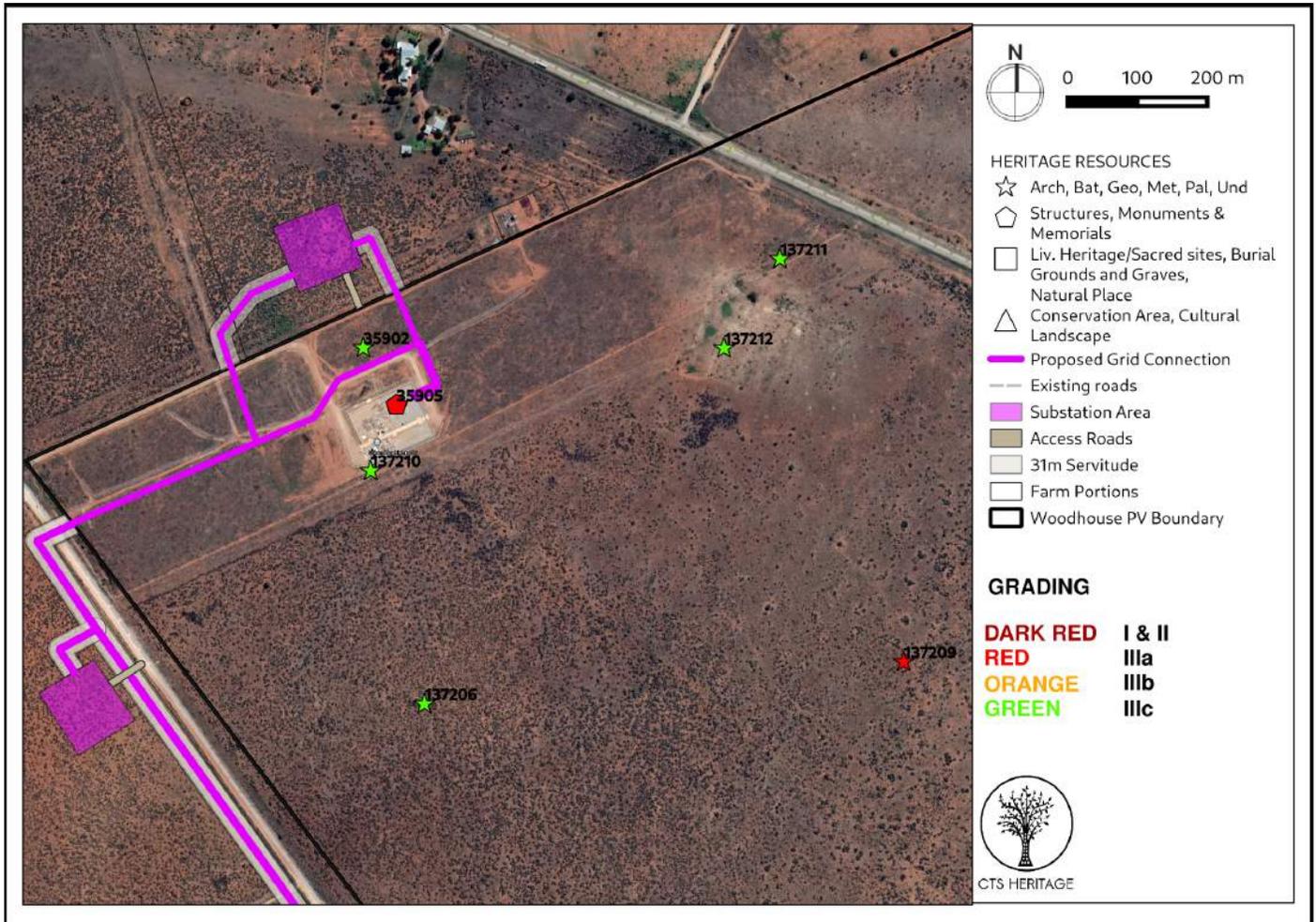


Figure 5.1: Inset A



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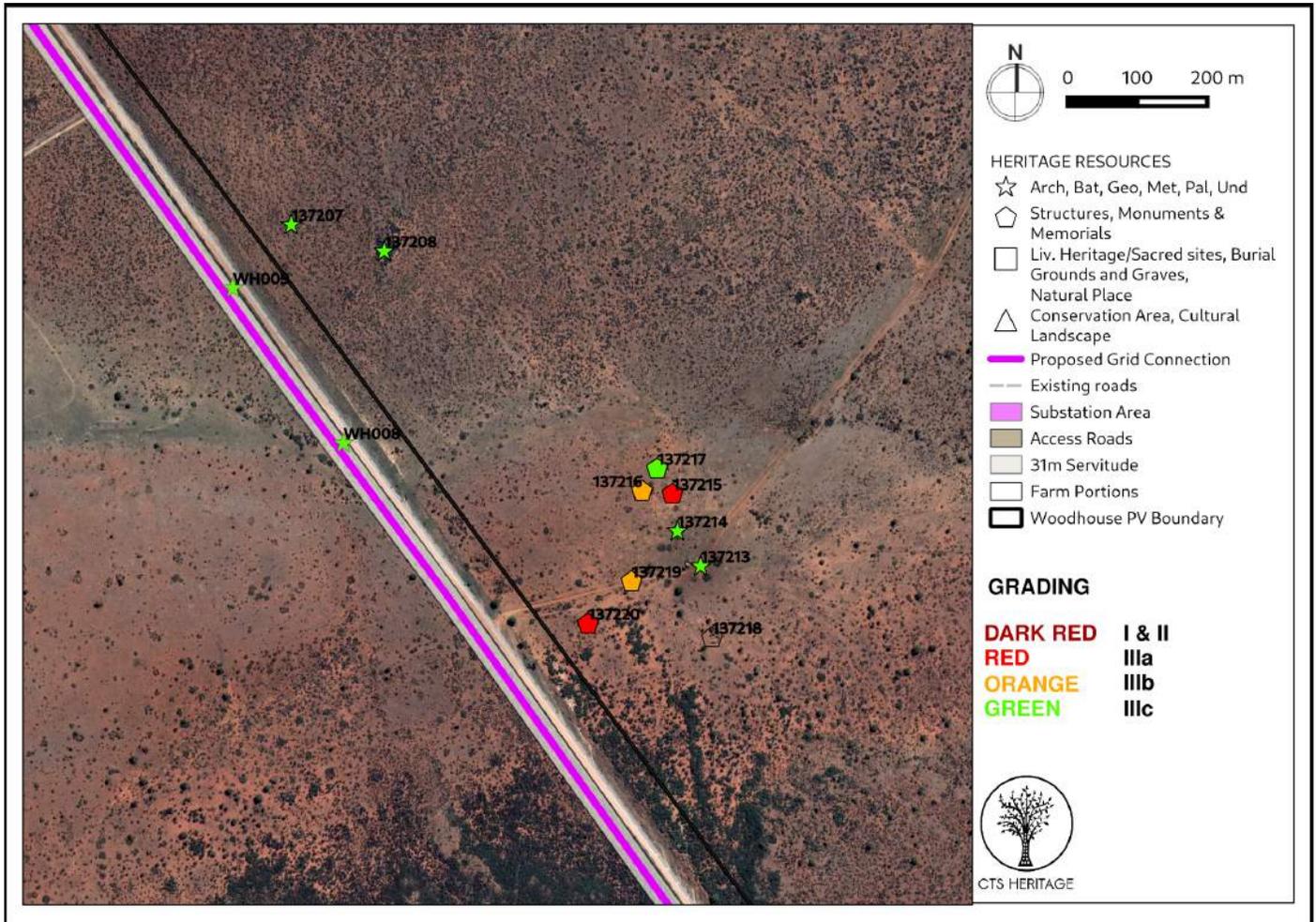


Figure 5.2: Inset B



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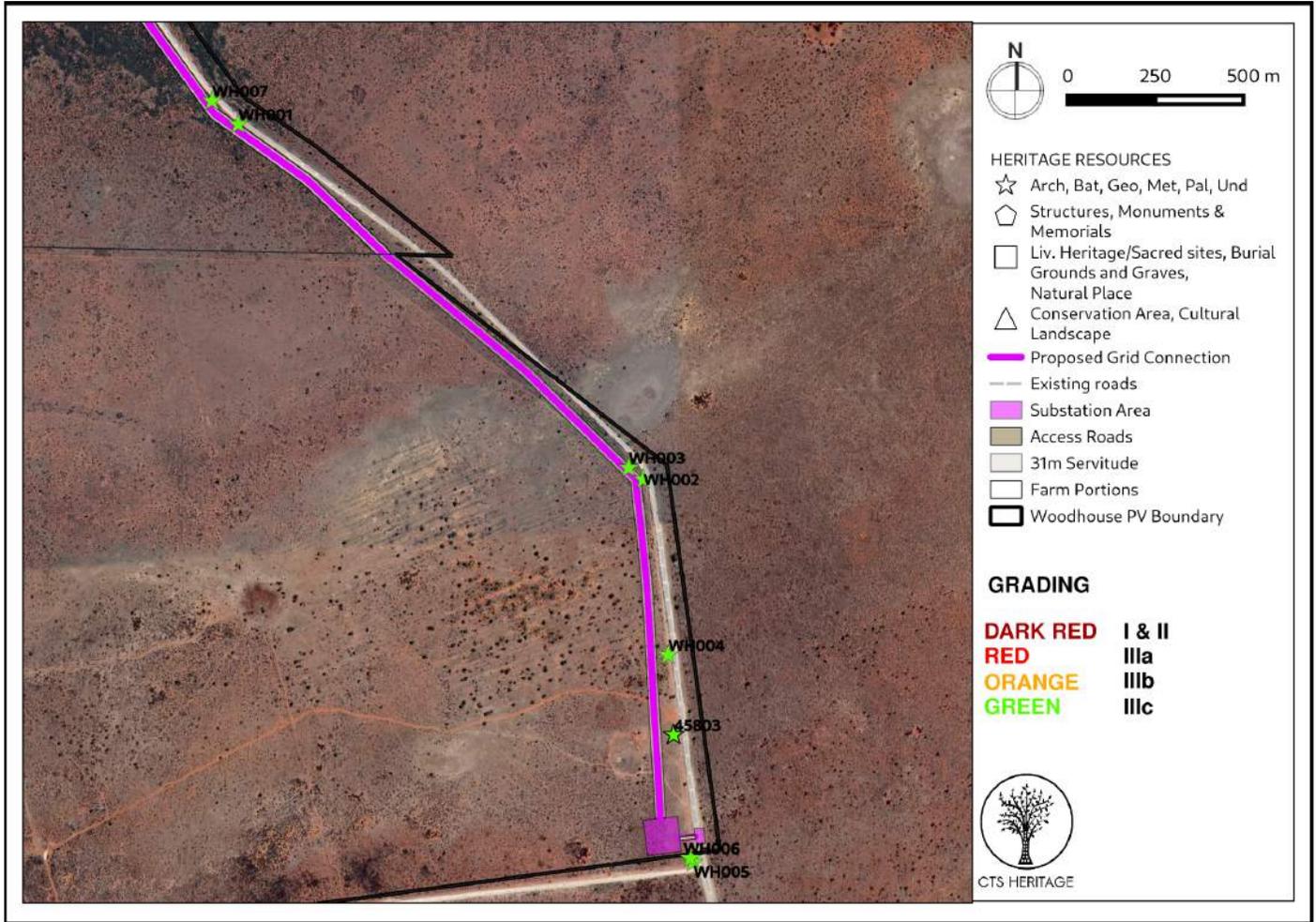


Figure 5.3: Inset C

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Table 4.1: Impacts of the proposed development to archaeological resources

NATURE: It is possible that archaeological resources may be impacted by the proposed development				
		Without Mitigation		With Mitigation
MAGNITUDE	H (10)	Nine archaeological sites of low scientific significance were identified within the development area for the proposed overhead powerline	H (4)	Nine archaeological sites of low scientific significance were identified within the development area for the proposed overhead powerline - these can be avoided through the micro-siting of pylons
DURATION	H (5)	Where manifest, the impact will be permanent.	H (5)	Where manifest, the impact will be permanent.
EXTENT	L (1)	Limited to the development footprint	L (1)	Limited to the development footprint
PROBABILITY	H (5)	It is likely that significant archaeological resources will be impacted	L (1)	It is unlikely that significant archaeological resources will be impacted
SIGNIFICANCE	L	$(10+5+1) \times 5 = 80$	L	$(4+5+1) \times 1 = 10$
STATUS		Negative		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?	H	Likely	L	Not Likely
CAN IMPACTS BE MITIGATED		Yes		
MITIGATION:				
<ul style="list-style-type: none"> The placement of the pylon footings must be carefully considered in order to avoid impact to the sites mapped in Figure 5.1 to 5.3 above. Should any buried archaeological resources or burials be uncovered during the course of development activities, work must cease in the vicinity of these finds. The South African Heritage Resources Agency (SAHRA) must be contacted immediately in order to determine an appropriate way forward. 				
RESIDUAL RISK:				
None				

Table 4.2: Impacts of the proposed development to palaeontological resources

NATURE: It is possible that buried palaeontological resources may be impacted by the proposed development				
		Without Mitigation		With Mitigation
MAGNITUDE	L (8)	According to the SAHRIS Palaeosensitivity Map, the area proposed for development of the OHL is underlain by sediments that have moderate and high palaeontological sensitivity. Without mitigation, any fossils uncovered would be lost.	L (4)	According to the SAHRIS Palaeosensitivity Map, the area proposed for development of the OHL is underlain by sediments that have moderate and high palaeontological sensitivity. With mitigation, significant fossils can be retained.
DURATION	H (5)	Where manifest, the impact will be permanent.	H (5)	Where manifest, the impact will be permanent.
EXTENT	L (1)	Limited to the development footprint	L (1)	Limited to the development footprint
PROBABILITY	L (1)	It is unlikely that significant fossils will be impacted	L (1)	It is unlikely that significant fossils will be impacted
SIGNIFICANCE	H	$(8+5+1) \times 1 = 14$	H	$(4+5+1) \times 1 = 10$
STATUS		Negative		Negative

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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?	H	Possible	L	Not Likely
CAN IMPACTS BE MITIGATED		Yes		
MITIGATION:				
<ul style="list-style-type: none"> The attached Chance Fossil Finds procedure must be implemented during the course of construction activities 				
RESIDUAL RISK:				
None				

5.2 Sustainable Social and Economic Benefit

According to available information, the power line and substations are required to connect the authorised Woodhouse PV1 and Woodhouse PV2 projects to the electricity grid. This will ensure that the socio-economic benefits of the PV facilities are realised. These benefits include job creation, generation of renewable energy and SED/ED benefits associated with the projects.

The anticipated socio-economic benefits therefore outweigh the anticipated negative impact to heritage resources on condition that the recommendations included below are implemented.

5.3 Proposed development alternatives

There is currently a grid connection authorised for the project which includes a substation at Woodhouse PV1 and a substation at Woodhouse PV2 as well as a 132kV power line. This connection is no longer considered to be technically feasible which is the reason a new connection solution is being considered. No other alternatives were considered in this heritage impact assessment.

5.4 Cumulative Impacts

The proposed grid connection will form part of the infrastructure required for the Woodhouse PV 1 and 2 solar development. Furthermore, the proposed grid connection corridor is located within a belt of approved renewable energy facilities (Figure 5). In terms of impacts to heritage resources, it is preferred that this kind of infrastructure development is concentrated in one location and is not sprawled across an otherwise culturally significant landscape. The proposed grid connection is therefore unlikely to result in unacceptable risk or loss, nor will the proposed development result in a complete change to the sense of place of the area or result in an unacceptable increase in impact.

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Table 5: Cumulative Impact Table

NATURE: Cumulative Impact to the sense of place and known archaeological and palaeontological resources				
		Overall impact of the proposed project considered in isolation		Cumulative impact of the project and other projects in the area
MAGNITUDE	L (4)	Low	M (5)	Moderate
DURATION	M (3)	Medium-term	H (4)	Long-term
EXTENT	L (1)	Low	L (1)	Low
PROBABILITY	L (2)	Improbable	H (3)	Probable
SIGNIFICANCE	L	$(4+3+1) \times 2 = 16$	L	$(5+4+1) \times 3 = 30$
STATUS		Neutral		Neutral
REVERSIBILITY	H	High	L	Low
IRREPLACEABLE LOSS OF RESOURCES?	L	Unlikely	L	Unlikely
CAN IMPACTS BE MITIGATED		NA		NA
CONFIDENCE IN FINDINGS: High				
MITIGATION: None				

6. RESULTS OF PUBLIC CONSULTATION

The public consultation process will be undertaken by the EAP during the EIA. No heritage-related comments have been received to-date. SAHRA is required to comment on this HIA and make recommendations prior to the granting of the Environmental Authorisation.

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7. CONCLUSION

The proposed development of an overhead powerline to connect the Woodhouse PV 1 and PV 2 developments is proposed within a belt of approved renewable developments located along an existing road approximately 5km from Vryburg. It is not anticipated that the proposed development will negatively impact on significant cultural landscape resources.

Although the SAHRIS palaeosensitivity map indicates that the development area is underlain by sediments of moderate and high palaeontological sensitivity, an assessment completed by Becker (2016, Appendix 3) for the immediately adjacent PV facilities concludes that “Although trace fossils and plants could be present in the Dwyka Group the likelihood of significant fossil heritage in the Vryburg area is considered to be low. The southern portion of the development footprint consists of the Vryburg Formation, which is considered as unfossiliferous in this area. Therefore, there are no areas located within the development footprint considered as sensitive.” No impact to significant palaeontological heritage is therefore anticipated. However, it is recommended that the attached Chance Fossil Finds Procedure is implemented during the course of construction activities.

The findings of the archaeology field assessment (Appendix 2) largely correlate with the findings of Van der Walt (2016). The archaeological resources identified were all *ex situ* and are of low heritage significance. It is likely that the proposed development of the OHL will negatively impact these resources as they are located within the development area. It is therefore recommended that the placement of the pylons is carefully considered in order to ensure that these resources are not negatively impacted. Furthermore, it is possible that archaeological resources may be located beneath the ground surface which may be impacted during the course of development. Recommendations in this regard are included below.

8. RECOMMENDATIONS

There is no objection to the proposed development of the Woodhouse overhead powerline in terms of impacts to heritage resources on condition that:

- The placement of the pylon footings is carefully considered in order to avoid impact to the sites mapped in Figure 5.1 to 5.4.
- The attached Chance Fossil Finds Procedure (Appendix 4) is implemented during the course of construction activities.
- Should any buried archaeological resources or burials be uncovered during the course of development activities, work must cease in the vicinity of these finds. The South African Heritage

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Resources Agency (SAHRA) must be contacted immediately in order to determine an appropriate way forward.



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9. REFERENCES

Heritage Impact Assessments				
Nid	Report Type	Author/s	Date	Title
2147	HIA Phase 1	Johnny Van Schalkwyk	01/06/2012	Heritage impact assessment for the PROPOSED DEVELOPMENT OF PHOTOVOLTAIC POWER PLANTS ON FOUR DIFFERENT LOCATIONS IN NORTH WEST AND NORTHERN CAPE PROVINCES
8372	HIA Phase 1	Johnny Van Schalkwyk	01/10/2008	Heritage Impact Survey Report for the Proposed 400/132 kV Vryburg Substation and Loop-In Lines, North West Province
89376	HIA Phase 1	Johnny Van Schalkwyk	01/10/2012	Heritage impact assessment for the PROPOSED DEVELOPMENT OF A PHOTOVOLTAIC POWER PLANT ON A PORTION OF THE FARM WATERLOO 992, VRYBURG REGION, NORTH WEST PROVINCE
109477	PIA Phase 1	John E Almond	01/01/2013	PALAEONTOLOGICAL HERITAGE ASSESSMENT: COMBINED DESKTOP & FIELD-BASED STUDY Proposed PV Solar Facility on a portion of the farm Waterloo 992 near Vryburg, Naledi Local Municipality, North-West Province
109478	PIA Desktop	John E Almond	01/01/2013	PALAEONTOLOGICAL HERITAGE ASSESSMENT: DESKTOP STUDY Proposed PV Solar Facility on a portion of the farm Rosendal 673 near Vryburg, Naledi Local Municipality, North-West Province
156955	AIA Phase 1	Jaco van der Walt	11/12/2013	Archaeological Impact Assessment for the Proposed Tiger Kloof Photovoltaic Solar Energy Facility near Vryburg, North West Province
156958	Palaeontological Specialist Reports	John E Almond	30/11/2013	Proposed Tiger Skloof Photovoltaic Solar Energy Facility near Vryburg, Naledi Local Municipality, North-West Province
177017	Heritage Impact Assessment Specialist Reports	Johnny Van Schalkwyk	31/08/2014	BASIC HERITAGE ASSESSMENT FOR THE PROPOSED MOOKODI 132KV PHASE 2 POWER LINES DEVELOPMENT, NORTH WEST PROVINCE
358386	Palaeontological Specialist Reports	John Edward Almond		Palaontological Heritage Assessment: Combined Desktop & Field-Based Study: Proposed Gamma Solar Power Plant on the Remaining Extent of Portion 4 (Bos Kop), Farm Champions Kloof 731, North-West Province
358387	Palaeontological	John Edward Almond		Palaeontological Heritage Assessment: Combined Desktop & Field-Based Study: Proposed Khubu Solar Plant on Portion 5 (Shadow Eve) (Portion of

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	Specialist Reports			Portion 4). Farm Champions Kloof 731 near Vryburg. Naledi Local Municipality, North-West Province
358388	Heritage Impact Assessment Specialist Reports	Johnny Van Schalkwyk		Cultural heritage Impact assessment for the Development of the Proposed Khubu Solar Power Plant in the Portion 5 of the Farm CHampions Kloof 731, Vryburg Region, North West Province
343610	Archaeological Specialist Reports	Jaco van der Walt	09/11/2015	Archaeological Scoping Report for the Proposed Woodhouse Solar 1 and Woodhouse Solar 2 PV Facilities close to Vryburg, NW Province
343611	Palaeontological Specialist Reports	Elize Butler	25/09/2015	Palaeontological Impact Assessment of the Proposed Woodhouse PV Solar Energy Facilities and Associated Infrastructure on the Remaining Extent of Farm Woodhouse 729, near Vryburg, NW Province
361091	HIA Phase 1	David Morris	01/04/2014	Appendix D3 Vryburg WWTW Heritage Specialist Report
362237		Johnny Van Schalkwyk	29/01/2016	Cultural heritage impact assessment for THE DEVELOPMENT OF THE PROPOSED GAMMA SOLAR POWER PLANT ON PORTION 4 OF THE FARM CHAMPIONS KLOOF 731, VRYBURG REGION, NORTH WEST PROVINCE
364708	Heritage Impact Assessment Specialist Reports	Wouter Fourie	26/05/2016	75MW SOLAR PHOTOVOLTAIC (PV) ENERGY FACILITY “ SENDAWO SOLAR 3 Heritage Impact Assessment
364718	Heritage Impact Assessment Specialist Reports	Wouter Fourie	19/05/2016	SENDAWO POWERLINE ALTERNATIVES “ SENDAWO PROJECTS Heritage Impact Assessment
365017	Heritage Impact Assessment Specialist Reports	Johnny Van Schalkwyk	01/03/2016	Cultural heritage impact assessment for THE EXTENSION OF THE PROPOSED SOLAR POWER PLANT ON A PORTION OF THE FARM WATERLOO 992, VRYBURG REGION, NORTH WEST PROVINCE
367821		John Almond	07/01/2013	Palaeontological Heritage Assessment: Combined Desktop & Field-based Study: Proposed PV Solar Facility on a portion of the farm Waterloo 992 near Vryburg, Naldi Local Municipality, North West Province

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374639	Archaeological Specialist Reports	Jaco van der Walt	30/04/2016	Archaeological Impact Assessment Report for the proposed Woodhouse 1 Solar PV Facility near Vryberg, North West Province
374641	Palaeontological Specialist Reports	Elize Butler	10/04/2016	Palaeontological Impact Assessment Report for the proposed Woodhouse 1 Solar PV Facility near Vryberg, North West Province
374673	Archaeological Specialist Reports	Jaco van der Walt	30/04/2016	Archaeological Impact Assessment Report for the proposed Woodhouse 2 Solar PV Facility near Vryberg, North West Province
374960	Palaeontological Specialist Reports	Elize Butler	10/04/2016	Palaeontological Impact Assessment Report for the proposed Woodhouse 2 Solar PV Facility near Vryberg, North West Province

Also

Mucina, L. and Rutherford, M.C., 2006. *The vegetation of South Africa, Lesotho and Swaziland*. South African National Biodiversity Institute.

