

HERITAGE IMPACT ASSESSMENT

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

Proposed development of the Becrux 1 PV facility near Secunda, Mpumalanga Province

SAHRIS Ref:

Prepared by CTS Heritage



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For

Savannah Environmental (Pty) Ltd

November 2021



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EXECUTIVE SUMMARY

1. Site Name:

Becrux 1 Solar PV Facility

2. Location:

2km east of Secunda

3. Locality Plan:



Figure 1: Location of the proposed study area relative to Secunda

4. Description of Proposed Development:

Becrux Solar PV Project One (Pty) Ltd is proposing the development of a Solar Photovoltaic (PV) Energy Facility and associated infrastructure on Portion 6 of the Farm Goedehoop No. 290, located ~7km south-east of Secunda and 15km east of Embalenhle. The project site falls within the jurisdiction of the Govan Mbeki Local Municipality, which forms part of the Gert Sibande District Municipality in Mpumalanga Province.



5. Heritage Resources Identified in the study area:

Site No.	Site Name	Description	Co-ordinates		Grading	Mitigation
SEC_1	Secunda 1	Possible upper grinding stone. The shape of the riverine cobble suggests it could have been the grinding stone, but the abraded surface is eroded.	2,656,741	2,921,916	NCW	NA
SEC_20	Secunda 10	Kombewa flake. Possibly later Acheulean	2,656,968	2,922,261	NCW	NA
SEC_21	Secunda 21	Bifacial fragment. Artefact edges are rolled suggestive of a redeposited context	2,656,934	2,922,277	NCW	NA
SEC_22	Secunda 22	Upper grinding stone. Artefact preserved ochre stains, but overall was damaged by the ploughing activities	26,569	2,922,277	NCW	NA

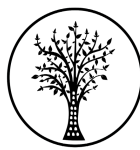
6. Anticipated Impacts on Heritage Resources:

The ephemeral isolated archaeological finds were exclusively associated with the planted regions of the project area, and occurred in secondary contexts, so therefore have limited potential for modern scientific analyses (due to the *ex situ* spatial contexts of the finds and limited possibility of radiometric dating).

The field assessment conducted revealed no significant archaeological resources located within the development footprint. Four observations of archaeological resources were identified. These have all been determined to be not conservation-worthy (NCW) and have been sufficiently recorded in this assessment.

In terms of impacts to palaeontological heritage, based on the nature of the project, surface activities may impact upon the fossil heritage if preserved in the proposed Solar Facility area. The geological structures suggest that the rocks are the correct age and type to contain fossils, i.e. fossil plant impressions of the *Glossopteris* flora, but the rocks are covered by soils, sandy soils and vegetation. The site visit confirmed that there were no rocky outcrops and no fossils in the sandy soils. Since there is a small chance that fossils from the below ground Vryheid Formation may be disturbed, a Fossil Chance Find Protocol has been added to this report. Taking account of the defined criteria, the potential impact to fossil heritage resources is extremely low.

The impact of the proposed development on the sense of place of the regions was assessed in the VIA completed for the proposed development (2021). According to the VIA (2021), "Sense of place refers to a unique experience of an environment by a user, based on his or her cognitive experience of the place. Visual criteria, specifically the



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visual character of an area (informed by a combination of aspects such as topography, level of development, vegetation, noteworthy features, cultural / historical features, etc.), plays a significant role.

An impact on the sense of place is one that alters the visual landscape to such an extent that the user experiences the environment differently, and more specifically, in a less appealing or less positive light.

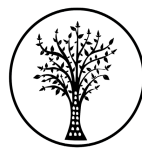
The environment surrounding the proposed PV facility has a predominantly rural and undeveloped character. These generally undeveloped landscapes are considered to have a high visual quality, except where urban development and mining/industrial activities represent existing visual disturbances.

The anticipated visual impact of the proposed PV facility on the regional visual quality, and by implication, on the sense of place, is difficult to quantify, but is generally expected to be of low significance. This is due to the relatively low viewer incidence within close proximity to the proposed development site and the presence of existing mining and industrial activities within the region.”

7. Recommendations:

There is no objection to the proposed development of the Becrux 1 PV Facility and associated overhead powerline in terms of impacts to heritage resources on condition that:

- The mitigation measures articulated in the VIA (2021) completed for this project are implemented
- The attached Chance Fossil Finds Procedure (Appendix 3) is implemented during the course of construction activities.
- Should any buried archaeological resources or human remains 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.