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APPENDICES

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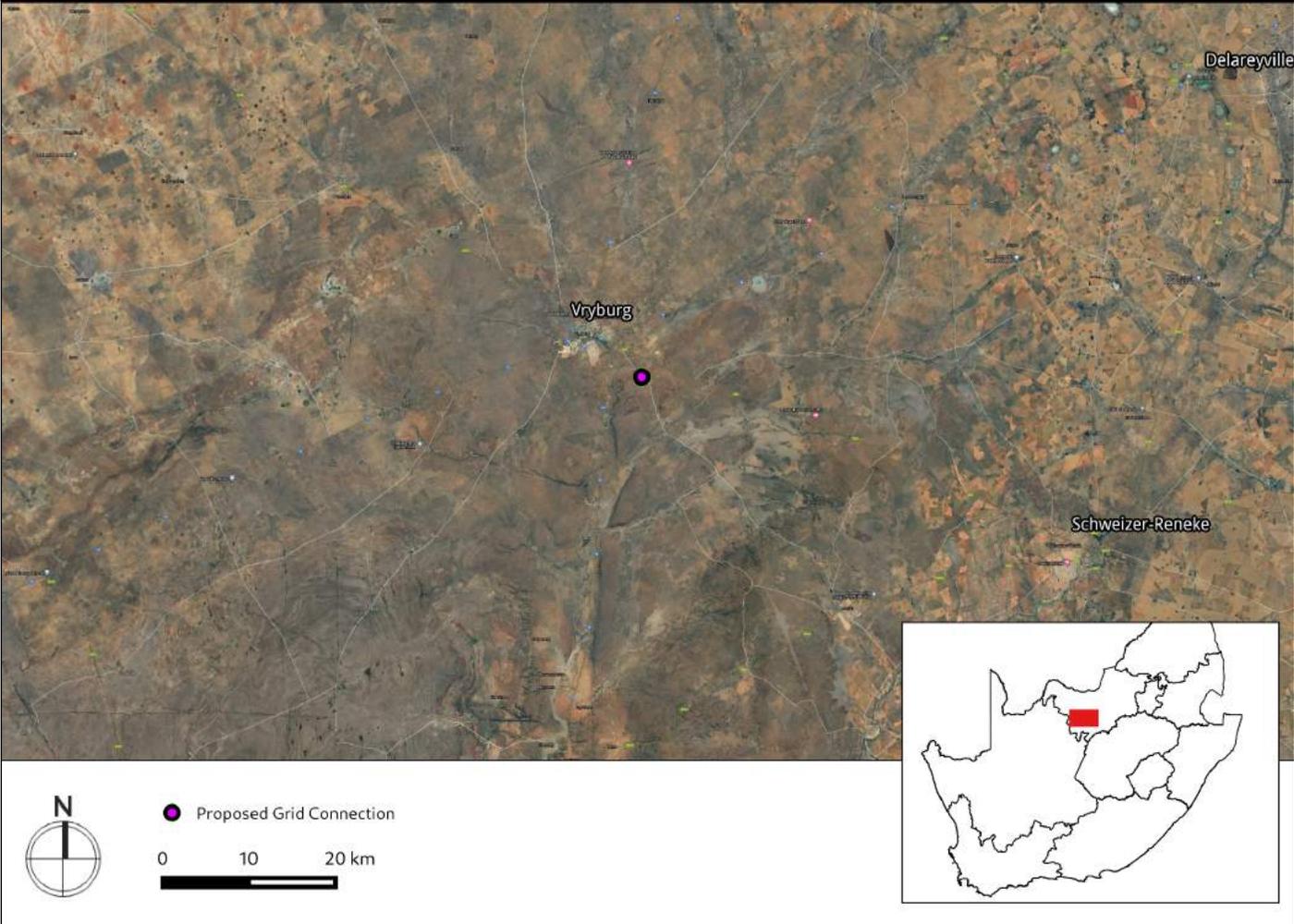
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APPENDIX 1: Heritage Screening Assessment (2021)



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HERITAGE SCREENER

CTS Reference Number:	CTS21_137
SAHRIS Case No.	8723
Client:	Savannah Environmental (Pty) Ltd
Date:	July 2021
Title:	Proposed grid connection infrastructure to connect the authorised Woodhouse 1 and Woodhouse 2 PV facilities to the Eskom grid near Vryburg, North West Province
	
Figure 1a. Satellite map indicating the location of the proposed development in the Western Cape	
CTS Heritage Recommendation	RECOMMENDATION Based on the information available, it is likely that the proposed grid connection corridor will impact on significant archaeological heritage and as such, it is recommended that a Heritage Impact Assessment is conducted that complies with section 38(3) of the NHRA for the proposed development with special focus on impacts to significant archaeological heritage.

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1. Proposed Development Summary

Genesis Eco-Energy Developments is proposing grid connection infrastructure to connect the authorised Woodhouse 1 and Woodhouse 2 PV facilities to the Eskom grid. The project includes the following:

- 1 x collector substation (one at Woodhouse 1 (2 alternatives) and 1 switching station at Woodhouse 2
- 1 x 132kV overhead line
- Connection from Woodhouse 1 substation to Bophirima Substation

2. Application References

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

3. Property Information

Latitude / Longitude	27° 0'13.25"S 24°49'4.05"E
Erf number / Farm number	
Local Municipality	Naledi Local Municipality
District Municipality	Dr Ruth Segomotsi Mompati District Municipality
Previous Magisterial District	North West Province
Province	Agriculture with approved PV facility
Current Zoning	Agriculture

4. Nature of the Proposed Development

Total Area	TBA
Depth of excavation (m)	TBA

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Height of development (m)	TBA
---------------------------	-----

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
x	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-
	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

As per the project description

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

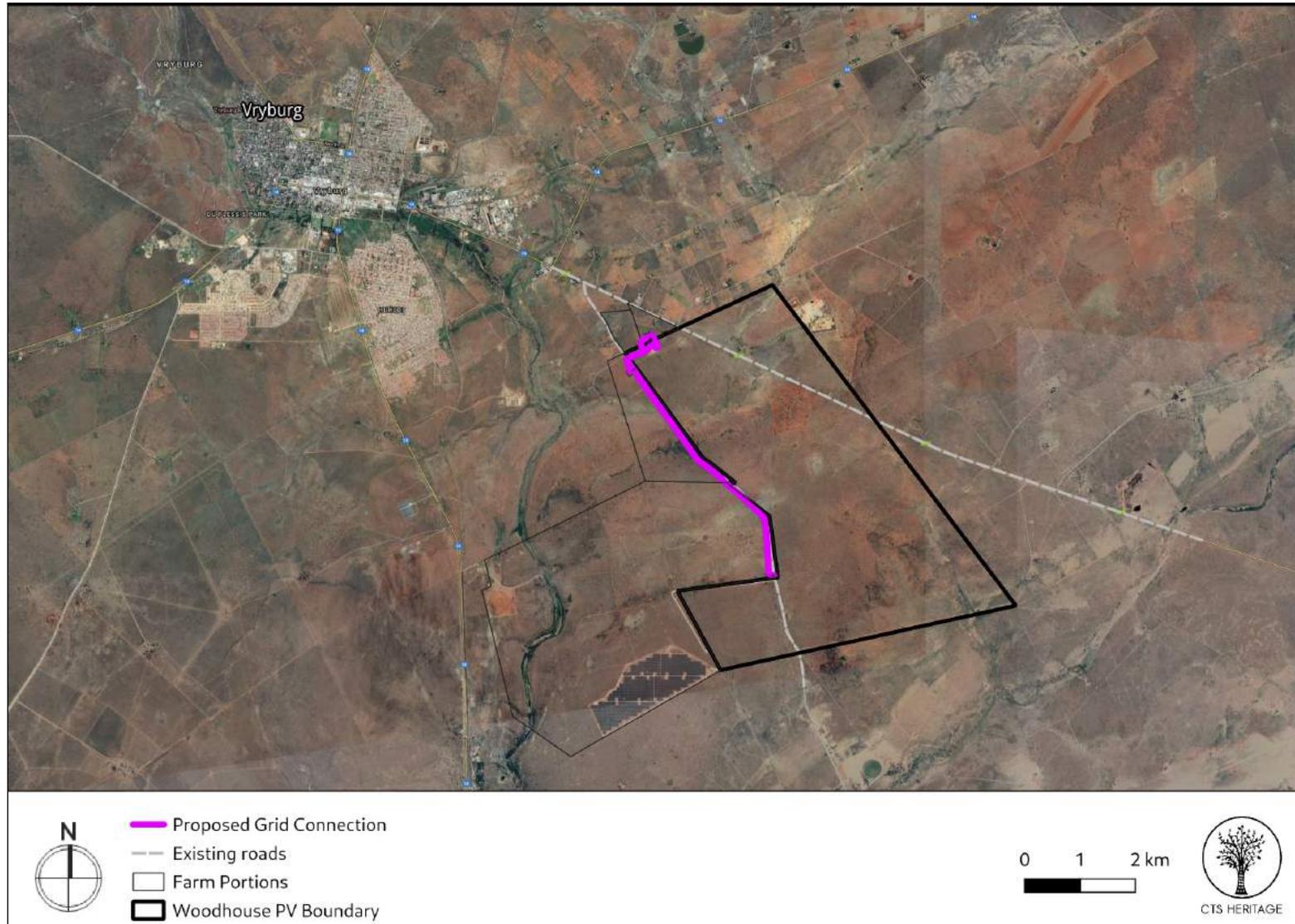


Figure 1b. Overview Map. Satellite image (2020) indicating the proposed development area in relation to Vryburg

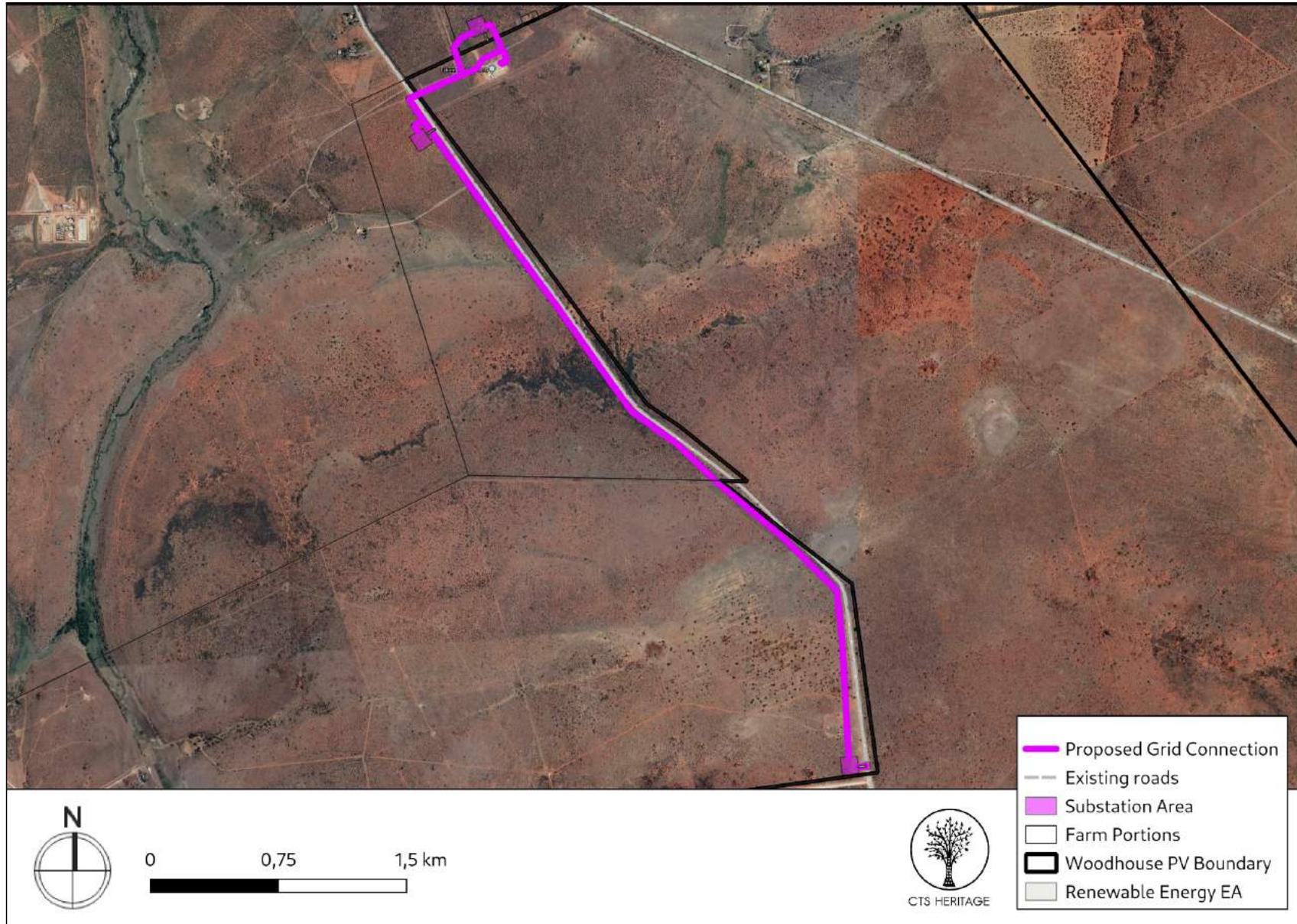


Figure 1c. Overview Map. Satellite image (2020) indicating the proposed development area

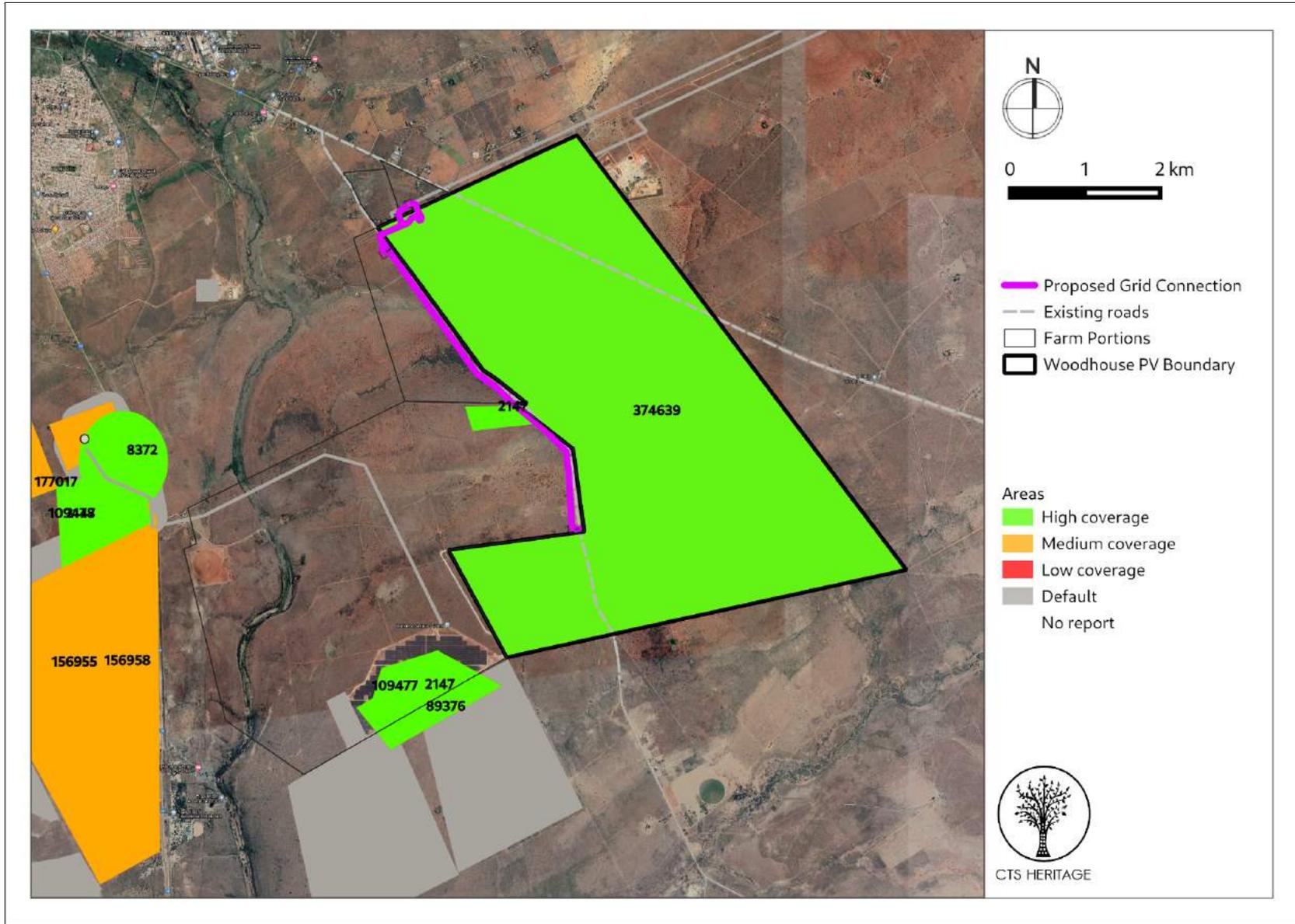


Figure 2. Previous HIAs Map. Previous Heritage Impact Assessments covering the proposed development area with SAHRIS NIDS indicated. Please see Appendix 2 for a full reference list.

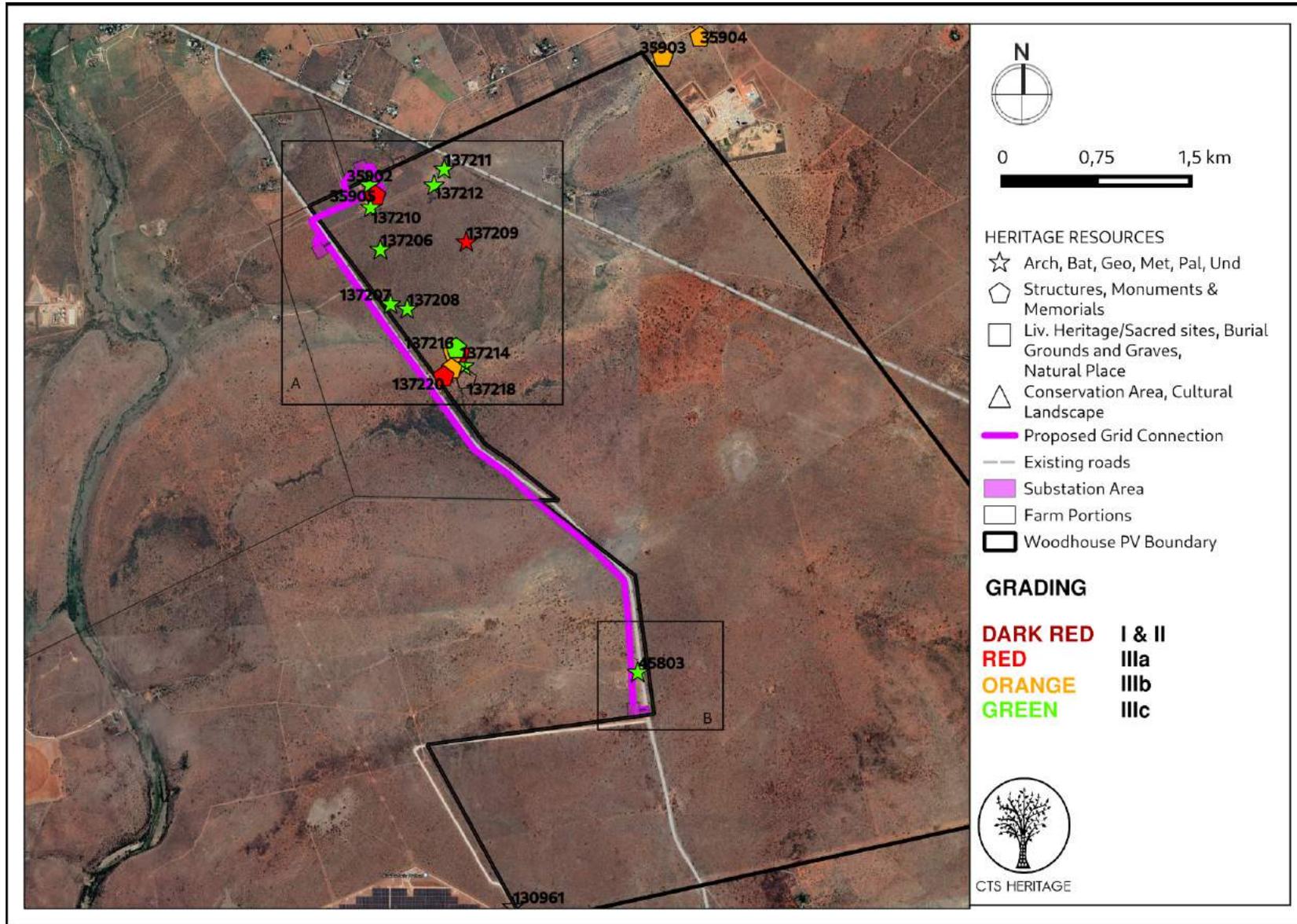


Figure 3. Heritage Resources Map. Heritage Resources previously identified within the study area, with SAHRIS Site IDs indicated in the insets below. Please See Appendix 4 for a full description of heritage resource types.



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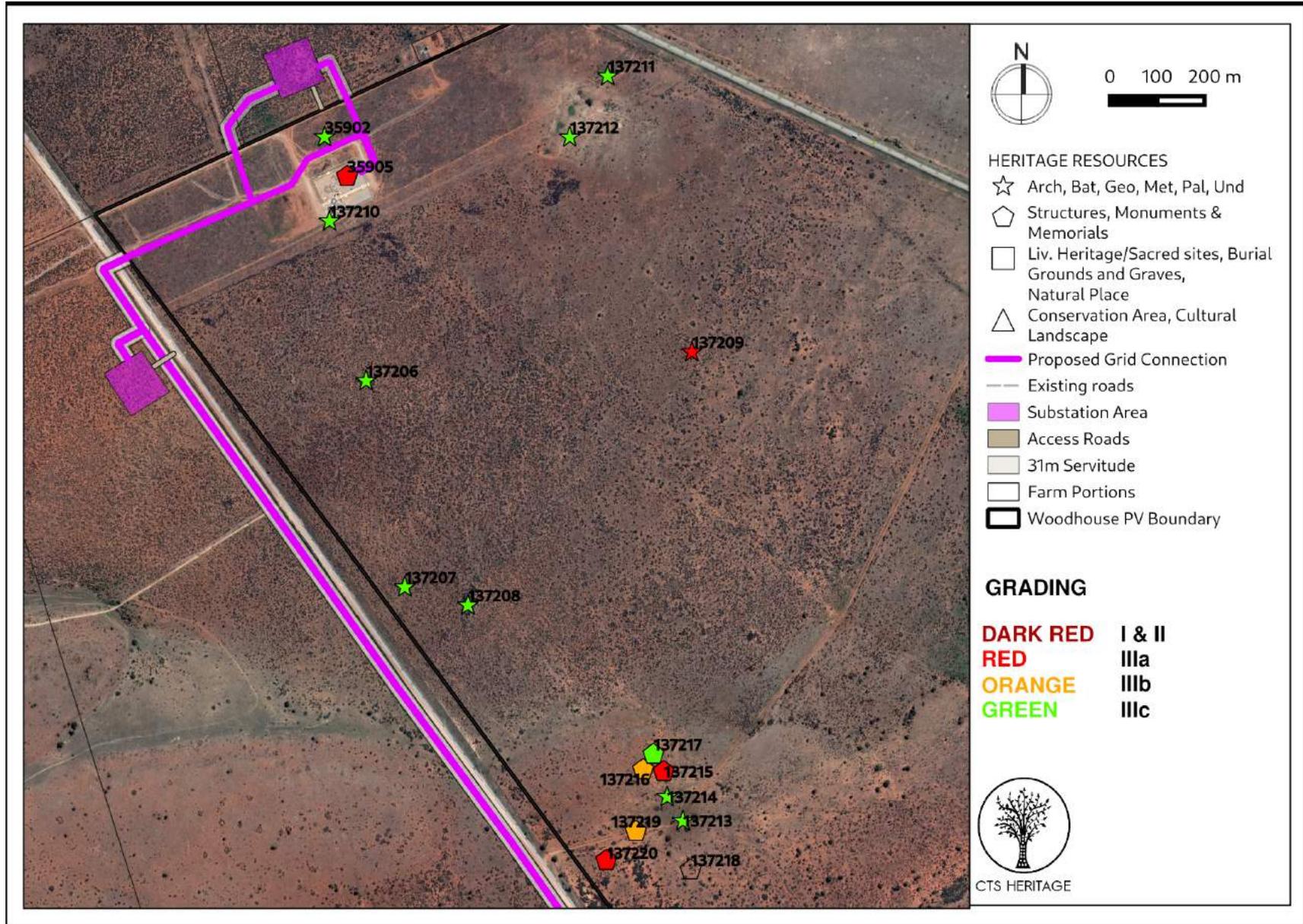


Figure 3a. Heritage Resources Map Inset A

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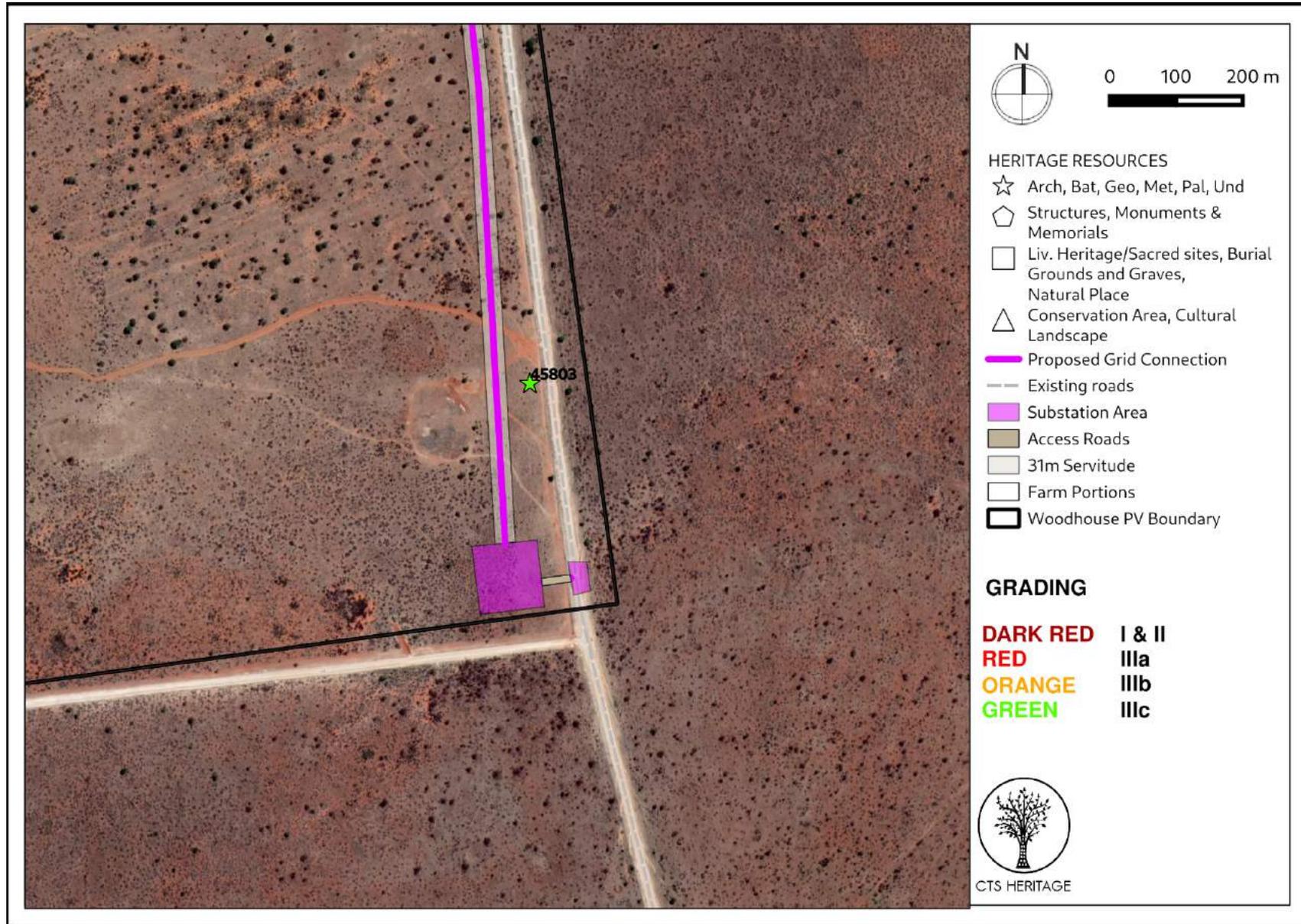


Figure 3b. Heritage Resources Map Inset B



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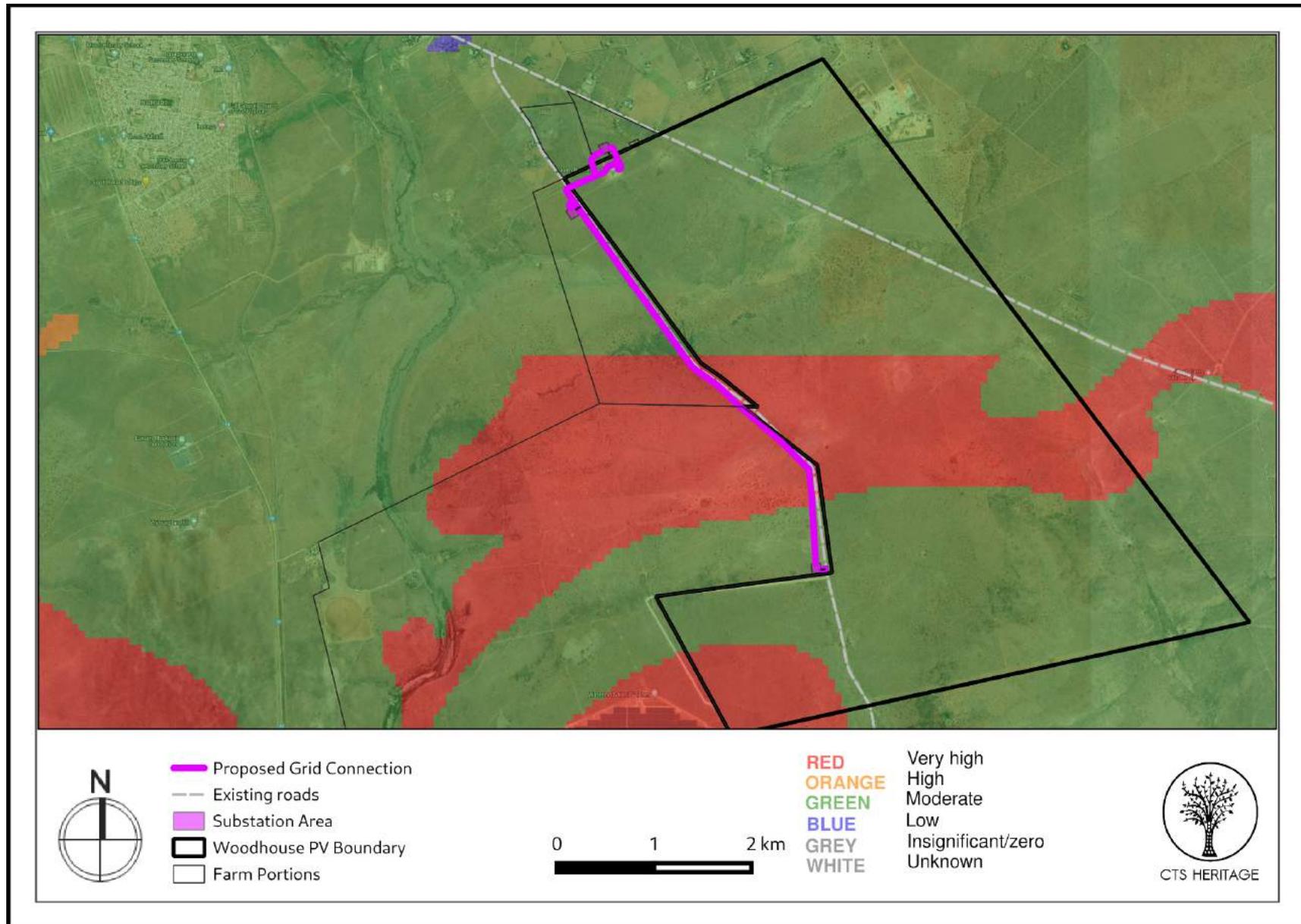


Figure 4a. Palaeosensitivity Map. Indicating fossil sensitivity underlying the study area. Please See Appendix 3 for a full guide to the legend.

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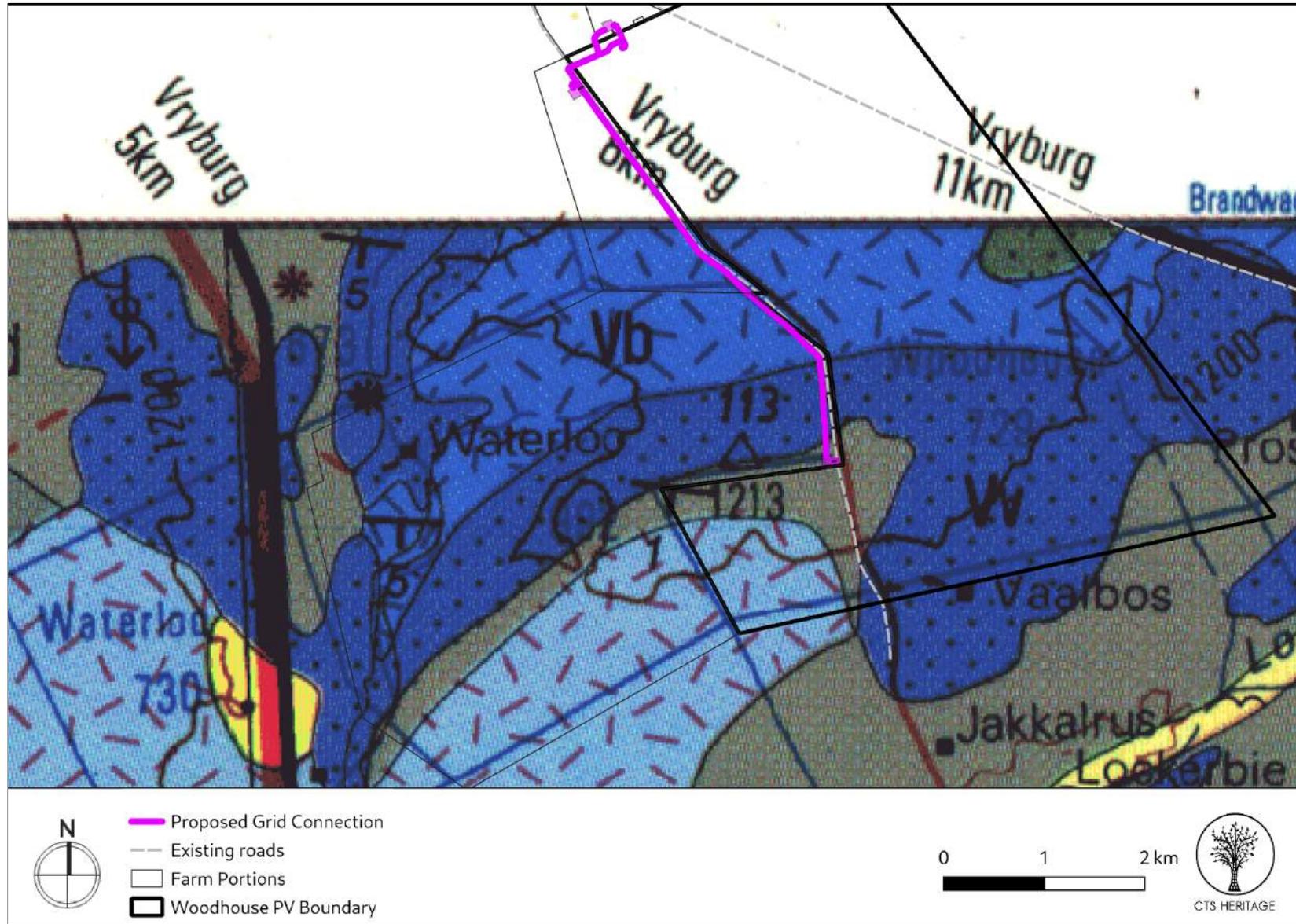


Figure 4b. Geology Map. Extract from the CGS 2724 Christiana Map indicating that the development area for the Woodhouse Solar Energy Facility as well as the development area is underlain by Vb (Boomplaas Formation), C-Pd (Dwyka Group sediments) and the Vv (Vryberg Formation).

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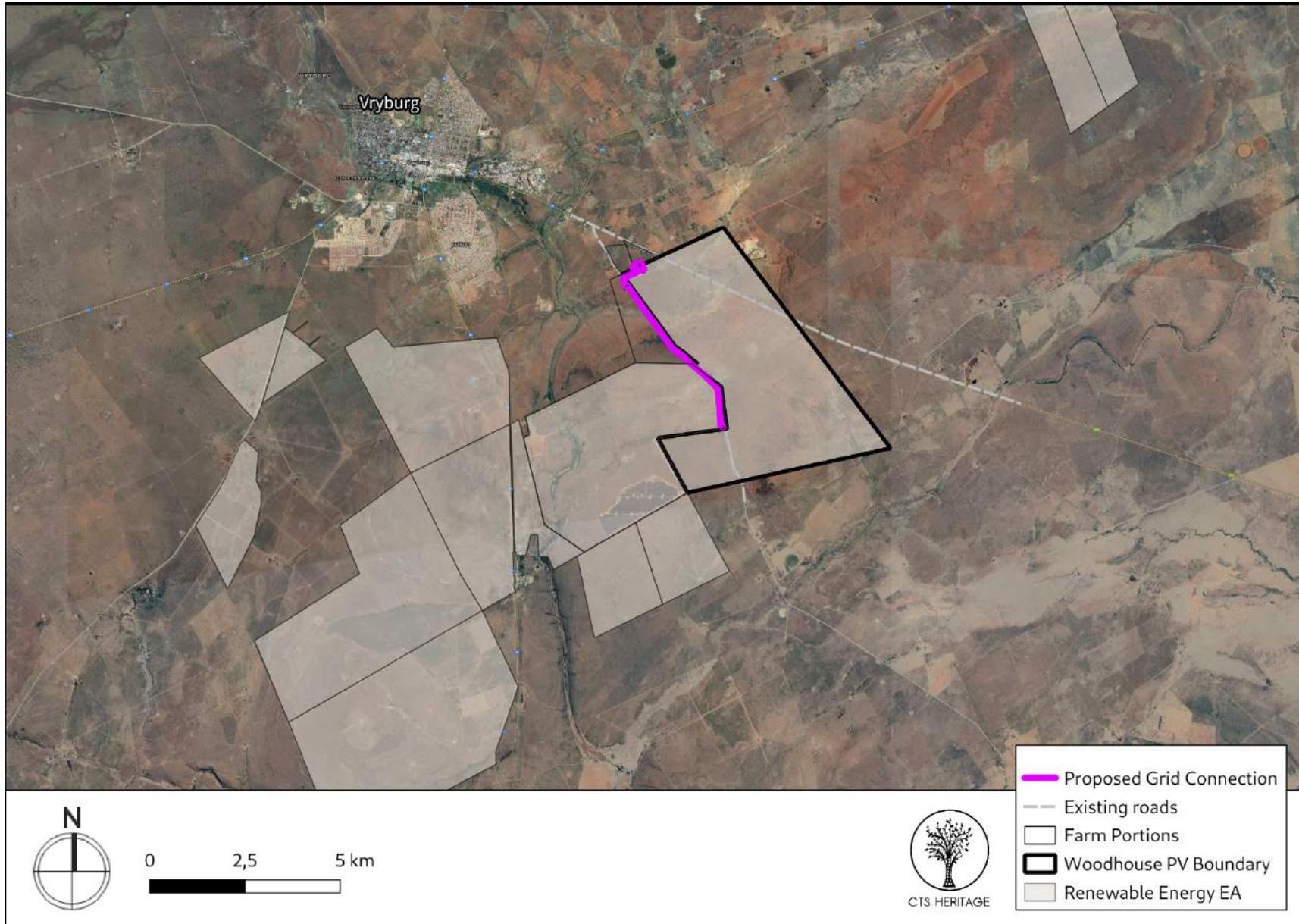


Figure 5. Cumulative Impact Map. Indicating other Renewable Energy Facilities that have been granted Environmental Authorisation (EA).



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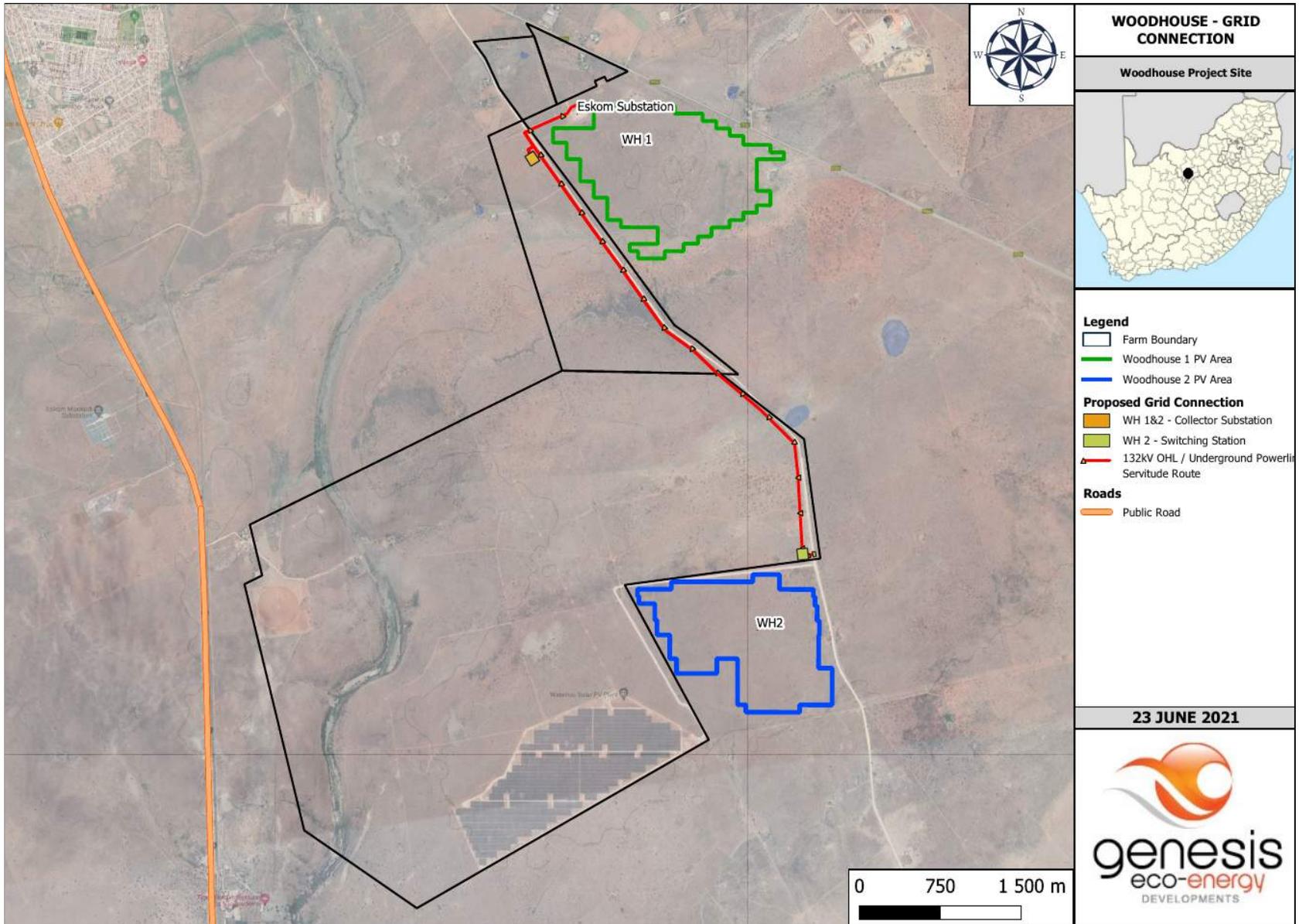


Figure 6. Project Map. Provided by Genesis Eco-Energy

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8. Heritage Assessment

Background

On 20 September 2016, Environmental Authorisation (EA) was granted for the proposed construction of two commercial photovoltaic (PV) solar energy facilities (known as the Woodhouse Solar 1 and Woodhouse Solar 2 PV Facilities) as well as all associated infrastructure on the Remaining Extent of Farm Woodhouse 729, situated approximately 10km southeast of Vryburg. This application is for the proposed grid connection infrastructure to connect the authorised Woodhouse 1 and Woodhouse 2 PV facilities to the Eskom grid. The area proposed for the Woodhouse Solar 1 and 2 PV Facilities was thoroughly assessed for impacts to heritage resources in an Archaeological Impact Assessment conducted by Van der Walt (2016, SAHRIS NID 374639) and a Palaeontological Impact Assessment by Becker (2016, SAHRIS NID 374641). These reports are referred to below in order to determine the likely heritage sensitivity of the area proposed for the development of the grid connection.

Archaeology and Built Environment Heritage

Vryburg town was established in 1882 as the capital town of the independent Boer Republic of Stellaland. During its short history, the small state became a focal point for conflict between the British Empire and the South African Republic, the two major players vying for control of the territory. After a series of claims and annexations, British fears of Boer expansionism led to its demise and, among other factors, set the stage for the Second Boer War. Before the proclamation of the republic, the area was under the control of competing Korana and Tswana groups, while the United Kingdom laid claim to it as a part of the emerging protectorate of British Bechuanaland. Two of the indigenous groups were under the leadership of chiefs Mankoroane and Montšioa, whom the British regarded as "friendly," and two others under the leadership of chiefs Moshette (a Motswana) and Massouw (a Korana). When a feud erupted between Mankoroane and another chief, each side resorted to recruiting volunteers, promising them land in return for their assistance. After a settlement was negotiated with mediation from the Transvaal Republic, large portions of Mankoroane's land were given to Boer mercenaries who had fought on his adversary's side, and the new inhabitants decided to declare independence and establish the Republic of Stellaland. During the Second Boer War, a concentration camp was established at Vryburg, however the location of this camp is unknown.

No known built environment or historically significant heritage resources are known to be located in close proximity to the proposed grid connection corridor and as such, negative impact is unlikely.

According to Van der Walt (2016); "MSA (Middle Stone Age) artefacts are observed in low densities scattered over most of the study area (for the Woodhouse Solar 1 and 2 PV Facilities), but identified the most significant resources within the area proposed for Woodhouse PV 1. In most areas, the artefacts are covered by apedal soils and more artefacts could occur sub-surface. Low density (less than 2 artefacts per 5m²) isolated artefacts were recorded as find spots although discrete stone age sites were also recorded. In the southwestern portion of the study area, several rectangular stone ruins were recorded with associated stone cairns". These finds have been mapped relative to the proposed development in Figures 3a and 3b. Sites 407 and 408 recorded by Van der Walt (2016) mark a dense scatter of MSA and LSA (Later Stone Age) lithics. As the MSA and LSA are not well dated in this area, Van der Walt (2016) argued that these sites have higher heritage significance as they are located within a dateable context. The stone cairns (Sites 405, 411 and 416) identified by Van der Walt (2016) could be grave markings and as such are treated as human remains (Grade IIIA). None of these identified resources are anticipated to be negatively impacted by the proposed development of the grid connection.

Archaeological resources of significance have been identified in the area immediately adjacent to the proposed grid connection corridor and as such, it is likely that additional

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archaeological resources of significance may be located within the proposed grid connection corridor. As such, it is recommended that the grid connection corridor and substation locations be surveyed by an archaeologist.

Palaeontology

According to the SAHRIS Palaeosensitivity Map, the area proposed for the grid connection corridor is underlain by sediments of very high and moderate palaeontological sensitivity (Figure 4a). According to the extract from the CGS 2724 Christiana Map indicating that the development area is underlain by sediments of the Vryburg Formation (Ghaap Group) and Dwyka Group of the Karoo Supergroup. According to Becker (2016); “The geologically older Vryburg Formation (2.6 billion year-old) consists of fluvial and shallow marine quartzites, mudrocks and conglomerates, while the Dwyka Group [317 Million years] consists of Permo-carboniferous glacial sediments. The Dwyka Group (Karoo Supergroup) is represented by small outcrops in the north of the development footprint. Although trace fossils and plants could be present in the Dwyka Group the likelihood of significant fossil heritage in the Vryburg area is considered to be low. The southern portion of the development footprint consists of the Vryburg Formation, which is considered as unfossiliferous in this area. Therefore, there are no areas located within the development footprint considered as sensitive.” These findings directly pertain to the proposed grid connection corridor and as such, it is recommended that no additional palaeontological assessment is required.

Cumulative Impacts

The proposed grid connection will form part of the infrastructure required for the Woodhouse PV 1 and 2 solar development. Furthermore, the proposed grid connection corridor is located within a belt of approved renewable energy facilities (Figure 5). In terms of impacts to heritage resources, it is preferred that this kind of infrastructure development is concentrated in one location and is not sprawled across an otherwise culturally significant landscape. The proposed grid connection is therefore unlikely to result in unacceptable risk or loss, nor will the proposed development result in a complete change to the sense of place of the area or result in an unacceptable increase in impact.

RECOMMENDATION

Based on the information available, it is likely that the proposed grid connection corridor will impact on significant archaeological heritage and as such, it is recommended that a Heritage Impact Assessment is conducted that complies with section 38(3) of the NHRA for the proposed development with special focus on impacts to significant archaeological heritage.

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APPENDIX 1

List of heritage resources within the development area

Site ID	Site no	Full Site Name	Site Type	Grading
45803	WATR01	Waterloo PV 506 -01	Artefacts	Grade IIIc
35902	BOP001	Bophirima 001	Artefacts	Grade IIIc
35903	BOP002	Bophirima 002	Structures, Stone walling	Grade IIIb
35904	BOP003	Bophirima 003	Structures	Grade IIIb
35905	BOP004	Bophirima 004	Structures	Grade IIIa
44526	WAT002	Waterloo 002	Palaeontological	Ungraded
44527	WAT003	Waterloo 003	Artefacts	Grade IIIc
105719	Stromatolite occurrences	Stromatolite occurrences on Farm Waterloo 992	Palaeontological	
105826	Waterloo 001	Waterloo 001	Artefacts	
105827	Waterloo 002	Waterloo 002	Artefacts	
137206	WS-001	Woodhouse Solar Site 402	Artefacts	Grade IIIc
137207	WS-002	Woodhouse Solar Site 403	Artefacts	Grade IIIc
137208	WS-003	Woodhouse Solar Site 404	Artefacts	Grade IIIc
137209	WS-004	Woodhouse Solar Site 405	Artefacts	Grade IIIa
137210	WS-005	Woodhouse Solar Site 406	Artefacts	Grade IIIc
137211	WS-006	Woodhouse Solar Site 407	Artefacts	Grade IIIc
137212	WS-007	Woodhouse Solar Site 408	Artefacts	Grade IIIc

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137213	WS-008	Woodhouse Solar Site 409	Artefacts	Grade IIIc
137214	WS-009	Woodhouse Solar Site 410	Artefacts	Grade IIIc
137215	WS-010	Woodhouse Solar Site 411	Structures	Grade IIIa
137216	WS-011	Woodhouse Solar Site 412	Structures	Grade IIIb
137217	WS-012	Woodhouse Solar Site 413	Structures	Grade IIIc
137218	WS-013	Woodhouse Solar Site 414	Structures	
137219	WS-014	Woodhouse Solar Site 415	Structures	Grade IIIb
137220	WS-015	Woodhouse Solar Site 416	Structures	Grade IIIa
130958	WTLS001	Waterloo South	Artefacts	
130959	WTLS002	Waterloo South	Artefacts	
130961	WTLS003	Waterloo South	Artefacts	

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APPENDIX 2

Reference List with relevant AIAs and PIAs

Heritage Impact Assessments				
Nid	Report Type	Author/s	Date	Title
2147	HIA Phase 1	Johnny Van Schalkwyk	01/06/2012	Heritage impact assessment for the PROPOSED DEVELOPMENT OF PHOTOVOLTAIC POWER PLANTS ON FOUR DIFFERENT LOCATIONS IN NORTH WEST AND NORTHERN CAPE PROVINCES
8372	HIA Phase 1	Johnny Van Schalkwyk	01/10/2008	Heritage Impact Survey Report for the Proposed 400/132 kV Vryburg Substation and Loop-In Lines, North West Province
89376	HIA Phase 1	Johnny Van Schalkwyk	01/10/2012	Heritage impact assessment for the PROPOSED DEVELOPMENT OF A PHOTOVOLTAIC POWER PLANT ON A PORTION OF THE FARM WATERLOO 992, VRYBURG REGION, NORTH WEST PROVINCE
109477	PIA Phase 1	John E Almond	01/01/2013	PALAEONTOLOGICAL HERITAGE ASSESSMENT: COMBINED DESKTOP & FIELD-BASED STUDY Proposed PV Solar Facility on a portion of the farm Waterloo 992 near Vryburg, Naledi Local Municipality, North-West Province
109478	PIA Desktop	John E Almond	01/01/2013	PALAEONTOLOGICAL HERITAGE ASSESSMENT: DESKTOP STUDY Proposed PV Solar Facility on a portion of the farm Rosendal 673 near Vryburg, Naledi Local Municipality, North-West Province
156955	AIA Phase 1	Jaco van der Walt	11/12/2013	Archaeological Impact Assessment for the Proposed Tiger Kloof Photovoltaic Solar Energy Facility near Vryburg, North West Province
156958	Palaeontological Specialist Reports	John E Almond	30/11/2013	Proposed Tiger Skloof Photovoltaic Solar Energy Facility near Vryburg, Naledi Local Municipality, North-West Province
177017	Heritage Impact Assessment Specialist Reports	Johnny Van Schalkwyk	31/08/2014	BASIC HERITAGE ASSESSMENT FOR THE PROPOSED MOOKODI 132KV PHASE 2 POWER LINES DEVELOPMENT, NORTH WEST PROVINCE
358386	Palaeontological	John Edward Almond		Palaontological Heritage Assessment: Combined Desktop & Field-Based Study: Proposed Gamma

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	Specialist Reports			Solar Power Plant on the Remaining Extent of Portion 4 (Bos Kop), Farm Champions Kloof 731, North-West Province
358387	Palaeontological Specialist Reports	John Edward Almond		Palaeontological Heritage Assessment: Combined Desktop & field-Based Study: Proposed Khubu Solar Plant on Portion 5 (Shadow Eve) (Portion of Portion 4). Farm Champions Kloof 731 near Vryburg. Naledi Local Municipality. North-West Province
358388	Heritage Impact Assessment Specialist Reports	Johnny Van Schalkwyk		Cultural heritage Impact assessment for the Development of the Proposed Khubu Solar Power Plant in the Portion 5 of the Farm CHampions Kloof 731, Vryburg Region, North West Province
343610	Archaeological Specialist Reports	Jaco van der Walt	09/11/2015	Archaeological Scoping Report for the Proposed Woodhouse Solar 1 and Woodhouse Solar 2 PV Facilities close to Vryburg, NW Province
343611	Palaeontological Specialist Reports	Elize Butler	25/09/2015	Palaeontological Impact Assessment of the Proposed Woodhouse PV Solar Energy Facilities and Associated Infrastructure on the Remaining Extent of Farm Woodhouse 729, near Vryburg, NW Province
361091	HIA Phase 1	David Morris	01/04/2014	Appendix D3 Vryburg WWTW Heritage Specialist Report
362237		Johnny Van Schalkwyk	29/01/2016	Cultural heritage impact assessment for THE DEVELOPMENT OF THE PROPOSED GAMMA SOLAR POWER PLANT ON PORTION 4 OF THE FARM CHAMPIONS KLOOF 731, VRYBURG REGION, NORTH WEST PROVINCE
364708	Heritage Impact Assessment Specialist Reports	Wouter Fourie	26/05/2016	75MW SOLAR PHOTOVOLTAIC (PV) ENERGY FACILITY – SENDAWO SOLAR 3 Heritage Impact Assessment
364718	Heritage Impact Assessment Specialist Reports	Wouter Fourie	19/05/2016	SENDAWO POWERLINE ALTERNATIVES – SENDAWO PROJECTS Heritage Impact Assessment
365017	Heritage Impact Assessment Specialist Reports	Johnny Van Schalkwyk	01/03/2016	Cultural heritage impact assessment for THE EXTENSION OF THE PROPOSED SOLAR POWER PLANT ON A PORTION OF THE FARM WATERLOO 992, VRYBURG REGION,

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				NORTH WEST PROVINCE
367821		John Almond	07/01/2013	Palaeontological Heritage Assessment: Combined Desktop & Field-based Study: Proposed PV Solar Facility on a portion of the farm Waterloo 992 near Vryburg, Naldi Local Municipality, North West Province
374639	Archaeological Specialist Reports	Jaco van der Walt	30/04/2016	Archaeological Impact Assessment Report for the proposed Woodhouse 1 Solar PV Facility near Vryberg, North West Province
374641	Palaeontological Specialist Reports	Elize Butler	10/04/2016	Palaeontological Impact Assessment Report for the proposed Woodhouse 1 Solar PV Facility near Vryberg, North West Province
374673	Archaeological Specialist Reports	Jaco van der Walt	30/04/2016	Archaeological Impact Assessment Report for the proposed Woodhouse 2 Solar PV Facility near Vryberg, North West Province
374960	Palaeontological Specialist Reports	Elize Butler	10/04/2016	Palaeontological Impact Assessment Report for the proposed Woodhouse 2 Solar PV Facility near Vryberg, North West Province

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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)
DEFF	Department of Environmental, Forestry and Fisheries (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 PALAEOLOGICAL 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.

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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

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- 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, 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 50 Heritage Impact Assessments throughout South Africa.

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APPENDIX 2: Archaeological Assessment (2021)

ARCHAEOLOGICAL SPECIALIST STUDY

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

Proposed grid connection infrastructure to connect the authorised Woodhouse 1 and Woodhouse 2 PV facilities to the Eskom grid near Vryburg, North West Province

Prepared by

Dr Darya Presnyakova, Dr Will Archer

and



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In Association with

Savannah Environmental

July 2021



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EXECUTIVE SUMMARY

On 20 September 2016, Environmental Authorisation (EA) was granted for the for the proposed construction of two commercial photovoltaic (PV) solar energy facilities (known as the Woodhouse Solar 1 and Woodhouse Solar 2 PV Facilities) as well as all associated infrastructure on the Remaining Extent of Farm Woodhouse 729, situated approximately 10km southeast of Vryburg. This application is for the proposed grid connection infrastructure to connect the authorised Woodhouse 1 and Woodhouse 2 PV facilities to the Eskom grid. The area proposed for the Woodhouse Solar 1 and 2 PV Facilities was thoroughly assessed for impacts to heritage resources in an Archaeological Impact Assessment conducted by Van der Walt (2016, SAHRIS NID 374639).

Genesis Eco-Energy Developments is proposing grid connection infrastructure to connect the authorised Woodhouse 1 and Woodhouse 2 PV facilities to the Eskom grid. The project includes the following:

- 1 x collector substation (one at Woodhouse 1 (2 alternatives)) and 1 x switching station at Woodhouse 2
- 1 x 132kV overhead line
- Connection from Woodhouse 1 substation to Bophirima Substation

An archaeologist completed a site visit on 17 July 2021. The findings of this field assessment largely correlate with the findings of Van der Walt (2016). The fieldwork identified a number of archaeological resources located within the development area for the overhead powerline. It has been determined that the archaeological resources observed in this assessment are all ex situ, and the potential for finding a dateable *in-situ* archaeological horizon based on current surface observations appears to be low. The archaeological resources identified therefore have scientifically LOW-SIGNIFICANCE and are graded IIIC.

As these resources are located within the development area for the OHL, it is likely that these resources will be negatively impacted by the proposed development. Mitigation measures are proposed below in order to limit the negative impact to these resources.

Furthermore, it is possible that additional archaeological resources are present below the ground surface which may be impacted by the proposed development.

Recommendations

There is no objection to the proposed development of the Woodhouse overhead powerline in terms of impacts to archaeological heritage on condition that:

- The placement of the pylon footings is carefully considered in order to avoid impact to the sites mapped in Figure 14.1 to 14.4 above.
- Should any buried archaeological resources or burials be uncovered during the course of development activities, work must cease in the vicinity of these finds. The South African Heritage Resources Agency (SAHRA) must be contacted immediately in order to determine an appropriate way forward.



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1. INTRODUCTION

1.1 Background Information on Project

On 20 September 2016, Environmental Authorisation (EA) was granted for the for the proposed construction of two commercial photovoltaic (PV) solar energy facilities (known as the Woodhouse Solar 1 and Woodhouse Solar 2 PV Facilities) as well as all associated infrastructure on the Remaining Extent of Farm Woodhouse 729, situated approximately 10km southeast of Vryburg. This application is for the proposed grid connection infrastructure to connect the authorised Woodhouse 1 and Woodhouse 2 PV facilities to the Eskom grid. The area proposed for the Woodhouse Solar 1 and 2 PV Facilities was thoroughly assessed for impacts to heritage resources in an Archaeological Impact Assessment conducted by Van der Walt (2016, SAHRIS NID 374639).

Genesis Eco-Energy Developments is proposing grid connection infrastructure to connect the authorised Woodhouse 1 and Woodhouse 2 PV facilities to the Eskom grid. The project includes the following:

- 1 x collector substation (one at Woodhouse 1 (2 alternatives)) and 1 x switching station at Woodhouse 2
- 1 x 132kV overhead line
- Connection from Woodhouse 1 substation to Bophirima Substation

1.2 Description of Property and Affected Environment

The footprint for the proposed grid connection infrastructure is located across 4 properties, including the farms Bernauw 2, 56 as well as Waterloo and Woodhouse, approximately 5km South- East of the town of Vryburg in the North West Province.

The landscape falls within the semi-arid southern African Savannah Biome, and the vegetation is characterized by grassy thornveld which is dense across the majority of the survey area, and is formally characterized as Ghaap Plateux Vaalbosveld (Figure 4) (see Mucina et al., 2006). A drainage channel intersects the proposed grid connection, and is oriented roughly from west to east, yielding several isolated *ex-situ* artefacts in close proximity (Figure 8). The topography of the area is characterized by low undulating ridges, with several small pans to the west and south-west of the study area. Bedrock outcrops in several places to the south-east of the footprint, with primary chert outcrops in several locations. Exploitation traces in the form of associated flakes and cores indicate these chert outcrops were sources of raw-material for Pleistocene hunter-gatherer populations in the region. Large low-quality quartzite nodules are present immediately south of the drainage channel with sparse interspersed isolated finds (Figure 7 c.1-c.2).

The surface sediments are generally bioturbated sandy soils, which appear to be aeolian in terms of original deposition, although the inclusion of sparse but sizeable quartzite cobbles with riverine cortex (>10cm) in the vicinity of the abovementioned drainage are suggestive of a fluvial component. The appearance of infrequent and isolated rolled stone artefacts (e.g. Figure 8 b.1-b.2), in amongst the cobbles are potentially suggestive of a Pleistocene age of the top soils. Calcretized redeposited pan deposits mixed in with the topsoil are more common to the south, which raises the potential for Pleistocene fossil preservation in the general area (although no fossils were documented).



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The general land use in the region appears historically to be predominantly cattle farming, with evidence of larger antelope and burrowing rodents (mole rats and hares) within the footprint which, in combination with the dense vegetation, likely account for the bioturbated nature of the surface sediments. The majority of identified archaeological remains occur within these disturbed upper sandy soil contexts and therefore have limited potential for modern scientific analyses (due to the context and limited possibility of radiometric dating). Even where topsoil has been removed (Figure 3 a.1-a.2), the artefacts are randomly oriented with several pieces on-end, indicating a redeposited context. However, the potential for *in situ* deposits in sub-surface contexts cannot be discounted.

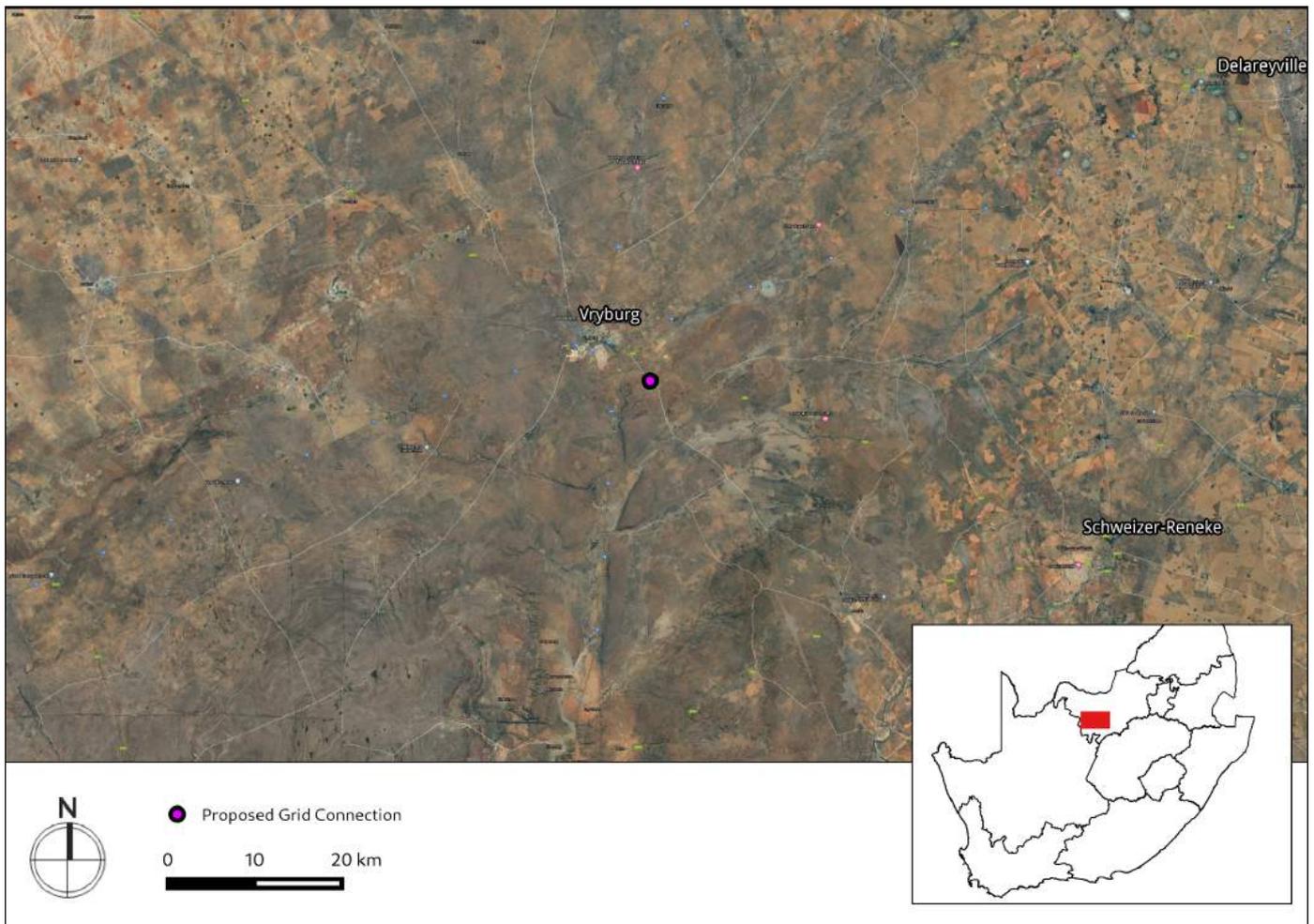


Figure 1.1: Close up satellite image indicating proposed location of study area



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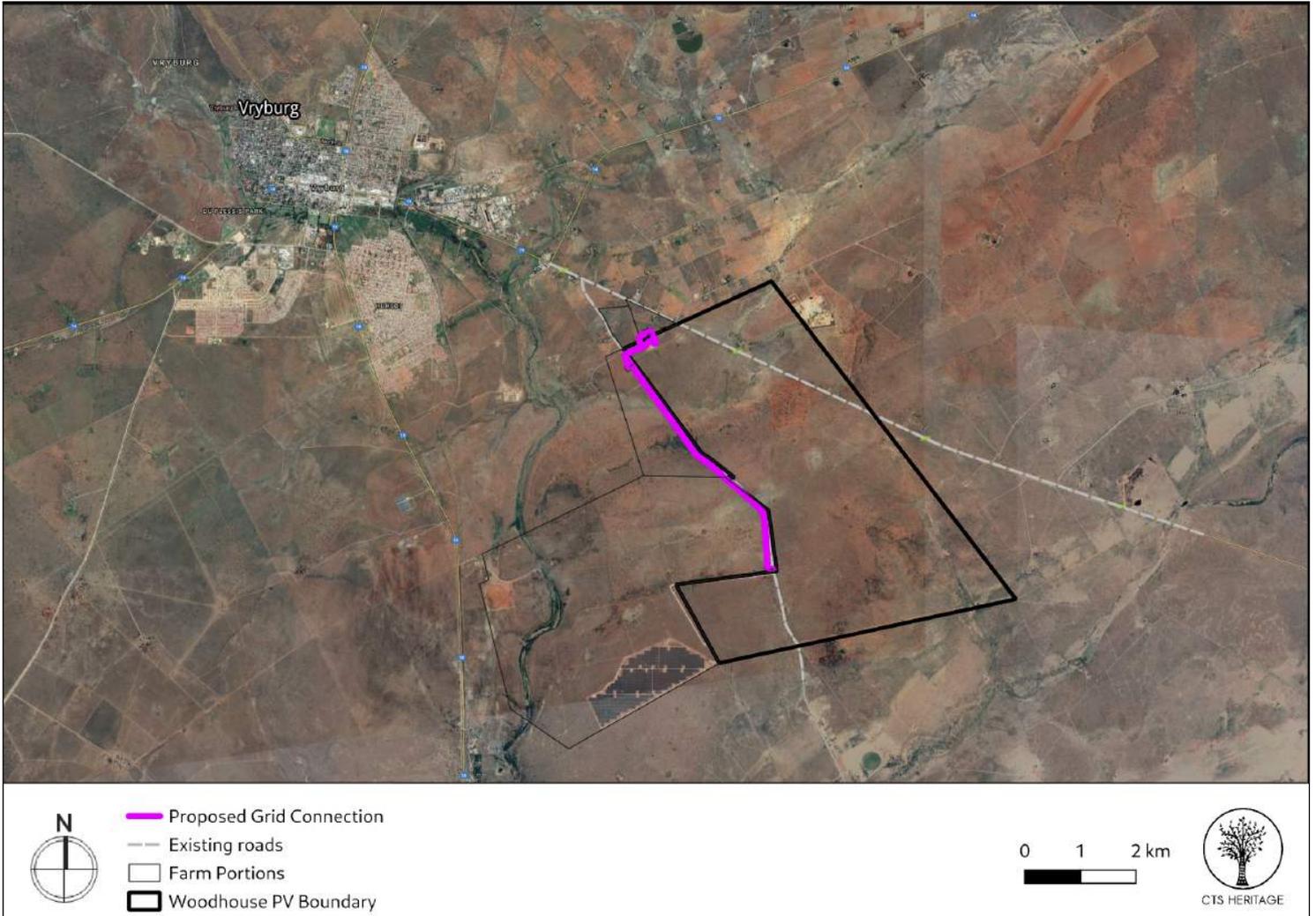


Figure 1.2: Study Area



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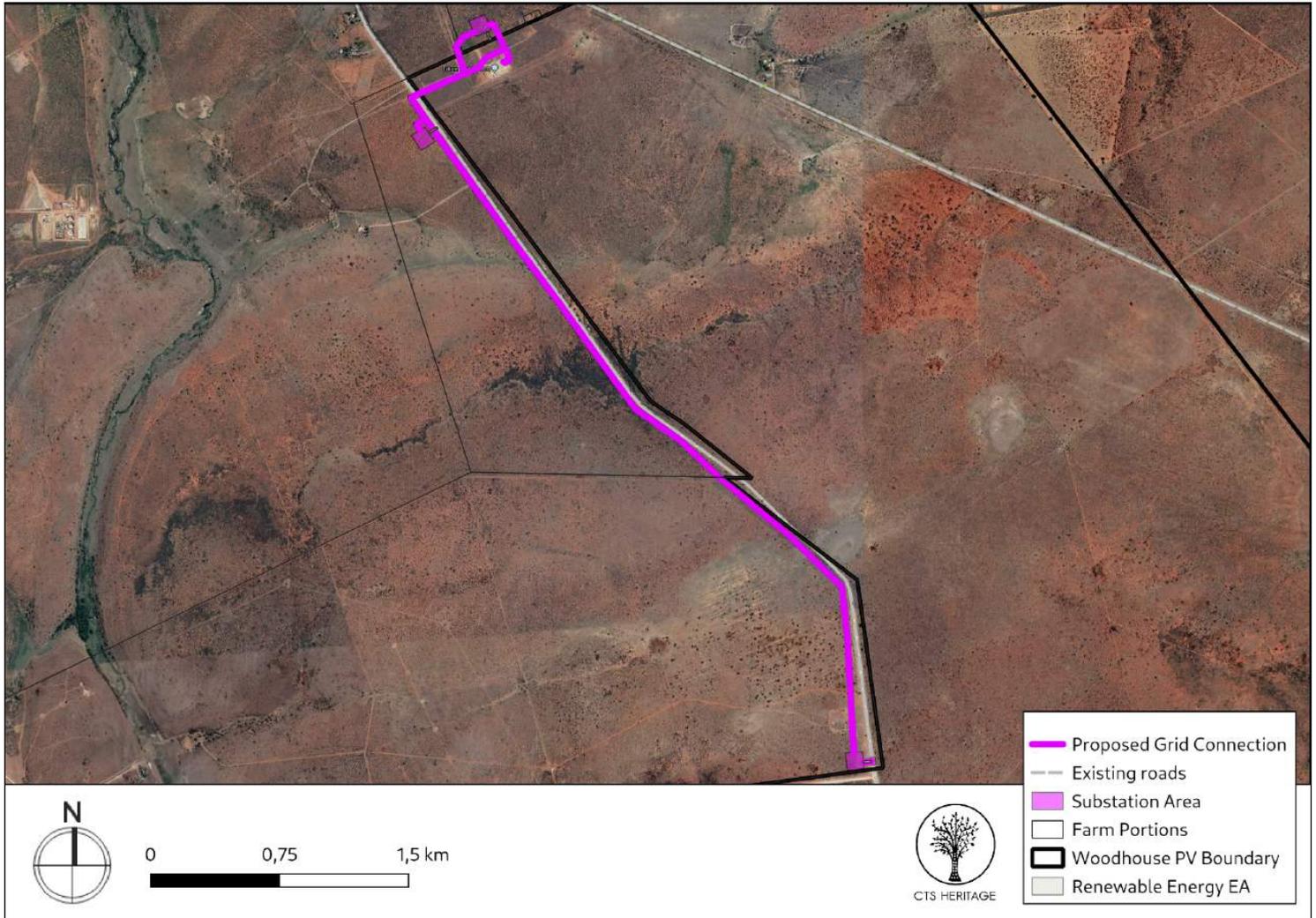


Figure 1.3: Study Area

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 on 17 July 2021 to determine what archaeological resources are likely to be impacted by the proposed development.
- The study area was assessed on foot in transects, 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.

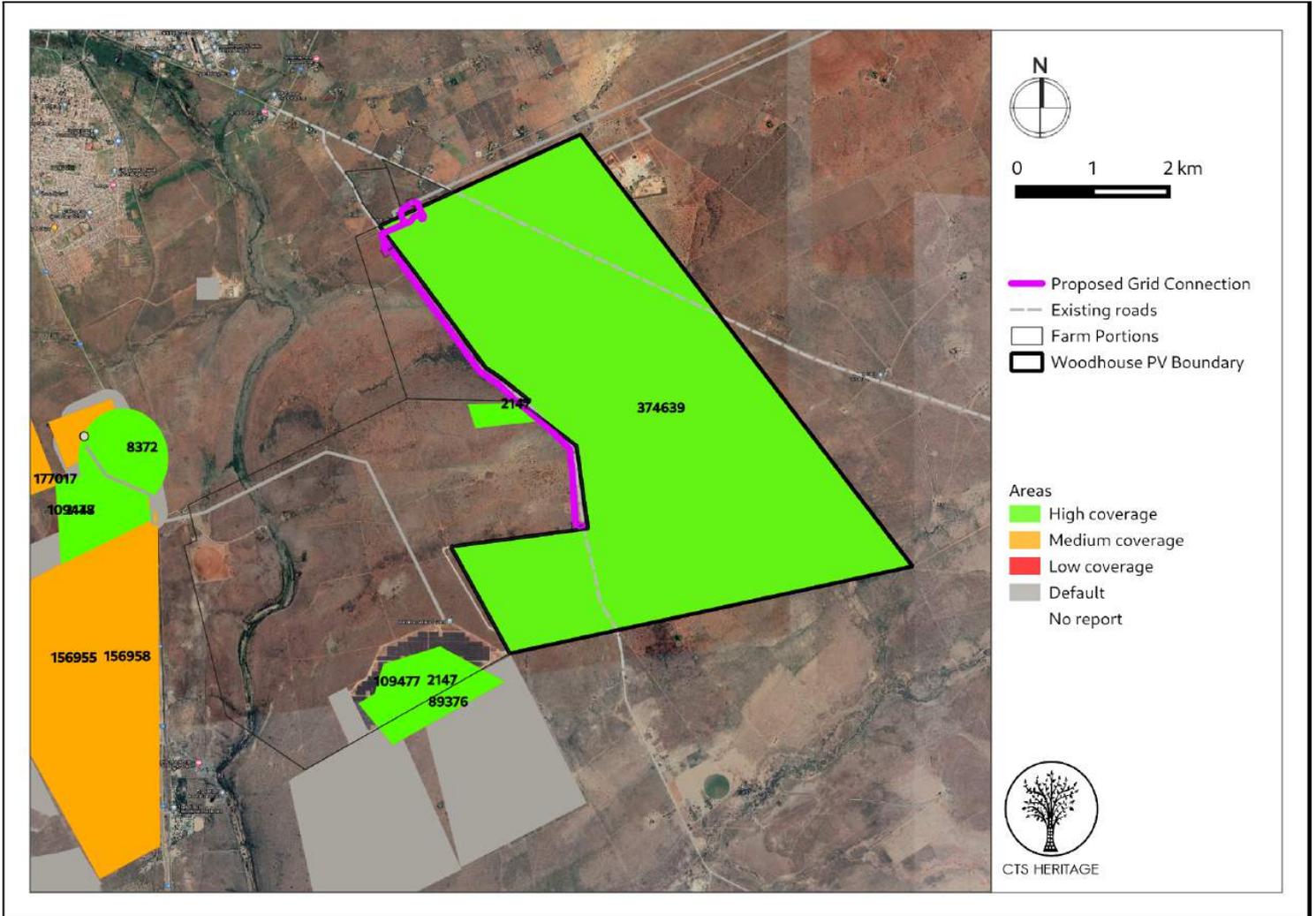


Figure 2: Close up satellite image indicating proposed location of the study area in relation to heritage studies previously conducted

2.3 Constraints & Limitations

Dense grass and thorn tree cover across much of the study area inhibited the potential visibility of surface scatters and the ability to assess some of the footprint area at ground surface level (Figure 4).

Although permission was acquired to survey the 300m of territory oriented east-north-east in the northern section of the footprint, nobody was available to open the security gate on the day of the survey. This section was therefore reviewed from the neighbouring property (see track, Figure 5), and with visible evidence of substantial dirt road construction is considered to have limited to no potential for *in situ* archaeological remains.

3. HISTORY AND EVOLUTION OF THE SITE AND CONTEXT

The area proposed for the Woodhouse Solar 1 and 2 PV Facilities was thoroughly assessed for impacts to heritage resources in an Archaeological Impact Assessment conducted by Van der Walt (2016, SAHRIS NID 374639). This report is referred to below in order to determine the likely heritage sensitivity of the area proposed for the development of the grid connection.



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Archaeology and Built Environment Heritage

Vryburg town was established in 1882 as the capital town of the independent Boer Republic of Stellaland. During its short history, the small state became a focal point for conflict between the British Empire and the South African Republic, the two major players vying for control of the territory. After a series of claims and annexations, British fears of Boer expansionism led to its demise and, among other factors, set the stage for the Second Boer War. Before the proclamation of the republic, the area was under the control of competing Korana and Tswana groups, while the United Kingdom laid claim to it as a part of the emerging protectorate of British Bechuanaland. Two of the indigenous groups were under the leadership of chiefs Mankoroane and Montšioa, whom the British regarded as “friendly,” and two others under the leadership of chiefs Moshette (a Motswana) and Massouw (a Korana). When a feud erupted between Mankoroane and another chief, each side resorted to recruiting volunteers, promising them land in return for their assistance. After a settlement was negotiated with mediation from the Transvaal Republic, large portions of Mankoroane’s land were given to Boer mercenaries who had fought on his adversary’s side, and the new inhabitants decided to declare independence and establish the Republic of Stellaland. During the Second Boer War, a concentration camp was established at Vryburg, however the location of this camp is unknown.

No known built environment or historically significant heritage resources are known to be located in close proximity to the proposed grid connection corridor and as such, negative impact is unlikely.

According to Van der Walt (2016); “MSA (Middle Stone Age) artefacts are observed in low densities scattered over most of the study area (for the Woodhouse Solar 1 and 2 PV Facilities), but identified the most significant resources within the area proposed for Woodhouse PV 1. In most areas, the artefacts are covered by apedal soils and more artefacts could occur sub-surface. Low density (less than 2 artefacts per 5m²) isolated artefacts were recorded as find spots although discrete stone age sites were also recorded. In the southwestern portion of the study area, several rectangular stone ruins were recorded with associated stone cairns”. These finds have been mapped relative to the proposed development in Figures 3.1 and 3.2. Sites 407 and 408 recorded by Van der Walt (2016) mark a dense scatter of MSA and LSA (Later Stone Age) lithics. As the MSA and LSA are not well dated in this area, Van der Walt (2016) argued that these sites have higher heritage significance as they are located within a dateable context. The stone cairns (Sites 405, 411 and 416) identified by Van der Walt (2016) could be grave markings and as such are treated as human remains (Grade IIIA). None of these identified resources are anticipated to be negatively impacted by the proposed development of the grid connection.

Archaeological resources of significance have been identified in the area immediately adjacent to the proposed grid connection corridor and as such, it is likely that additional archaeological resources of significance may be located within the proposed grid connection corridor.



Table 1: Sites previously identified in and near the proposed study area

SAHRIS ID	Site No.	Site Name	Site Type	Grading
45803	WATR01	Waterloo PV 506 -01	Artefacts	Grade IIIc
35902	BOP001	Bophirima 001	Artefacts	Grade IIIc
35903	BOP002	Bophirima 002	Structures, Stone walling	Grade IIIb
35904	BOP003	Bophirima 003	Structures	Grade IIIb
35905	BOP004	Bophirima 004	Structures	Grade IIIa
44526	WAT002	Waterloo 002	Palaeontological	Ungraded
44527	WAT003	Waterloo 003	Artefacts	Grade IIIc
105719	Stromatolite occurrences	Stromatolite occurrences on Farm Waterloo 992	Palaeontological	
105826	Waterloo 001	Waterloo 001	Artefacts	
105827	Waterloo 002	Waterloo 002	Artefacts	
137206	WS-001	Woodhouse Solar Site 402	Artefacts	Grade IIIc
137207	WS-002	Woodhouse Solar Site 403	Artefacts	Grade IIIc
137208	WS-003	Woodhouse Solar Site 404	Artefacts	Grade IIIc
137209	WS-004	Woodhouse Solar Site 405	Artefacts	Grade IIIa
137210	WS-005	Woodhouse Solar Site 406	Artefacts	Grade IIIc
137211	WS-006	Woodhouse Solar Site 407	Artefacts	Grade IIIc
137212	WS-007	Woodhouse Solar Site 408	Artefacts	Grade IIIc
137213	WS-008	Woodhouse Solar Site 409	Artefacts	Grade IIIc
137214	WS-009	Woodhouse Solar Site 410	Artefacts	Grade IIIc
137215	WS-010	Woodhouse Solar Site 411	Structures	Grade IIIa
137216	WS-011	Woodhouse Solar Site 412	Structures	Grade IIIb
137217	WS-012	Woodhouse Solar Site 413	Structures	Grade IIIc
137218	WS-013	Woodhouse Solar Site 414	Structures	
137219	WS-014	Woodhouse Solar Site 415	Structures	Grade IIIb
137220	WS-015	Woodhouse Solar Site 416	Structures	Grade IIIa
130958	WTLS001	Waterloo South	Artefacts	
130959	WTLS002	Waterloo South	Artefacts	
130961	WTLS003	Waterloo South	Artefacts	



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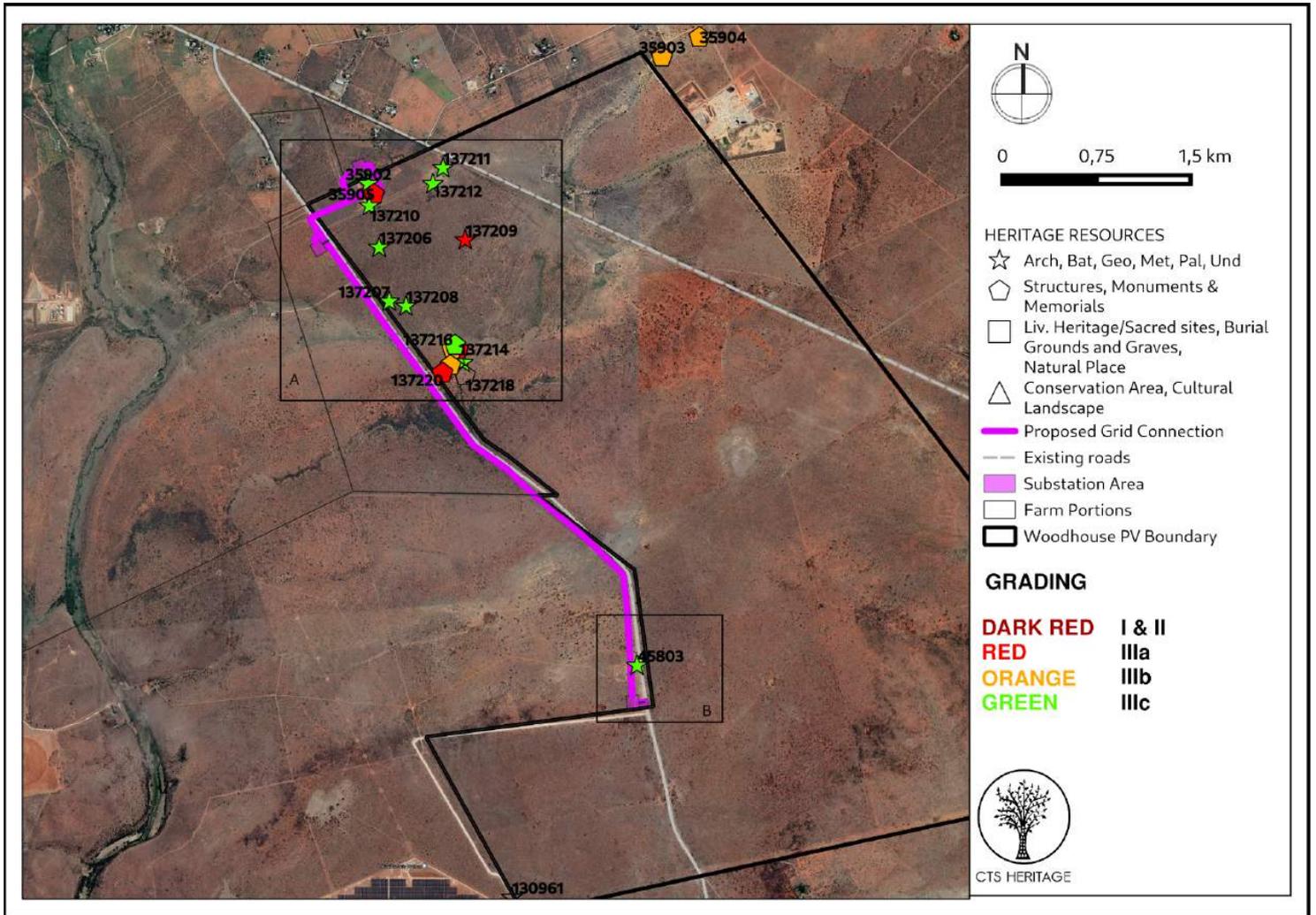


Figure 3.1. Heritage Resources Map. Heritage Resources previously identified in and near the study area, with SAHRIS Site IDs indicated (see Heritage Screening Assessment for insets)

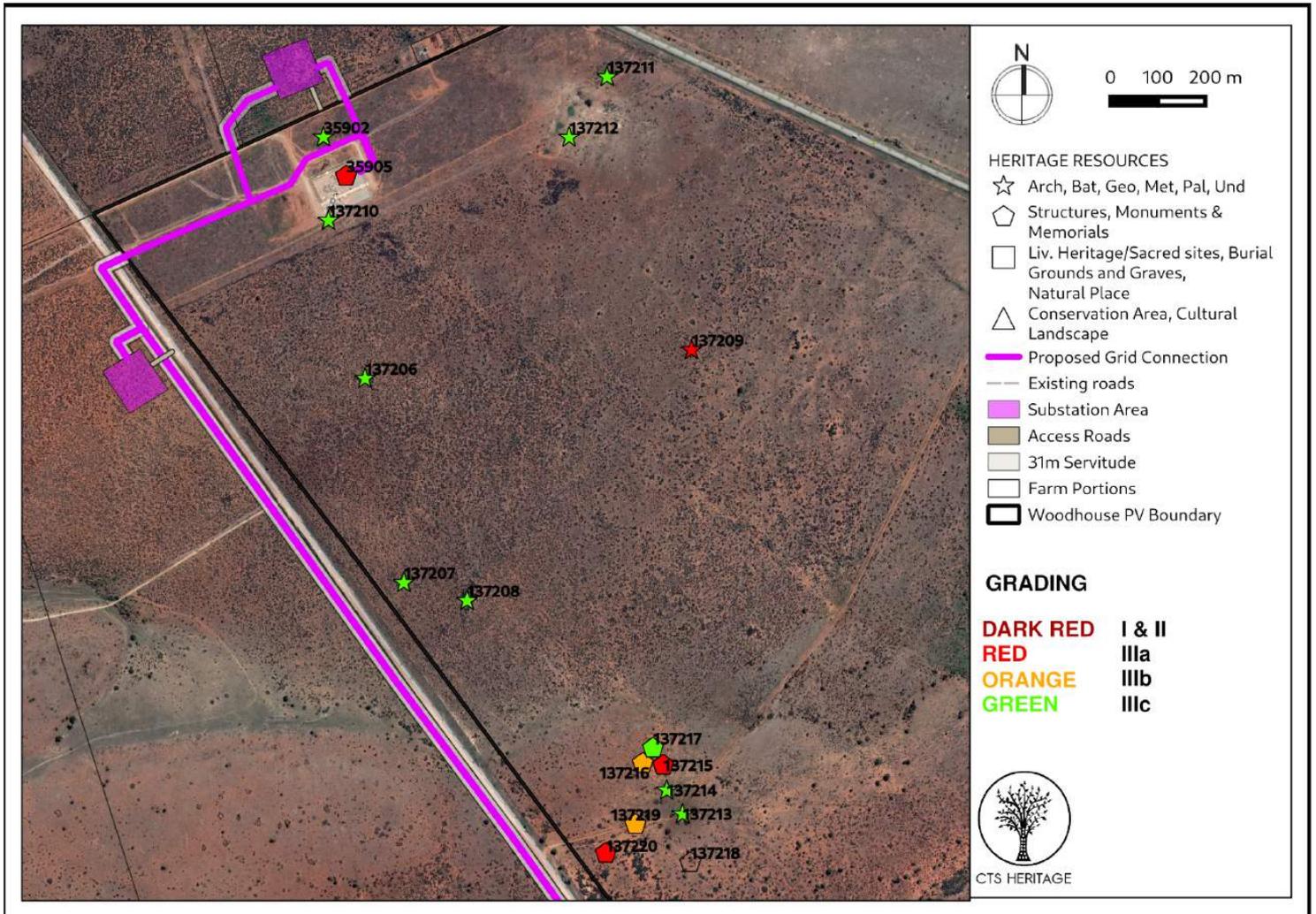


Figure 3.2. Heritage Resources Map. Heritage Resources previously identified in and near the study area, with SAHRIS Site IDs indicated (see Heritage Screening Assessment for insets)

4. IDENTIFICATION OF HERITAGE RESOURCES

4.1 Field Assessment

Field assessment suggests that the area was occupied or traversed intermittently by Stone Age groups potentially throughout much of the Pleistocene. Artefacts typical of the Middle Stone Age (MSA) (Figures 9 and 10) and the Later Stone Age (LSA) (Figure 9) were documented within the vicinity or close to the vicinity of the connecting line footprint, whereas large isolated simple rotated cores that would fit within the African Earlier Stone Age (ESA) or generalized earlier MSA were also identified, including a large prepared core that would fit within the so-called 'Victoria West' industry characteristic of the nearby Northern Cape ESA (Figure 8 d.1-d.2).

The most significant findings in terms of techno-cultural affinity are associated with the MSA and LSA of the region. Although little has been written exclusively on the Stone Age of the North-West province, several typical technological characteristics can be linked to the southern African MSA and LSA more generally, and are reflective of broad chrono-cultural associations. These characteristic pieces were identified in artefact scatters 1 and 2 (Figure 14 (a-b)).



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The prismatic blade core (Figure 9 c.1 and c.2) is typical of the later MSA of southern Africa, and could be associated with the so-called Howeisons Poort industry ('HP' - typically 65-58ka) although it could also be older. Levallois blade production (Figure 10 b.1-c.2) has been documented through substantial periods within the southern African MSA (~300-40ka). The smaller scrapers (Figure 9 a.1-a.2, Figure 10 d.1-d.2) are likely LSA in cultural affinity and may be Holocene in age, as is the case with the bladelette cores (Figure 9 b.1-b.2, Figure 13) as well as the miniature bipolar core (Figure 13).

The raw-materials exploited were predominantly quartzite rocks (ESA occurrences), a mix of chert and quartzite for the MSA finds and exclusively chert for the LSA artefacts including microlithics. Indeed, the presence of primary and secondary sources of quartzite and chert (Figure 7) in association with what were likely seasonal pans to the east of the proposed connecting line, are suggestive of the landscape resources that probably drew Stone Age groups to the region over an extended expanse of human evolutionary history.

All findings were documented in *ex-situ* contexts, which is further supported by the palimpsest of MSA and LSA artefacts at scatters 1 and 2 (Figure 14). The potential for finding a dateable *in-situ* archaeological horizon based on current surface observations appears to be low. The archaeological resources identified therefore have scientifically LOW-SIGNIFICANCE and are graded IIIC.



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Figure 4: Images depicting the vegetation parameters affecting archaeological visibility and efficiency in survey with frequent thornveld (a-b), as well as dense grass cover (c-d) across much of the terrain. (e-f) depict the assessor (for scale) in relation to surrounding vegetation.



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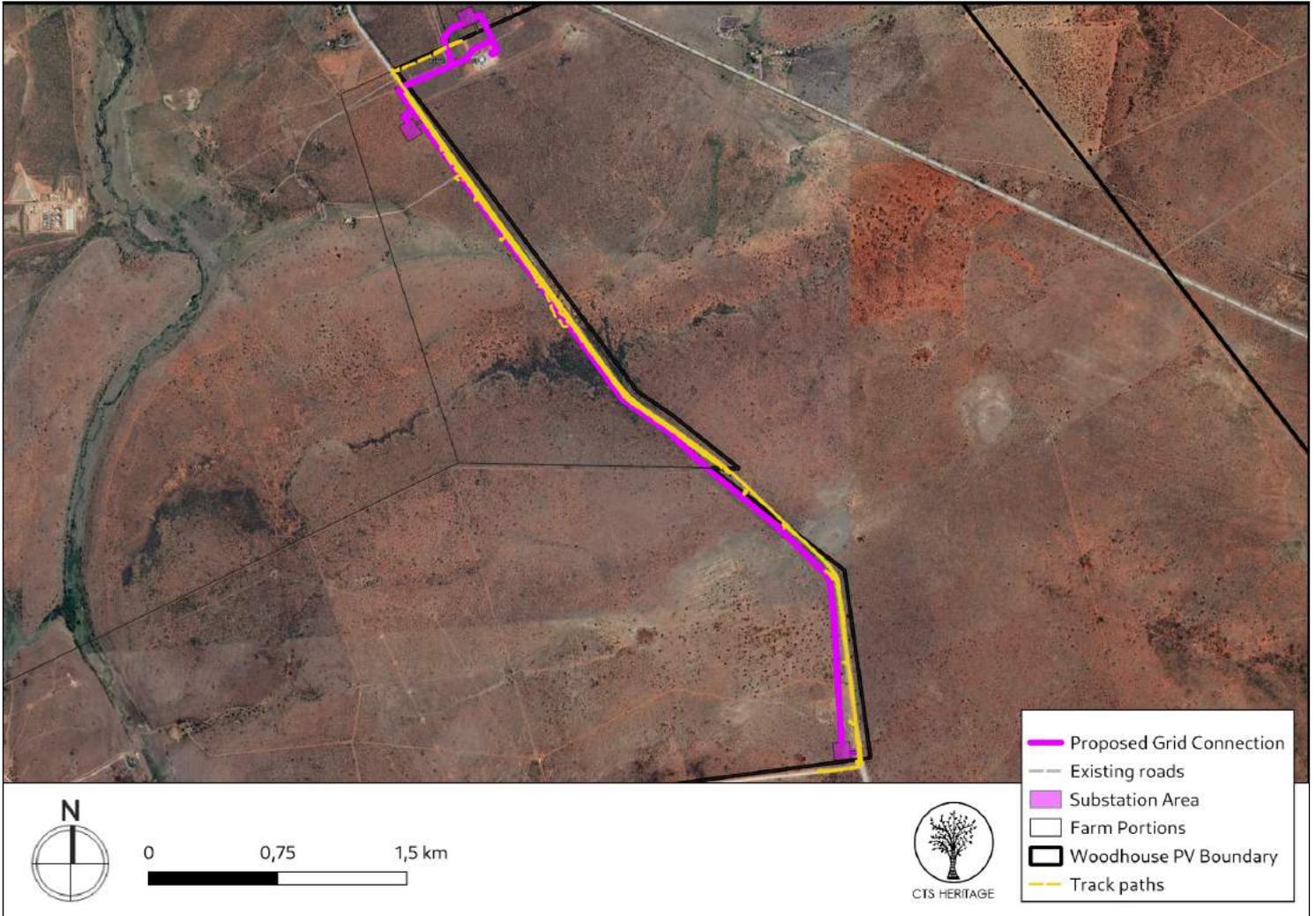


Figure 5: Overall track paths of foot survey



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4.2 Archaeological Resources identified

Table 2: Observations noted during the field assessment

Site No.	Site Name	Description	Co-ordinates		Grading	Mitigation
WH001	Woodhouse 001	Isolated Artefact, ESA or early MSA	-27.0023	24.79759	IIIC	None required
WH002	Woodhouse 002	Artefact scatter, MSA and LSA	-27.0114	24.80922	IIIC	None required
WH003	Woodhouse 003	Artefact scatter, MSA and LSA	-27.0111	24.8088	IIIC	None required
WH004	Woodhouse 004	Isolated Artefact, ESA or early MSA	-27.0159	24.80993	IIIC	None required
WH005	Woodhouse 005	Chert Source	-27.0212	24.81066	IIIC	None required
WH006	Woodhouse 006	Isolated Artefact, ESA or early MSA	-27.0211	24.81057	IIIC	None required
WH007	Woodhouse 007	Isolated Artefact, ESA	-27.0017	24.79684	IIIC	None required
WH008	Woodhouse 008	Isolated Artefact, LSA	-26.9945	24.79093	IIIC	None required
WH009	Woodhouse 009	Isolated Artefact, LSA	-26.9925	24.78933	IIIC	None required

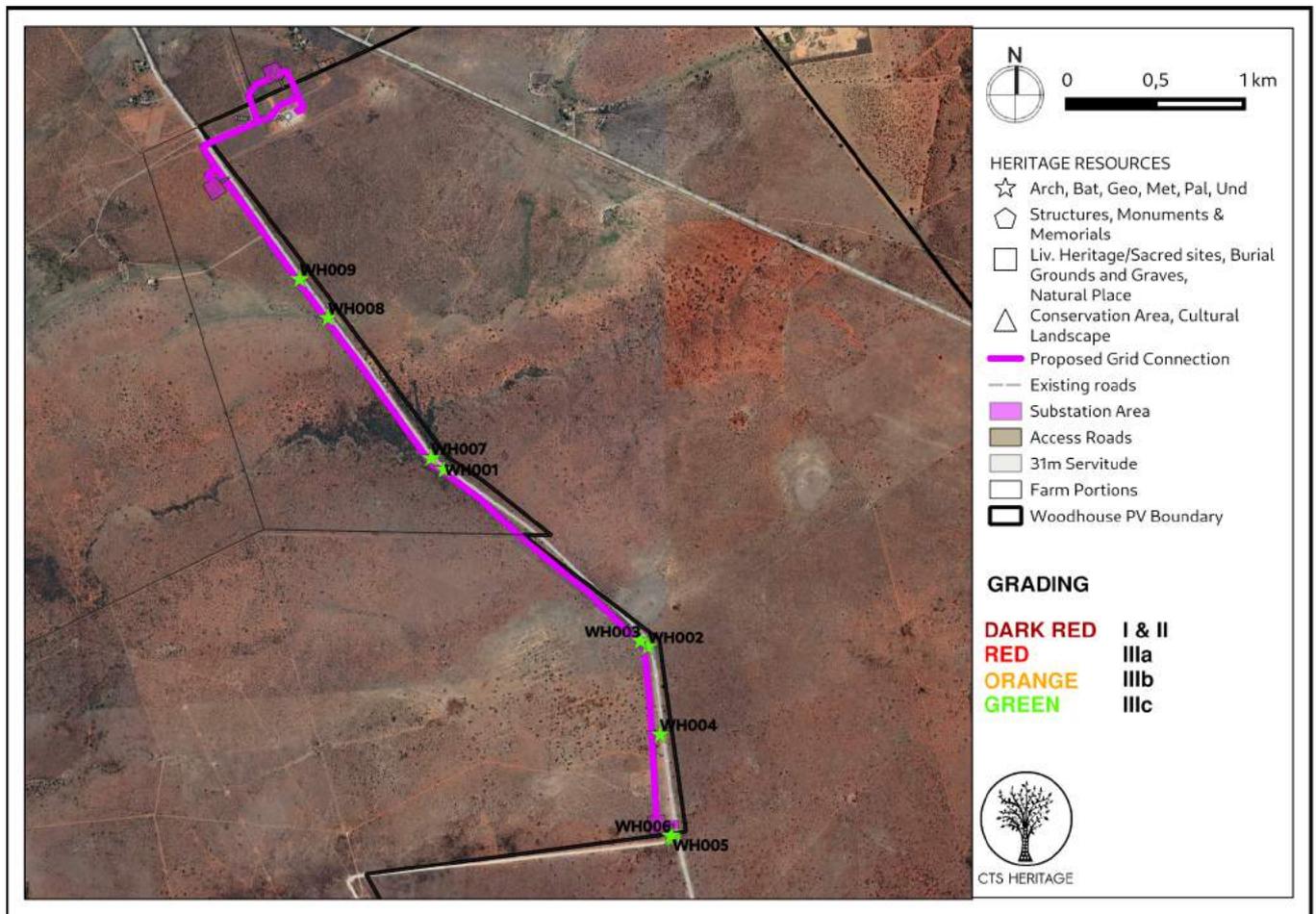


Figure 6: Map of field observations relative to the proposed development



4.3 Selected photographic record

(a full photographic record is available upon request)



Figure 7: WH005 - Primary sources of chert (a.1-b.2) with freshly knapped associated artefacts, and secondary nodules of quartzite (c.1-c.2).



(a.1)



(a.2)



(b.1)



(b.2)



(c.1)



(c.2)



(d.1)



(d.2)



Figure 8: Large crude isolated cores, including large prepared core specimen that may relate to the Victoria West industry (d.1-2). WH001 (a.1), WH004 (b.1-2), WH006 (c.1-2) and WH007 (d.1-2)



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Figure 9: MSA and LSA finds (WH002) - a: notched piece; b: bladelette core; c: prismatic blade core; d: scraper. All chert except for d (hornfels).

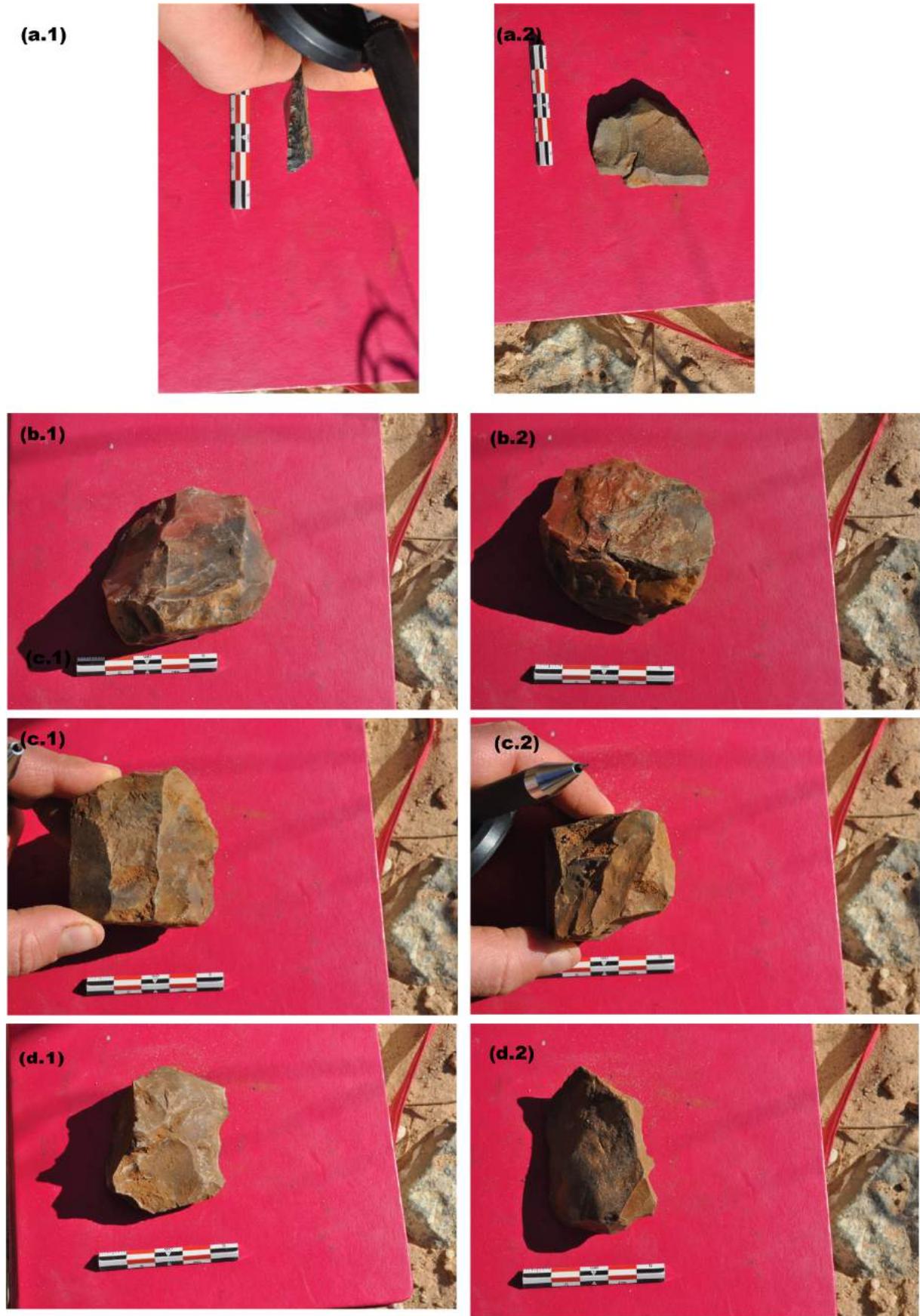


Figure 10: MSA and LSA finds (WH003) - a: notched piece; b: Levallois core; c: Levallois core; d: simple core-on-flake.

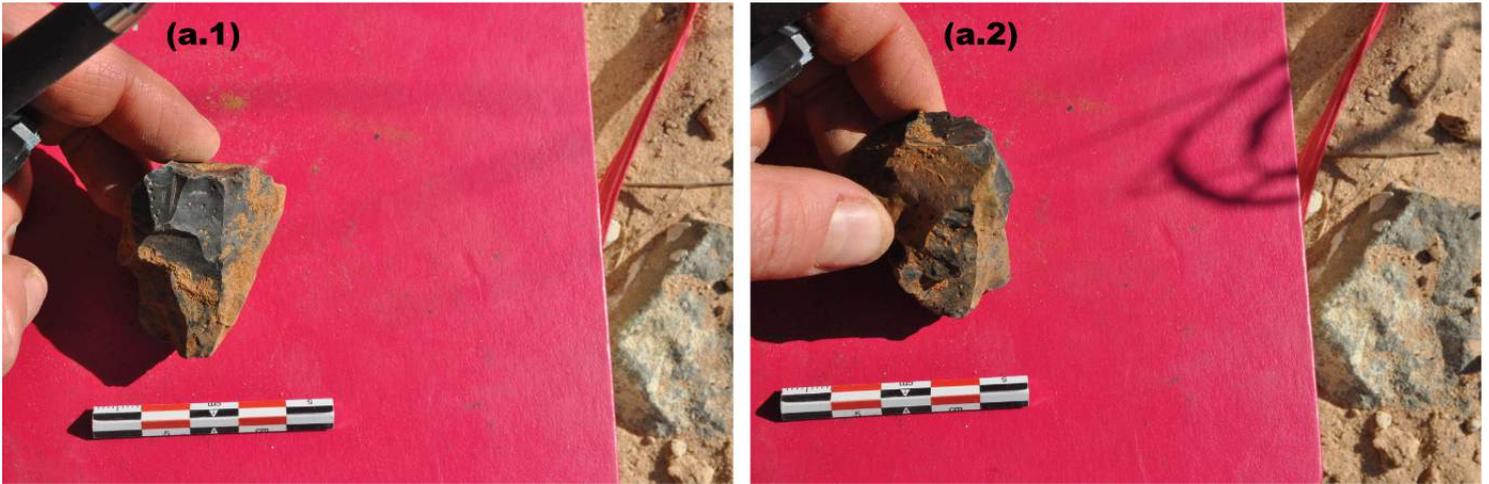


Figure 11: WH008 - Bladelette core on hornfels (LSA).

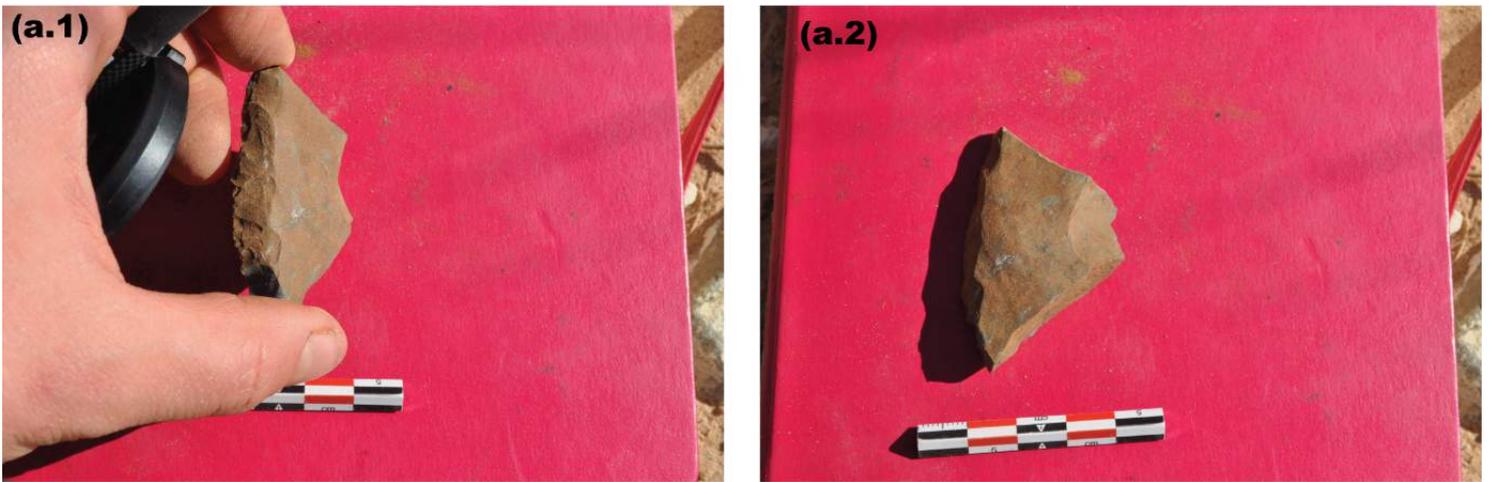


Figure 12: Patinated scraper on chert (MSA or LSA).

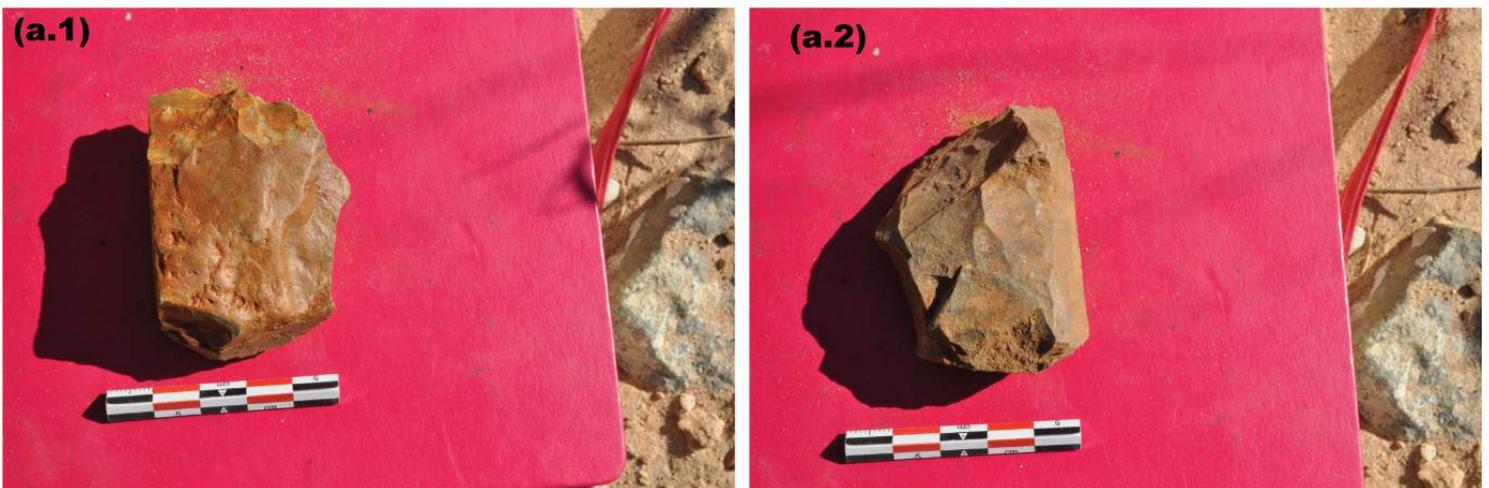


Figure 13: WH009 - Bipolar core on chert (MSA or LSA).



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Figure 14: Two artefact scatters exposed through top-soil removal (a-b) and intensive grazing (c-d). WH002, Artefact scatter 1 (c-d) and WH003, Artefact scatter 2 (a-b).

5. ASSESSMENT OF THE IMPACT OF THE DEVELOPMENT

5.1 Assessment of impact to Archaeological Resources

The findings of this field assessment largely correlate with the findings of Van der Walt (2016). The fieldwork identified a number of archaeological resources located within the development area for the overhead powerline. It has been determined that the archaeological resources observed in this assessment are all *ex situ*, and the potential for finding a dateable *in-situ* archaeological horizon based on current surface observations appears to be low. The archaeological resources identified therefore have scientifically LOW-SIGNIFICANCE and are graded IIIC.

As these resources are located within the development area for the OHL, it is likely that these resources will be negatively impacted by the proposed development. Mitigation measures are proposed below in order to limit the negative impact to these resources.

Furthermore, it is possible that additional archaeological resources are present below the ground surface which may be impacted by the proposed development.



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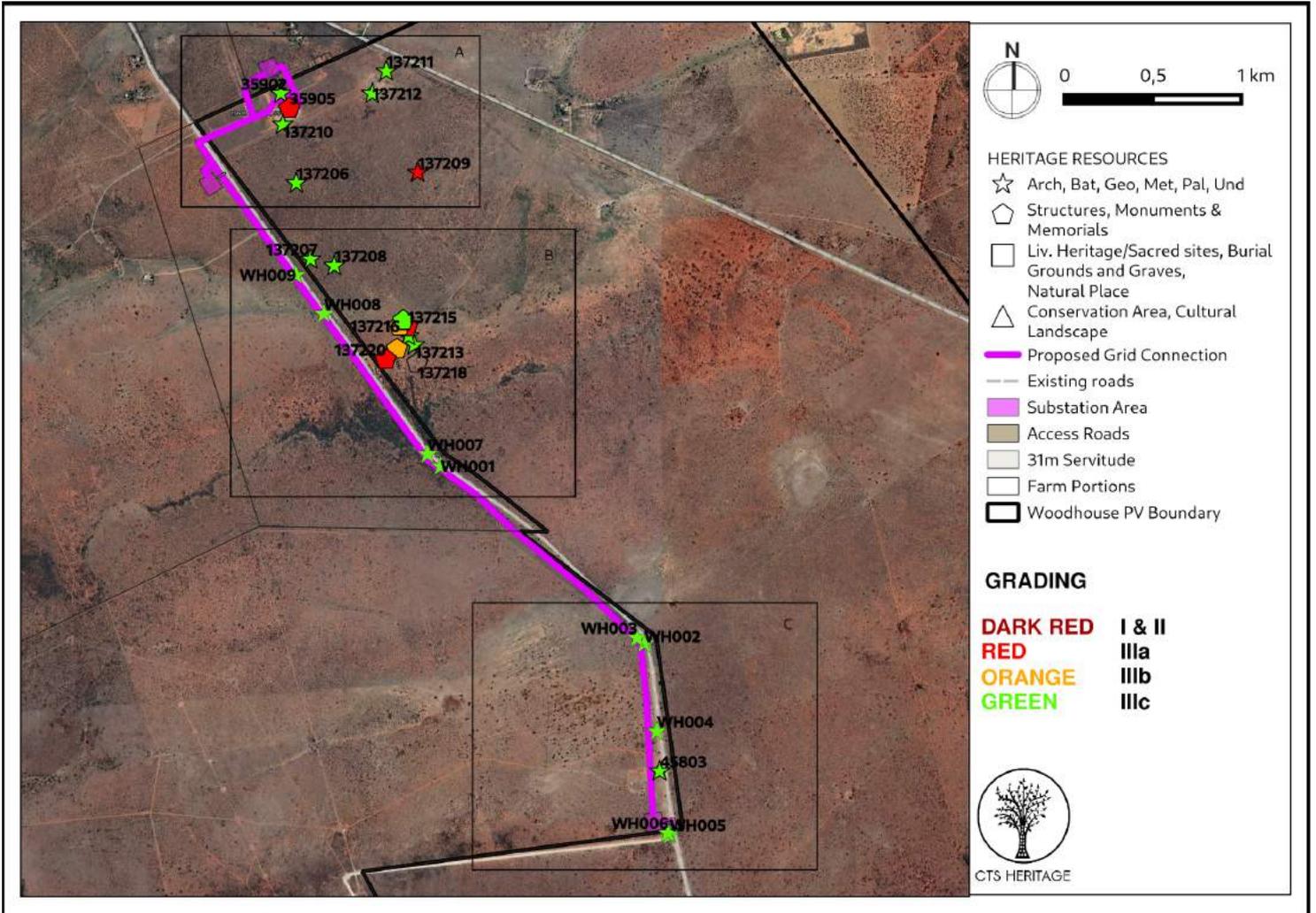


Figure 15.1: Map of heritage resources identified during the field assessment, relative to the study area and associated archaeological sensitivity



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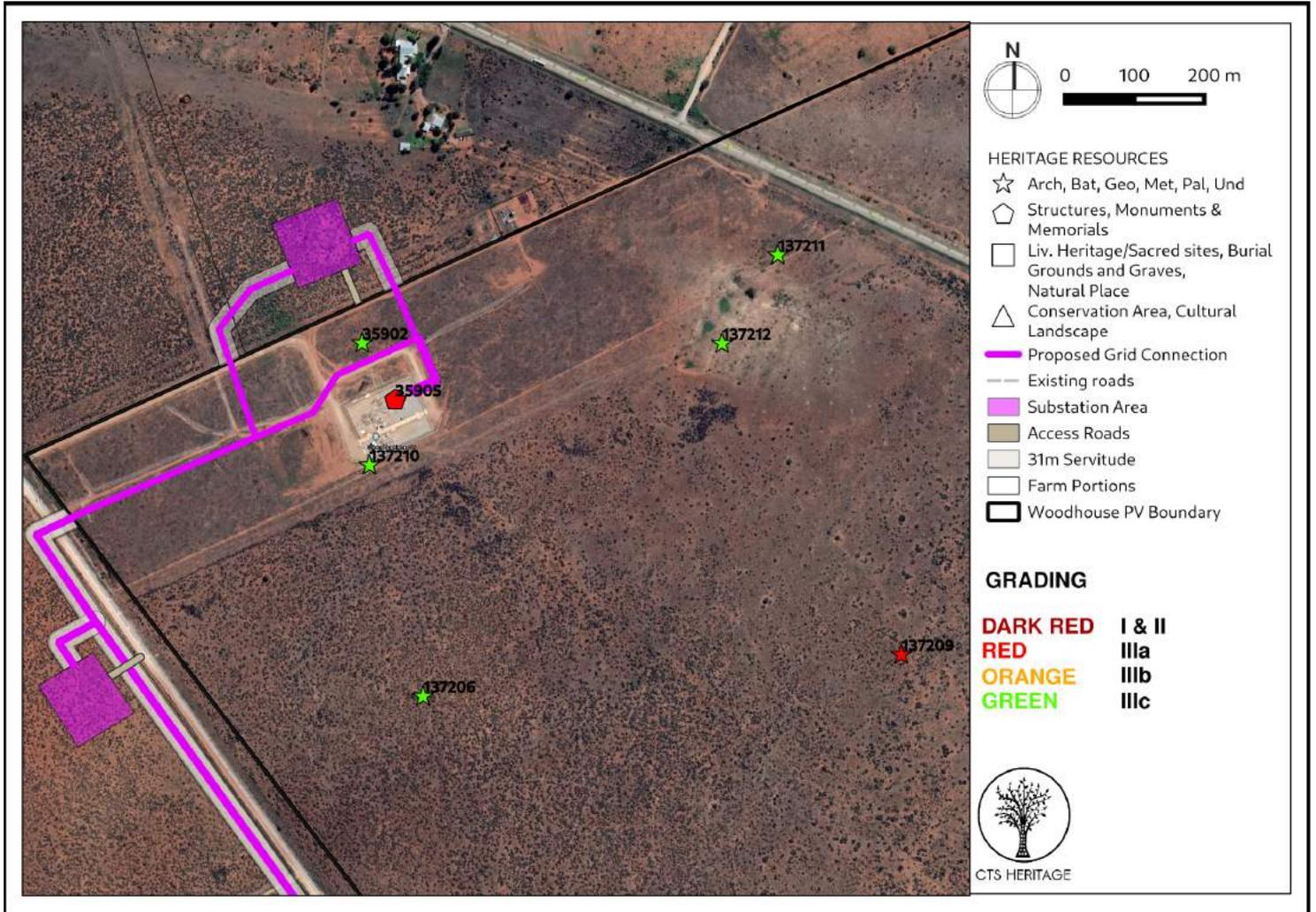


Figure 15.2: Inset A



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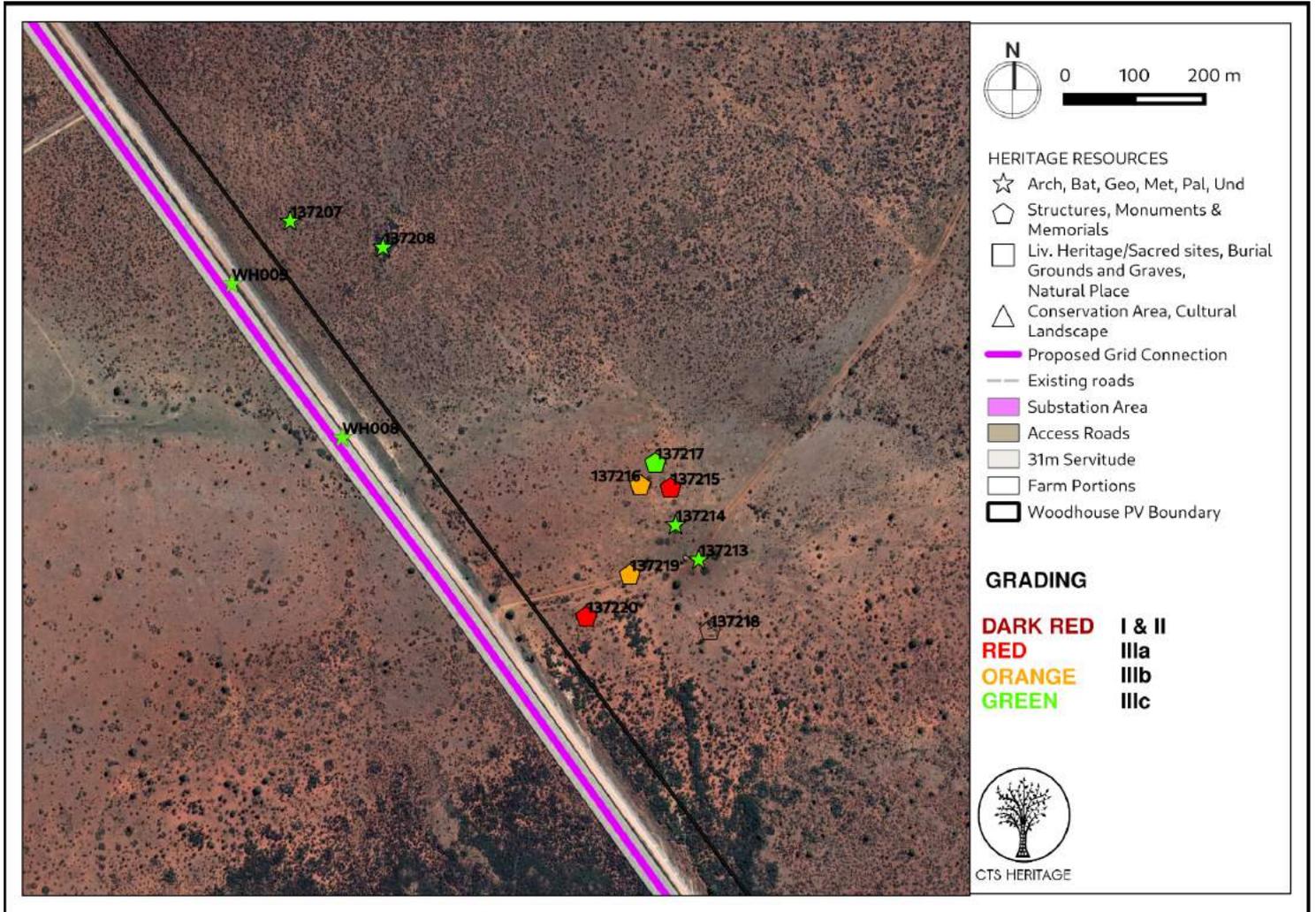


Figure 15.3: Inset B

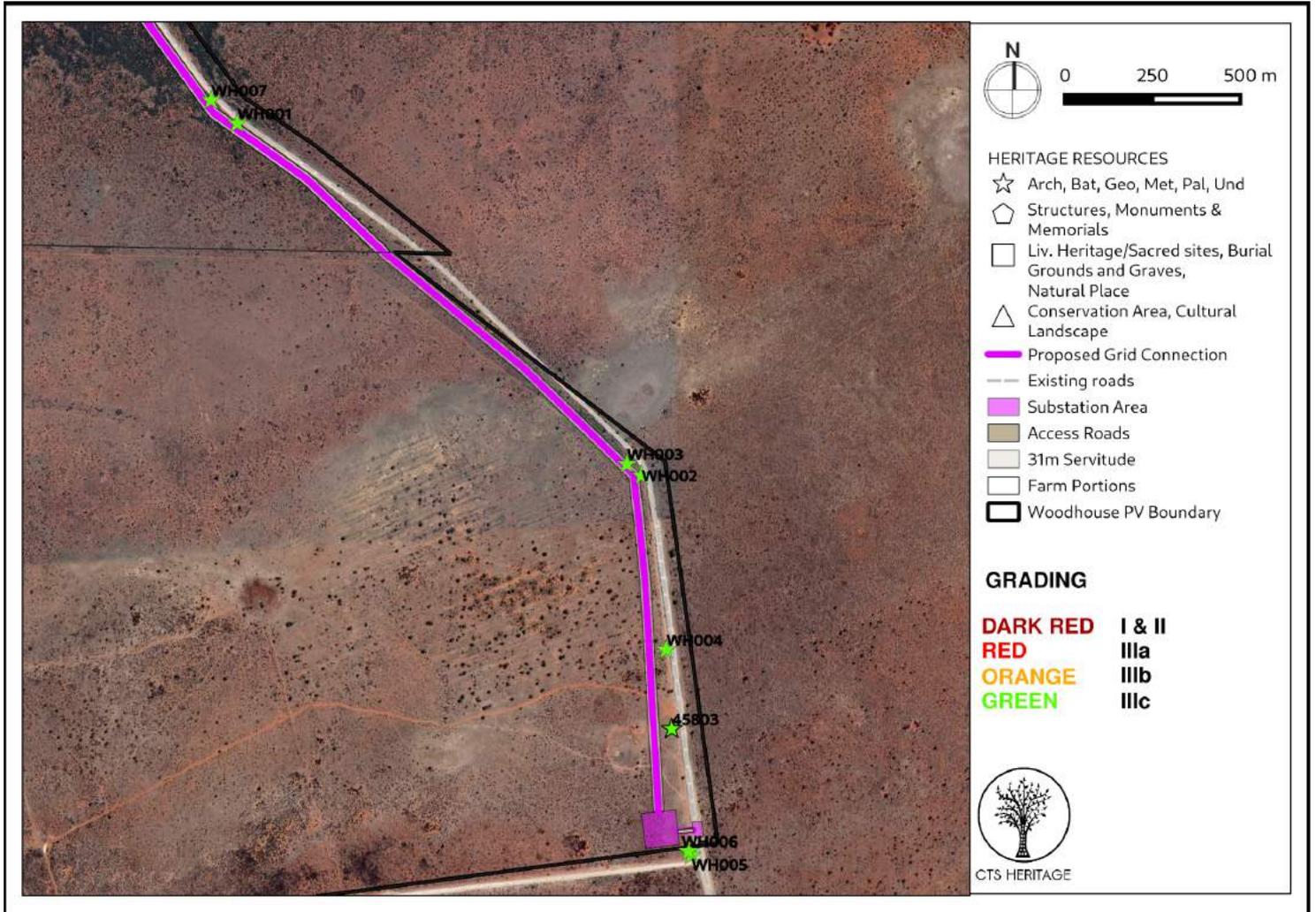


Figure 15.4: Inset C

6. CONCLUSION AND RECOMMENDATIONS

The findings of this field assessment largely correlate with the findings of Van der Walt (2016). The archaeological resources identified were all *ex situ* and are of low heritage significance.

It is likely that the proposed development of the OHL will negatively impact these resources as they are located within the development area. It is therefore recommended that the placement of the pylons is carefully considered in order to ensure that these resources are not negatively impacted.

Furthermore, it is possible that archaeological resources may be located beneath the ground surface which may be impacted during the course of development. Recommendations in this regard are included below.



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Recommendations

There is no objection to the proposed development of the Woodhouse overhead powerline in terms of impacts to archaeological heritage on condition that:

- The placement of the pylon footings is carefully considered in order to avoid impact to the sites mapped in Figure 14.1 to 14.4 above.
- Should any buried archaeological resources or burials be uncovered during the course of development activities, work must cease in the vicinity of these finds. The South African Heritage Resources Agency (SAHRA) must be contacted immediately in order to determine an appropriate way forward.



7. REFERENCES

Heritage Impact Assessments				
Nid	Report Type	Author/s	Date	Title
2147	HIA Phase 1	Johnny Van Schalkwyk	01/06/2012	Heritage impact assessment for the PROPOSED DEVELOPMENT OF PHOTOVOLTAIC POWER PLANTS ON FOUR DIFFERENT LOCATIONS IN NORTH WEST AND NORTHERN CAPE PROVINCES
8372	HIA Phase 1	Johnny Van Schalkwyk	01/10/2008	Heritage Impact Survey Report for the Proposed 400/132 kV Vryburg Substation and Loop-In Lines, North West Province
89376	HIA Phase 1	Johnny Van Schalkwyk	01/10/2012	Heritage impact assessment for the PROPOSED DEVELOPMENT OF A PHOTOVOLTAIC POWER PLANT ON A PORTION OF THE FARM WATERLOO 992, VRYBURG REGION, NORTH WEST PROVINCE
109477	PIA Phase 1	John E Almond	01/01/2013	PALAEONTOLOGICAL HERITAGE ASSESSMENT: COMBINED DESKTOP & FIELD-BASED STUDY Proposed PV Solar Facility on a portion of the farm Waterloo 992 near Vryburg, Naledi Local Municipality, North-West Province
109478	PIA Desktop	John E Almond	01/01/2013	PALAEONTOLOGICAL HERITAGE ASSESSMENT: DESKTOP STUDY Proposed PV Solar Facility on a portion of the farm Rosendal 673 near Vryburg, Naledi Local Municipality, North-West Province
156955	AIA Phase 1	Jaco van der Walt	11/12/2013	Archaeological Impact Assessment for the Proposed Tiger Kloof Photovoltaic Solar Energy Facility near Vryburg, North West Province
156958	Palaeontological Specialist Reports	John E Almond	30/11/2013	Proposed Tiger Skloof Photovoltaic Solar Energy Facility near Vryburg, Naledi Local Municipality, North-West Province
177017	Heritage Impact Assessment Specialist Reports	Johnny Van Schalkwyk	31/08/2014	BASIC HERITAGE ASSESSMENT FOR THE PROPOSED MOOKODI 132KV PHASE 2 POWER LINES DEVELOPMENT, NORTH WEST PROVINCE
358386	Palaeontological Specialist Reports	John Edward Almond		Palaontological Heritage Assessment: Combined Desktop & Field-Based Study: Proposed Gamma Solar Power Plant on the Remaining Extent of Portion 4 (Bos Kop), Farm Champions Kloof 731, North-West Province
358387	Palaeontological Specialist Reports	John Edward Almond		Palaeontological Heritage Assessment: Combined Desktop & Field-Based Study: Proposed Khubu Solar Plant on Portion 5 (Shadow Eve) (Portion of Portion 4). Farm Champions Kloof 731 near Vryburg. Naledi Local Municipality. North-West Province
358388	Heritage Impact Assessment Specialist Reports	Johnny Van Schalkwyk		Cultural heritage Impact assessment for the Development of the Proposed Khubu Solar Power Plant in the Portion 5 of the Farm CHampions Kloof 731, Vryburg Region, North West Province
343610	Archaeological Specialist	Jaco van der Walt	09/11/2015	Archaeological Scoping Report for the Proposed Woodhouse Solar 1 and Woodhouse Solar 2 PV Facilities close to Vryburg, NW Province



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	Reports			
343611	Palaeontological Specialist Reports	Elize Butler	25/09/2015	Palaeontological Impact Assessment of the Proposed Woodhouse PV Solar Energy Facilities and Associated Infrastructure on the Remaining Extent of Farm Woodhouse 729, near Vryburg, NW Province
361091	HIA Phase 1	David Morris	01/04/2014	Appendix D3 Vryburg WWTW Heritage Specialist Report
362237		Johnny Van Schalkwyk	29/01/2016	Cultural heritage impact assessment for THE DEVELOPMENT OF THE PROPOSED GAMMA SOLAR POWER PLANT ON PORTION 4 OF THE FARM CHAMPIONS KLOOF 731, VRYBURG REGION, NORTH WEST PROVINCE
364708	Heritage Impact Assessment Specialist Reports	Wouter Fourie	26/05/2016	75MW SOLAR PHOTOVOLTAIC (PV) ENERGY FACILITY – SENDAWO SOLAR 3 Heritage Impact Assessment
364718	Heritage Impact Assessment Specialist Reports	Wouter Fourie	19/05/2016	SENDAWO POWERLINE ALTERNATIVES – SENDAWO PROJECTS Heritage Impact Assessment
365017	Heritage Impact Assessment Specialist Reports	Johnny Van Schalkwyk	01/03/2016	Cultural heritage impact assessment for THE EXTENSION OF THE PROPOSED SOLAR POWER PLANT ON A PORTION OF THE FARM WATERLOO 992, VRYBURG REGION, NORTH WEST PROVINCE
367821		John Almond	07/01/2013	Palaeontological Heritage Assessment: Combined Desktop & Field-based Study: Proposed PV Solar Facility on a portion of the farm Waterloo 992 near Vryburg, Naldi Local Municipality, North West Province
374639	Archaeological Specialist Reports	Jaco van der Walt	30/04/2016	Archaeological Impact Assessment Report for the proposed Woodhouse 1 Solar PV Facility near Vryberg, North West Province
374641	Palaeontological Specialist Reports	Elize Butler	10/04/2016	Palaeontological Impact Assessment Report for the proposed Woodhouse 1 Solar PV Facility near Vryberg, North West Province
374673	Archaeological Specialist Reports	Jaco van der Walt	30/04/2016	Archaeological Impact Assessment Report for the proposed Woodhouse 2 Solar PV Facility near Vryberg, North West Province
374960	Palaeontological Specialist Reports	Elize Butler	10/04/2016	Palaeontological Impact Assessment Report for the proposed Woodhouse 2 Solar PV Facility near Vryberg, North West Province



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Mucina, L. and Rutherford, M.C., 2006. *The vegetation of South Africa, Lesotho and Swaziland*. South African National Biodiversity Institute.



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APPENDIX 3: Palaeontological Assessment (2016)

**PALAEONTOLOGICAL IMPACT ASSESSMENT OF THE PROPOSED
WOODHOUSE PHOTOVOLTAIC SOLAR ENERGY FACILITIES AND
ASSOCIATED INFRASTRUCTURE ON THE REMAINING EXTENT OF FARM
WOODHOUSE 729, NEAR VRYBURG, NORTH WEST PROVINCE**

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EXECUTIVE SUMMARY

Genesis Eco-energy Developments proposes the development of two commercial photovoltaic (PV) solar energy facilities as well as associated infrastructure on the Remaining Extent of Farm Woodhouse 729, south east of Vryburg, Naledi Local Municipality and within the greater Dr Ruth Segomotsi Mompati District Municipality, North West Province. According to the National Heritage Resources Act (Act No 25 of 1999, section 38), a palaeontological impact assessment is required to detect the presence of fossil material within the proposed development site.

The development site is underlain by Ghaap Group (Schmidtsdrif Subgroup and Vryburg Formation), and the Dwyka Group of the Karoo Supergroup. The geologically older Vryburg Formation (2.6 billion year-old) consists of fluvial and shallow marine quartzites, mudrocks and conglomerates, while the Dwyka Group [317 Million years (Ma)] consists of Permo-carboniferous glacial sediments. Small outcrops on the north-western and south-eastern borders consist of Permo-Carboniferous glacial rocks of the Dwyka Group (Karoo Supergroup). Although trace fossils and plants could be present in the Dwyka the likelihood of significant fossil heritage in the Vryburg area is considered to be low. The central area of the development area consists of the Vryburg Formation, while a small outcrop of the Schmidtsdrif Subgroup is present in the south western margin of the development area. Stromatolite assemblages are recorded within the Schmidtsdrif Subgroup and Vryburg Formation. The Boomplaas Formation stromatolites represent some of the oldest examples of these microbial fossils in South Africa. Detailed descriptions of these fossils have yet to be documented while their stratigraphic and geographical distributions are poorly understood. It is thus recommended that an EIA report must be conducted to assess the value and prominence of stromatolites in the development area and the effect of the proposed development on the palaeontological heritage.

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1. INTRODUCTION

The Department of Environmental Affairs (DEA) contributes to the execution of the National Development Plan and National Infrastructure Plan by undertaking Strategic Environmental Assessments (SEAs). Its function is to identify adaptive processes that simplify the regulatory environmental requirements for Strategic Integrated Projects (SIPs), while protecting the environment. Wind and solar photovoltaic (PV) Strategic Environmental Assessments was thus commissioned by the DEA in support of the Strategic Integrated Projects to assist the implementation of sustainable green energy.

The SEA recognizes areas where large scale wind and solar PV facilities can be developed and restrict negative impacts on the environment, while producing the highest possible socio-economic benefits to the country. These areas are known as the Renewable Energy Development Zones (REZDs). The solar PV assessments domain was identified by the location of the majority of existing solar PV project applications and includes Northern Cape, Western Cape, Free State and North West, although solar PV energy facilities is not limited to these areas.

Sensitivity maps for the proposed REDZs have been created by scoping pre-assessments which are based on available data. However, these sensitivity maps are not comprehensive enough to aid in project level decision making. According to the National Environmental Management Act (NEMA) (Act 107 of 1998) Basic Assessments will thus be conducted in accordance with relevant regulations to assist in Environmental Authorisation.

Savannah Environmental (Pty) Ltd has been appointed as the independent Environmental Assessment Practitioners (EAP) by Genesis Eco-energy Developments for the undertaking of the Environmental Impact Assessment process for the proposed Woodhouse Solar Facilities. The construction of two commercial photovoltaic (PV) solar energy facilities as well as associated infrastructure on the Remaining Extent of Farm Woodhouse 729, south east of Vryburg, Dr Ruth Segomotsi Mompati District Municipality is proposed (Figure 1).

The two projects are to be developed as stand-alone projects by Genesis Eco-energy Developments under two separate Special Purpose Vehicles namely Genesis Woodhouse Solar 1 (Pty) Ltd and Genesis Woodhouse Solar 2 (Pty) Ltd. **Site-specific studies will be undertaken to assess the localised impact of the proposed development in order to define areas of sensitivity within the farm. Once the limiting environmental factors have been identified, the layout for each proposed facility can be finalised, and will then be assessed in detail in the EIA Phase.**

Individually the PV facilities are proposed to include several arrays of photovoltaic solar panels with a contracted capacity of up to 100MW. The development footprint for each facility is expected to be approximately 300 hectares in total.

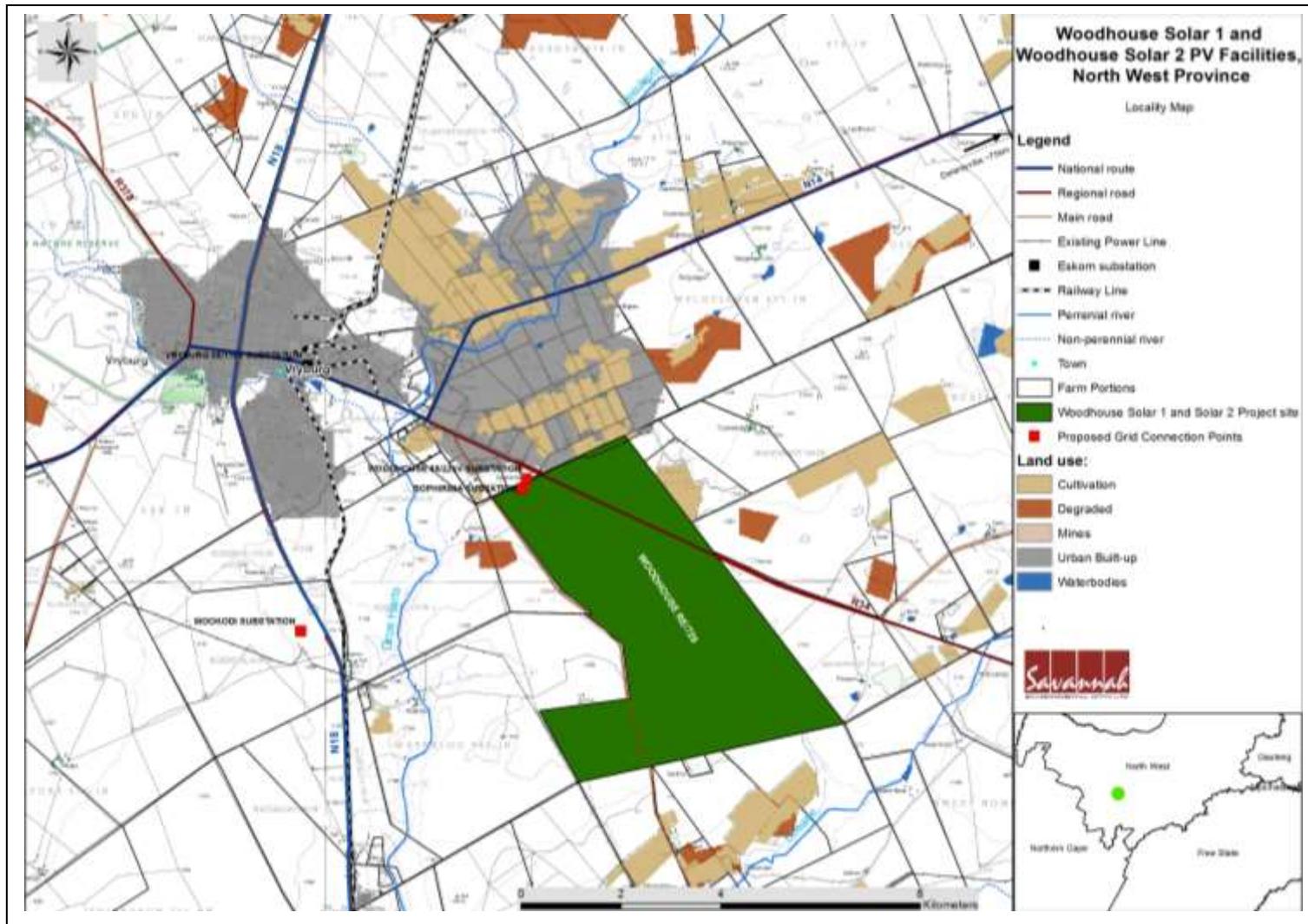


Figure 1. Location of the proposed Woodhouse Solar Facility (filled in green) on the remainder of Woodhouse 729, near Vryburg, Dr Ruth Segomotsi Mompoti District Municipality, North West Province. Map provided by Savannah Environmental.

The infrastructure associated with each facility will include:

- Arrays of PV panels with a capacity of up to 100MW
- Mounting structures to support the PV panels
- On-site inverters to convert the power from a direct current to an alternating current and a substation to facilitate the connection between the solar energy facility and the Eskom electricity grid
- A new 132kV power line between the on-site substation and the Eskom grid connection point.
- Three alternatives are being considered for the grid connection:
 - A direct connection to the proposed Eskom Bophirima substation to be constructed on-site, or
 - A direct connection to the existing Mookodi 400/132KV substation located to the west of the site, or
 - A connection to the existing Woodhouse 88/22KV Substation located on the boundary of the site in the north
- Cabling between the project components, to be laid underground where practical
- Offices and workshop areas for maintenance and storage
- Temporary laydown areas
- Internal access roads and fencing around the development area

1.1 TECHNOLOGICAL BACKGROUND

Use of solar PV Technology as the renewable energy technology for the project (information provided by Savannah Environmental):

The PV panels are designed to operate continuously and unattended and with low maintenance for more than 20 years. Solar energy facilities, such as those using PV panels use the sun's energy to generate electricity through a process known as the **Photovoltaic Effect**. This entails light photons colliding with electrons, and consequently placing the electrons into a higher state of energy to create electricity. The Solar PV facilities will include the following components:

- **Photovoltaic Cell**

Individual PV cells (static or tracking) are linked and placed behind a protective glass sheet to form a photovoltaic panel.

- **Inverter**

The photovoltaic effect generates electricity in direct current (DC). Therefore an inverter is required to change it to an alternating current (AC).

- **Support Structure**

The PV panels will be attached to a support structure up to 6 m off the ground, set at an angle to receive the maximum amount of solar radiation (fixed technology), or

set to track the sun (tracking technology) in order to increase the total amount of energy produced.

These developments will modify the existing topography and may disturb, damage or destroy scientific valuable fossil heritage exposed at the surface or buried below ground. Palaeontological material is unique and non-renewable and is protected by the National Heritage Resources Act (Act No. 25 of 1999, section 38). A Palaeontological Impact Assessment of the proposed development is therefore necessary to certify that palaeontological material is either removed, or is not present.

2 LEGISLATION

Cultural Heritage in South Africa is governed by the National Heritage Resources Act (Act 25 of 1999). This Palaeontological Scoping Study forms part of the Heritage Impact Assessment (HIA) and complies with the requirements of the above mentioned Act. In accordance with Section 38, an HIA is required to assess any potential impacts to palaeontological heritage within the development footprint.

SECTION 25 OF THE NATIONAL HERITAGE RESOURCES ACT 1999

The various categories of heritage resources are recognised as part of the National Estate in Section 3 of The National Heritage Resources Act. This include among others:

- geological sites of scientific or cultural importance
- palaeontological sites
- palaeontological objects and material, meteorites and rare geological specimens

According to Section 25 of the National Heritage Resources Act 1999, dealing with archaeology, palaeontology and meteorites:

- The protection of archaeological and palaeontological sites and material and meteorites is the responsibility of a provincial heritage resources authority
- All archaeological objects, palaeontological material and meteorites are the property of the State
- Any person who discovers archaeological or palaeontological objects or material or a meteorite in the course of development or agricultural activity must immediately report the find to the responsible heritage resources authority, or to the nearest local authority offices or museum, which must immediately notify such heritage resources authority
- No person may, without a permit issued by the responsible heritage resources authority—

- destroy, damage, excavate, alter, deface or otherwise disturb any archaeological or palaeontological site or any meteorite
- destroy, damage, excavate, remove from its original position, collect or own any archaeological or palaeontological material or object or any meteorite
- trade in, sell for private gain, export or attempt to export from the Republic any category of archaeological or palaeontological material or object, or any meteorite; or
- bring onto or use at an archaeological or palaeontological site any excavation equipment or any equipment which assist in the detection or recovery of metals or archaeological and palaeontological material or objects, or use such equipment for the recovery of meteorites.
- When the responsible heritage resources authority has reasonable cause to believe that any activity or development which will destroy, damage or alter any archaeological or palaeontological site is under way, and where no application for a permit has been submitted and no heritage resources management procedure in terms of section 38 has been followed, it may—
 - serve on the owner or occupier of the site or on the person undertaking such development an order for the development to cease immediately for such period as is specified in the order
 - carry out an investigation for the purpose of obtaining information on whether or not an archaeological or palaeontological site exists and whether mitigation is necessary

3 Objective

According to the "SAHRA APM Guidelines: Minimum Standards for the Archaeological and 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 assess 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.

The objective is thus to conduct a desktop/scoping study to determine the impact on potential palaeontological material at this site.

When a palaeontological desktop/scoping study is conducted, the potentially fossiliferous rocks (i.e. groups, formations, members, etc.) represented within the study

area are determined from geological maps. The known fossil heritage within each rock unit is collected from published scientific literature; Fossil sensitivity map; consultations with professional colleagues, previous palaeontological impact studies in the same region and the databases of various institutions may be consulted. This data is then used to assess the palaeontological sensitivity of each rock unit of the study area. The likely impact of the proposed development on local fossil heritage is subsequently established on the basis of

- the palaeontological sensitivity of the rocks and
- the nature and scale of the development itself (extent of new bedrock excavated)

When rocks of moderate to high palaeontological sensitivity are present within the study area, a field-based assessment by a professional palaeontologist is necessary. Based on this desktop data as well as a field examination of representative exposures of all major sedimentary rock present, the impact significance of the planned development is considered with recommendations for any further studies or mitigation.

4 BACKGROUND TO THE GEOLOGICAL AND PALAEOLOGICAL HISTORY

The development area near Vryburg is underlain by the Ghaap Group (Schmidtsdrif Subgroup, Vryburg Formation), and the Dwyka Group of the Karoo Supergroup. The geologically older Vryburg Formation (2.6 billion year-old) consists of fluvial and shallow marine quartzites, mudrocks and conglomerates, while the Dwyka Group [317 Million years (Ma)] consists of Permo-carboniferous glacial sediments (Fig. 2-3).

The proposed development site near Vryburg consists of characteristic flat-lying terrain of the Ghaap Plateau region. The climate is semi-arid and the vegetation cover of grassy thornveld is mapped as Ghaap Plateau Vaalbosveld. Small, low and scattered bedrock exposure may be present on the development site, but the literature states that the exposures are rare apart from along river banks and steeper hill slopes (Almond, 2013). Images from Google Earth show a flat relief and bedrock mantled by reddish-brown soils. These sandy soils contain abundant gravel clasts, primarily cherty material down washed from the underlying Boomplaas Formation (Eriksson, *et al.*, 2006).

The Dwyka Group, present in the proposed study area in the north-eastern and south-western margins, represents the lowermost unit of the Karoo Supergroup. It consists almost throughout of gravelly sediments with subordinate varved shale and mudstone containing scraped and faceted pebbles. These sediments are supposed to be of glacial origin and in places these materials have been deposited on typical glacier floors. In the Vryburg region this succession mainly comprises of glacial tillite or boulder mudstone and interglacial shale. Exposure levels are generally very poor, since the mudrock matrix easily weathers, and therefore the Dwyka outcrop area is represented at surface only by scattered erratic boulders (Keyser and Du Plessis 1993). The northern outcrops of the Dwyka Group may comprise of a low diversity non-marine trace fossil assemblages (fish and arthropod traces, *Rhizocorallium*) within interglacial mudrocks and dispersed vascular plant remains (*Glossopteris* leaves and petrified wood). Although these trace fossils and plants are considered to be a possibility, the likelihood of significant fossil heritage in the Vryburg area is considered to be low.

The south-western margin of the study area is underlain by ancient sedimentary rocks of the Schmidtsdrif Subgroup (Fig. 2) and consists of flat terrain. In the Griqualand West Basin, the Schmidtsdrif Subgroup is the basal subdivision of the Late Archaean to Early Proterozoic Ghaap Group (Transvaal Supergroup), Ghaap Plateau Sub-basin (Fig. 3). The Schmidtsdrif Subgroup can be divided into the geological older Boomplaas Formation and younger Clearwater Formation. The Ghaap Group represents 200 Ma of chemical sedimentation of which iron and manganese ores, cherts and carbonates with subordinate silicastic rocks are prominent within the Griqualand West Basin. The central and south-eastern (Fig. 2) portions of the study area are underlain by shallow marine or lagoon sediments as well as volcanic rocks of the Vryburg Formation. This Formation is roughly 140 m thick and overlies lavas of the Ventersdorp Supergroup. The lower portion

of the Vryburg succession consists of basal conglomerates followed by the 20 m thick Kobaga beds which show prominent weathering of cross-bedded feldspathic quartzites. The Kobaga beds are overlain by c. 20 m andesitic or basaltic lavas of the Rosendal Member and finally by the Waterloo Member which consists of c. 20-50 m of amygdaloidal and non-amygdaloidal basaltic or andesitic lavas and is overlain by 14 m of interbedded pyroclastic sediments and thin lenticular limestones. These sediments form the top of the Vryburg Formation and are followed by the overlying carbonate-rich Boomplaas Formation which is present in the study area. The Boomplaas Formation is known to contain well-preserved stromatolite (microbial dome) assemblages in the Vryburg region. It is very likely that comparable, scientifically important fossil stromatolites also occur on Woodhouse 729.

Microbial stromatolites in the upper Vryburg Formation were described by Smith (1991). The stromatolitic carbonates are interpreted to be intertidal (Altermann and Wotherspoon, 1995). Detailed descriptions of the Vryburg stromatolite occurrences are not present in the literature although South African Archaean stromatolites have been discussed in detail (Altermann, 2001; Buick, 2001; and Schopf, 2006). Columnar stromatolites from the Schmidtsdrif Subgroup of the Northern Cape have been described by Bertrand-Sarfati and Eriksson (1977).

The Boomplaas beds are characterized by grey dolomites which weathers reddish-brown with subordinate interbeds of limestone (weathering blue-grey), quartzite, flaggy sandstone and shale. Oolitic and stromatolitic dolomite alternating with intervals of carbonaceous possible lagoonal mudrocks containing interbeds of calcareous sandstone and mudclast breccias is present. The Boomplaas beds are overlain by the grey- to khaki-hued mudrocks and interbedded dolomites, flagstones, tuffites and BIF-like cherts of the Clearwater Formation (= Lokamonna Formation), the topmost unit of the Schmidtsdrif Subgroup. Stromatolites and oolites from the Transvaal Supergroup have been described by various authors (Keyser and Du Plessis, 1993; Truswell and Eriksson, 1973; Eriksson and Altermann, 1998).

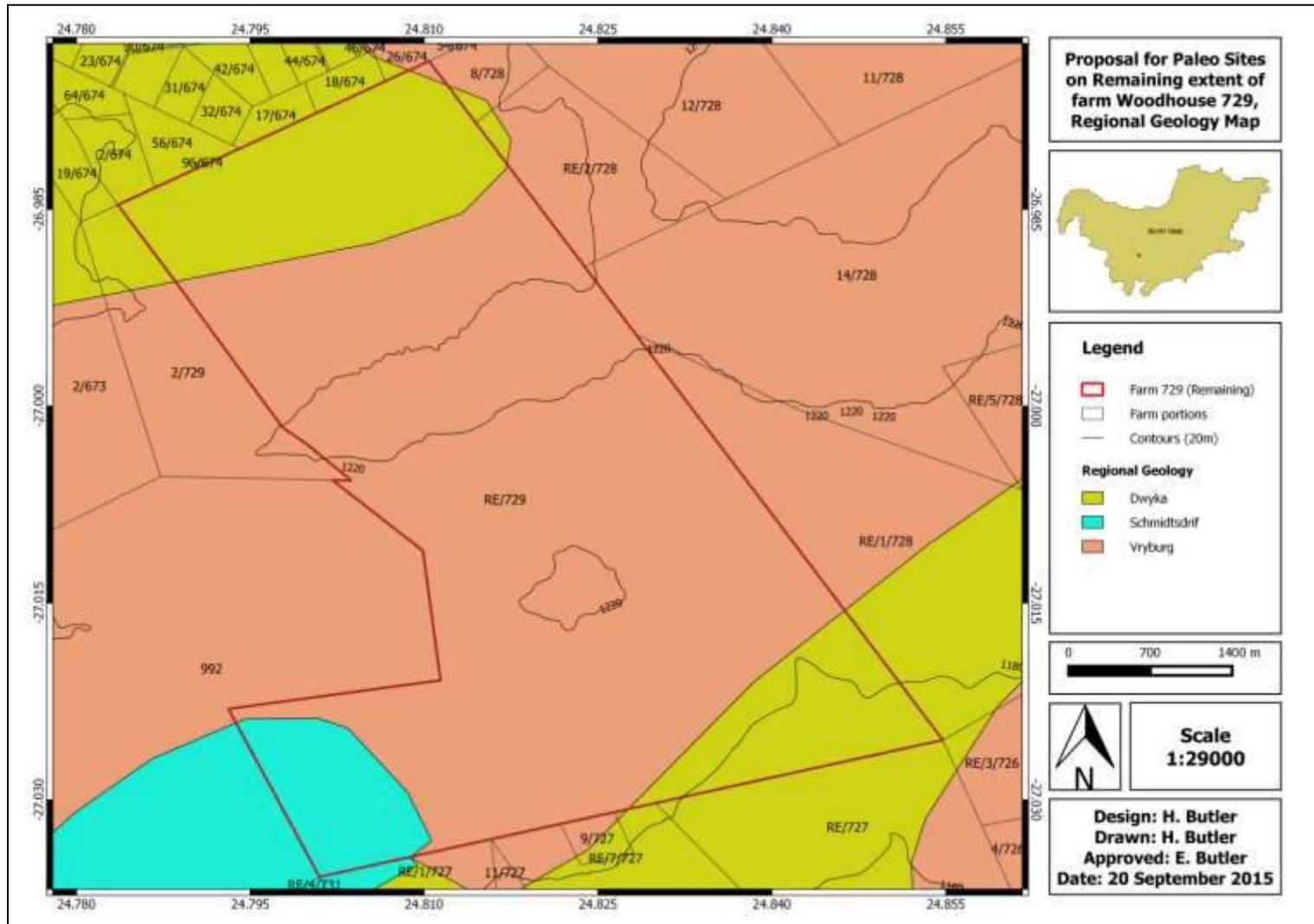


Figure 2. The surface geology of the proposed Woodhouse development area near Vryburg, Dr Ruth Segomotsi Mompot District Municipality. The development area is underlain by Dwyka Permo-Carboniferous glacial sediments and Schmidtsdrif Subgroup (Ghaap Group, Transvaal Supergroup of the Vryburg Formation). (Modified from the 1: 250 000 geological map 2724 Christiana (Council for Geoscience, Pretoria)

5 GEOGRAPHICAL LOCATION OF THE SITE

The proposed development site is located approximately 10 km south east of Vryburg and falls under the jurisdiction of the Dr Ruth Segomotsi Mompati District Municipality, North West Province (Fig.1).

6 METHODS

A Palaeontological Scoping study was conducted to assess the potential risk to palaeontological material (fossil and trace fossils) in the proposed area of development. The author's experience, aerial photos (using Google, 2015), topographical and geological maps and other reports from the same area were used to assess the proposed area of the development.

6.1.1 Assumptions and Limitations

The accuracy and reliability of desktop Palaeontological Impact Assessments as components of heritage impact assessments are normally limited by the following restrictions:

- Old fossil databases that have not been kept up-to-date or are not computerized. These databases do not always include relevant locality or geological information. South Africa has a limited number of professional palaeontologists that carry out fieldwork and most development study areas have never been surveyed by a palaeontologist
- The accuracy of geological maps where information may be based solely on aerial photographs and small areas of significant geology have been ignored. The sheet explanations for geological maps are inadequate and little to no attention is paid to palaeontological material
- Impact studies and other reports (*e.g.* of commercial mining companies) - is not readily available for desktop studies

Large areas of South Africa have not been studied palaeontologically. Fossil data collected from different areas but in similar Assemblage Zones might however provide insight on possible occurrence of fossils in an unexplored area. Desktop studies of this nature therefore usually assume the presence of unexposed fossil heritage within study areas of similar geological formations. Where considerable exposures of bedrocks or potentially fossiliferous superficial sediments are present in the study area, the reliability of a palaeontological impact assessment may be significantly improved through field assessment by a professional palaeontologist.

7 IMPACT ASSESSMENTS

An assessment of the impact significance of the proposed photovoltaic solar facilities on local fossil heritage on the Remaining Extent of the farm Woodhouse 729 is presented here:

7.1 Nature of the impact

The PV Solar Facilities will include the following infrastructures:

Each facility will include the following infrastructure:

- Arrays of PV panels with a capacity of up to 100MW
- Mounting structures to support the PV panels.
- On-site inverters to convert the power from a direct current to an alternating current and a substation to facilitate the connection between the solar energy facility and the Eskom electricity grid.
- A new 132kV power line between the on-site substation and the Eskom grid connection point. Three alternatives are being considered for the grid connection:
 - A direct connection to the proposed Eskom Bophirima substation to be constructed on-site, or
 - A direct connection to the existing Mookodi 400/132KV substation located to the west of the site, or
 - A connection to the existing Woodhouse 88/22KV Substation located on the boundary of the site in the north.
- Cabling between the project components, to be laid underground where practical.
- Offices and workshop areas for maintenance and storage.
- Temporary laydown areas.
- Internal access roads and fencing around the development area

The excavations and site clearance will involve substantial excavations into the superficial sediment cover as well as locally into the underlying bedrock. These excavations will modify the existing topography and may disturb damage, destroy or permanently seal-in fossils at or below the ground surface that are then no longer available for scientific research. According to the Geology of the study area there is a possibility of finding stromatolites (laminated microbial mounds).

7.2 Sensitive areas

The development area is underlain by Ghaap Group (Schmidtsdrif Subgroup, and Vryburg Formation), as well as the Dwyka Group of the Karoo Supergroup. Small outcrops of Permo-Carboniferous Dwyka Group, Vryburg Formation, (north-western and south-eastern borders) and Schmidtsdrif Subgroup (south-western margin) is present in

the development area. Although trace fossils and plants could be present in the Dwyka the likelihood of significant fossil heritage in the Vryburg area is considered to be low.

Stromatolite assemblages are recorded within the Schmidtsdrif Subgroup (south western margin of the development area) and Vryburg Formation (central area of the development area). The Boomplaas Formation (Schmidtsdrif Subgroup) stromatolites represent some of the oldest examples of these fossils in South Africa. Detailed descriptions of these fossils have yet to be documented while their stratigraphic and geographical distributions are poorly understood.

7.3 Extent of impact

A significant negative impact on fossil materials and thus palaeontological heritage will be limited to the construction phase when new excavations into fresh potentially fossiliferous bedrock take place. The extent of the area of potential impact is thus restricted to the project site and therefore categorised as **local**.

7.4 Duration of impact

The expected duration of the impact is assessed as potentially permanent to long term. In the absence of mitigation procedures (should fossil material be present within the affected area) the damage or destruction of any palaeontological materials will be **permanent**.

7.5 Potential significance of the impact

Should the project progress without due care to the possibility of fossils being present at the proposed development site within the Vryburg Formation the resultant damage, destruction or inadvertent relocation of any affected fossils will be **permanent and irreversible**. Thus, any fossils occurring within the study area are potentially scientifically and culturally significant and any negative impact on them would be of **high significance**.

7.6 Severity / benefit scale

The proposed project is potentially **beneficial** on not only a local level, but regional and national levels as well. The facilities will provide a long term benefit to the community in terms of the provision of electricity to a progressively stressed national electricity grid.

A potential **secondary advantage** of the project would be that the excavations may uncover fossils that were hidden beneath the surface exposures and, as such, would have remained unknown to science.

7.7 STATUS

Probability of the impact occurring

There is a possibility that concentrations of small to large stromatolites will be recorded in the proposed study area. Probable significant impacts on palaeontological heritage

during the construction phase are high, but the intensity of the impact on fossil heritage is rated as medium.

Intensity

The intensity of the impact on fossil heritage is rated as medium

8 DAMAGE MITIGATION, REVERSAL AND POTENTIAL IRREVERSIBLE LOSS

8.1 Mitigation

Should fossil material exist within the project area any negative impact upon it could be mitigated by surveying, recording, describing and sampling of well-preserved fossils within the study area by a professional palaeontologist. This should take place after initial vegetation clearance has taken place but *before* the ground is levelled for construction. Excavation of this fossil heritage will require a permit from SAHRA and the material must be housed in a permitted institution. In the event that an excavation is impossible or inappropriate the fossil or fossil locality could be protected and the site of any planned construction moved.

8.2 Degree of irreversible loss

Impacts on fossil heritage are generally irreversible. Well-documented records and further palaeontological studies of any fossils exposed during construction would represent a positive impact from a scientific perspective. The possibility of a negative impact on the palaeontological heritage of the area can be reduced by the implementation of adequate damage mitigation procedures. If damage mitigation is properly undertaken the benefit scale for the project will lie within the beneficial category.

8.3 Degree to which the impact may cause irreplaceable loss of resources

Stratigraphic and geographical distribution of Late Archaean stromatolites within the Schmidtsdrif Subgroup (including the Boomplaas Formation), is not documented in the literature. It is thus **not possible to accurately assess** the exceptional value of the stromatolite assemblages' present on Woodhouse 729. Better preserved specimens could be present on other areas in the Boomplaas Formation. By taking a precautionary approach, a significant loss of fossil resources is expected.

8.4 CUMULATIVE IMPACTS

Three proposed solar plant developments (excluding Woodhouse 792) are present in the surrounding areas. These include:

- A 19.5 MW solar plant on a northern portion of the farm Waterloo 992
- A 75 MW solar plant on a portion of the Remaining Extent of the farm Rosendal 673
- A 75 MW solar plant on the southern portion of the farm Waterloo 992

The cumulative effect of the three proposed solar plant developments is considered to be low.

9 FINDINGS AND RECOMMENDATIONS

The development area located within the Remaining Extent of the farm Woodhouse 729 is underlain by Ghaap Group (Schmidtsdrif Subgroup and Vryburg Formation), and the Dwyka Group of the Karoo Supergroup. Small outcrops of Permo-Carboniferous Dwyka Group, Vryburg Formation, (north-western and south-eastern borders) and Schmidtsdrif Subgroup (south-western margin) is present in the development area. Although trace fossils and plants could be present in the Dwyka the likelihood of significant fossil heritage in the Vryburg area is considered to be low.

Stromatolite assemblages are recorded within the Schmidtsdrif Subgroup (south western margin of the development area) and Vryburg Formation (central area of the development area). The Boomplaas Formation (Schmidtsdrif Subgroup) stromatolites represent some of the oldest examples of these fossils in South Africa. Detailed descriptions of these fossils have yet to be documented while their stratigraphic and geographical distributions are poorly understood. It is thus recommended that a EIA report must be conducted to assess the effect of the proposed development on the palaeontological heritage.

Should fossil remains be discovered during any phase of construction, either on the surface or exposed by fresh excavations, the ECO responsible for these developments should be alerted. Such discoveries ought to be protected (preferably *in situ*) and the ECO should alert SAHRA (South African Heritage Research Agency) so that appropriate mitigation (*e.g.* recording, sampling or collection) can be taken by a professional palaeontologist.

The specialist involved would require a collection permit from SAHRA. Fossil material must be curated in an approved collection (*e.g.* museum or university collection) and all fieldwork and reports should meet the minimum standards for palaeontological impact studies developed by SAHRA.

10 IMPACT TABLE

Impacts:			
There is a possibility that concentrations of small to large stromatolites will be recorded in the proposed development site. Probable significant impacts on palaeontological heritage during the construction phase are high.			
Desktop Sensitivity Analysis of the Site:			
ISSUE	NATURE OF IMPACT	EXTENT OF IMPACT	NO-GO AREAS
Loss of Palaeontological Heritage: stromatolites (laminated microbial mounds)	<p>Construction of the PV Facility will permanently modify the existing topography and may disturb damage, destroy or permanently seal-in fossils at or below the ground surface and are then no longer available for scientific research or as cultural heritage. Any fossils occurring in the project area are potentially scientifically and culturally significant and any negative impact on them would be of high significance.</p> <p>There is a possibility that concentrations of small to large stromatolites will be recorded in the proposed study area namely the Schmidtsdrif Subgroup (south western margin of the development</p>	Long term Local impact and limited to the construction phase	<p>At this point in time no-go areas have not been identified although palaeontological sensitive areas are present namely the Boomplaas and Vryburg Formations. Microbial stromatolites in the upper Vryburg Formation has been described although detailed occurrences of the Vryburg stromatolite has not been recorded in the literature. The stromatolites of the Boomplaas Formation is important as they represent some of the oldest examples of these fossils in South Africa.</p>

	<p>area) and Vryburg Formation (central area of the development area). Small outcrops on the north-western and south-eastern borders consist of Permo-Carboniferous glacial rocks of the Dwyka Group). Although trace fossils and plants could be present in the Dwyka the likelihood of significant fossil heritage in the Vryburg area is considered to be low.</p> <p>The destruction or inadvertent relocation of any affected fossils will be permanent and irreversible.</p>		
<p>Gaps in knowledge and recommendations for further study</p> <p>Stratigraphic and geographical distribution of Late Archaean stromatolites within the Schmidtsdrif Subgroup (including the Boomplaas Formation), is not documented in the literature. It is thus not possible to accurately assess the exceptional value of the stromatolite assemblages' present on Woodhouse 729 without an EIA.</p>			

11 REFERENCES

- ALMOND, J. E. 2013. *Proposed PV solar facility on a portion of the farm Waterloo 992 near Vryburg, Naledi local Municipality, North-West Province*, 29 pp.
- ALTERMANN, W. 2001. *The oldest fossils of Africa – a brief reappraisal of reports from the Archaean*. African Earth Sciences 33, 427-436.
- ALTERMANN, W. and WOTHERSPOON, J. McD. 1995. *The carbonates of the Transvaal and Griqualand West sequences of the Kaapvaal craton, with special reference to the Lime Acres limestone deposit*. Mineralium Deposita 30, 124-134
- BERTRAND-SARFATI, J. & ERIKSSON, K. A. 1977. *Columnar stromatolites from the Early Proterozoic Schmidtsdrift Formation, Northern Cape Province, South Africa-Part 1: Systematic and diagnostic features*. Palaeontologia Africana 20, 1-26.
- BUICK, K. 2001. *Life in the Archaean*. In: Briggs, D.E.G. & Crowther, P.R. (eds.) Palaeobiology II, 13-21. Blackwell Science, London.
- ERIKSSON, K.A. & TRUSWELL, J.F. 1973. *High inheritance elongate stromatolitic mounds from the Transvaal Dolomite*. Palaeontologia Africana 15, 23-28.
- ERIKSSON, K.A. & TRUSWELL, J.F. 1974. *Tidal flat associations from a Lower Proterozoic carbonate sequence in South Africa*. Sedimentology 21: 293-309.
- ERIKSSON, P.G. and ALTERMANN, W. 1998. *An overview of the geology of the Transvaal Supergroup dolomites (South Africa)*. Environmental Geology 36, 179-188.
- ERIKSSON, P.G., ALTERMANN, W. & HARTZER, F.J. 2006. *The Transvaal Supergroup and its precursors*. In: Johnson, M.R., Anhaeusser, C.R. & Thomas, R.J. (Eds.) The geology of South Africa, pp. 237-260. Geological Society of South Africa, Marshalltown.
- KEYSER, N. & DU PLESSIS, C.P. 1993. *The geology of the Vryburg area. Explanation to 1: 250 000 geology sheet 2624 Vryburg*, 28 pp. Council for Geoscience, Pretoria.
- MCCARTHY, T. & RUBIDGE, B. 2005. *The story of Earth and life: a southern African perspective on a 4.6-billion-year journey*. 334pp. Struik, Cape Town.
- SCHOPF, J.W. 2006. *Fossil evidence of Archaean life*. Philosophical Transactions of the Royal Society B361, 869-885.
- SMIT, P.J., BEUKES, N.J., JOHNSON, M.R., MALHERBE, S.J. & VISSER, J.N.J. 1991. *Lithostratigraphy of the Vryburg Formation (including the Kalkput, Geelbeksdam, Rosendal, Waterloo and Oeola Members)*. South African Committee for Stratigraphy

Lithostratigraphic Series No. 14, 1-10.

SUMNER, D.Y. & BEUKES, N.J. 2006. *Sequence stratigraphic development of the Neoproterozoic Transvaal carbonate platform, Kaapvaal Craton, South Africa. South African Journal of Geology* 109, 11-22.

QUALIFICATIONS AND EXPERIENCE OF THE AUTHOR

Elize Butler has an MSc in Palaeontology from the University of the Free State, Bloemfontein, South Africa. She has been working at the National Museum since 1993 and currently holds the position of Collection Manager of the Karoo Vertebrate Collection of the Palaeontology Department at the National Museum in Bloemfontein. Her current research interests comprise of Permo-Triassic vertebrate palaeobiology, with a special focus on gorgonopsians at the End-Permian Mass Extinction.

Declaration of Independence

I, Elize Butler, declare that I am an independent consultant and have no business, financial, personal or other interest in the proposed project, application or appeal in respect of which I was appointed other than fair remuneration for work performed in connection with the activity, application or appeal. There are no circumstances that compromise my objectivity in this work.

Sincerely

A handwritten signature in black ink, appearing to read 'Elize Butler'.

Mrs. Elize Butler



CTS HERITAGE

APPENDIX 4: Chance Fossil Finds Procedure



CHANCE FINDS OF PALAEOLOGICAL 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.



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- 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.

CTS Heritage

34 Harries Street, Plumstead, Cape Town, 7800

Tel: +27 (0)87 073 5739 **Email:** info@ctsheritage.com **Web:** www.ctsheritage.com



CTS HERITAGE

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:	<i>Lat:</i>	<i>Long:</i>
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)	<i>Digital image of vertical section (side)</i>	
	<i>Fossil from different angles</i>	
	<i>Wider context of the find</i>	
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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