CONTENTS

1. INTRODUCTION	6
1.1 Background Information on Project	6
1.2 Description of Property and Affected Environment	7
2. METHODOLOGY	11
2.1 Purpose of HIA	11
2.2 Summary of steps followed	11
2.3 Assumptions and uncertainties	11
2.4 Constraints & Limitations	11
2.5 Savannah Impact Assessment Methodology	12
3. HISTORY AND EVOLUTION OF THE SITE AND CONTEXT	14
3.1 Desktop Assessment	14
3.2 Palaeontology	15
4. IDENTIFICATION OF HERITAGE RESOURCES	20
4.1 Summary of findings of Specialist Reports	20
4.2 Heritage Resources identified	21
4.3 Mapping and spatialisation of heritage resources	22
5. ASSESSMENT OF THE IMPACT OF THE DEVELOPMENT	23
5.1 Assessment of impact to Heritage Resources	23
5.2 Sustainable Social and Economic Benefit	25
5.3 Proposed development alternatives	25
5.4 Cumulative Impacts	26
6. RESULTS OF PUBLIC CONSULTATION	26
7. CONCLUSION	26
8. RECOMMENDATIONS	27
APPENDICES	
1	Heritage Screening Assessment
2	Archaeological Impact Assessment (2021)
3	Palaeontology Impact Assessment (2021)
4	Chance Fossil Finds Procedure



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1. INTRODUCTION

1.1 Background Information on Project

Becrux Solar PV Project One (Pty) Ltd is proposing the development of a Solar Photovoltaic (PV) Energy Facility and associated infrastructure on Portion 6 of the Farm Goedehoop No. 290, located ~7km south-east of Secunda and 15km east of Embalenhle. The project site falls within the jurisdiction of the Govan Mbeki Local Municipality, which forms part of the Gert Sibande District Municipality in Mpumalanga Province.

The Solar PV Facility will have a contracted capacity of 19.99MW and will use bi-facial panels with single axis tracking to harness the solar resource on the project site. The purpose of the facility will be to generate electricity for exclusive use by Sasol's Secunda (coal-to-liquids) CTL Plant. The construction of the PV Facility aims to reduce Sasol's dependence on direct supply from Eskom's national grid for operation purposes and demonstrate Sasol's move towards a greener future through procurement of renewable energy from Independent Power Producers (IPPs).

To evacuate the generated power to Sasol's Secunda CTL Plant, an overhead power line will be established to connect the 11kV E-house containerized substation, to the existing Goedehoop Substation. The overhead power line will run ~300m from the Solar PV Facility to the Goedehoop Substation. A 170m wide and up to 400m long grid connection corridor has been identified for the assessment and placement of the overhead line. The assessment of a 170m wide grid connection corridor will allow for the avoidance of environmental sensitivities and ensure suitable placement of the power line within the corridor.

A development area of up to ~26.64ha and a development footprint of ~19.95ha have been identified within the preferred project site (~433ha) by Becrux Solar PV Project One (Pty) Ltd for the development of the Becrux Solar PV Energy Facility.

The development footprint is proposed to accommodate the following infrastructure:

- Solar PV array comprising PV modules and mounting structures.
- Inverters and transformers.
- Cabling between the panels.
- E-house containerized substation.
- 11kV overhead power line for the distribution of the generated power, which will be connected to the existing Goedehoop Substation.
- Laydown area.
- Access gravel road (existing) and internal gravel roads.
- Security booth, O&M building, workshop, storage area and site office.



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1.2 Description of Property and Affected Environment

The footprint of the proposed solar Photovoltaic Energy Facility and associated infrastructure is located across several agricultural camps, approximately 7km south-east of the town of Secunda, in the Mpumalanga Province of South Africa. In the south-western portion of the footprint, where original/natural landscape is retained, semi-arid grassland and shrubland is evident with sub-volcanic bedrock (mostly granites) outcropping in the form of secondary colluvial nodules in several locations.

The project area has an undulating topography with two springs and a non-perennial drainage in the south-western portion. The south-western portions are leased out by the current land-owner for cattle grazing with evidence of marginal donga formation in several places where vegetation has been completely removed through grazing, and where cattle have aggregated for watering/feeding. The eastern and northern portions of the footprint appear to be used for maize agriculture, and were planted in the period immediately preceding this archaeological survey. The upper soils in the planted regions have thus been extensively turbated in the planting process, and topsoils have been removed in excess of 1.5m depths in several places as a consequence of agriculture and/or road-building. The surface sediments across >60% of the footprint are bioturbated soils with substantial components of silt and clay, interspersed with organic material likely included as stimulants for the planting.

According to the VIA (2021) completed for the assessment, “The identified site for the proposed PV facility is situated approximately 7km south-east of Secunda on the farm *Goedehoop 290*. This farm is located in an area that has a distinct rural and agricultural character, with mining activity (mine dumps/slimes dams) located west of the proposed development site at a distance of less than 1km. The Sasol Secunda CTL Plant is located west of these mine dumps, with most of the plant shielded from the proposed PV facility site. The only visible structures are the significantly tall smoke stacks and flare stacks protruding above the mine dumps.

The Goedehoop Substation is located at a distance of 300m east of the proposed site. Other substations in the study area include:

- East Shaft Substation
- Quest Substation
- Quintus Substation

A great number of power lines, associated with these substations and the mining and industrial activities in the area, traverse the study area. These include:

- Quintus-Secunda 132kV
- Goedehoop-Quintus 132kV
- Goedehoop-Quest 132kV
- East Shaft-Goedehoop 132kV



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- East Shaft-Quest 132kV
- Sol-East Shaft 132kV
- East Shaft-West Shaft 132kV
- Sasol Three-Sol lines 1 and 2 132kV
- East Shaft-Grootfontein 132kV
- Quintus Syferfontein Mine lines 1 and 2 132kV Customer supply
- Twisdraai Coll 1 Customer supply
- Sol-Irenedale 132kV

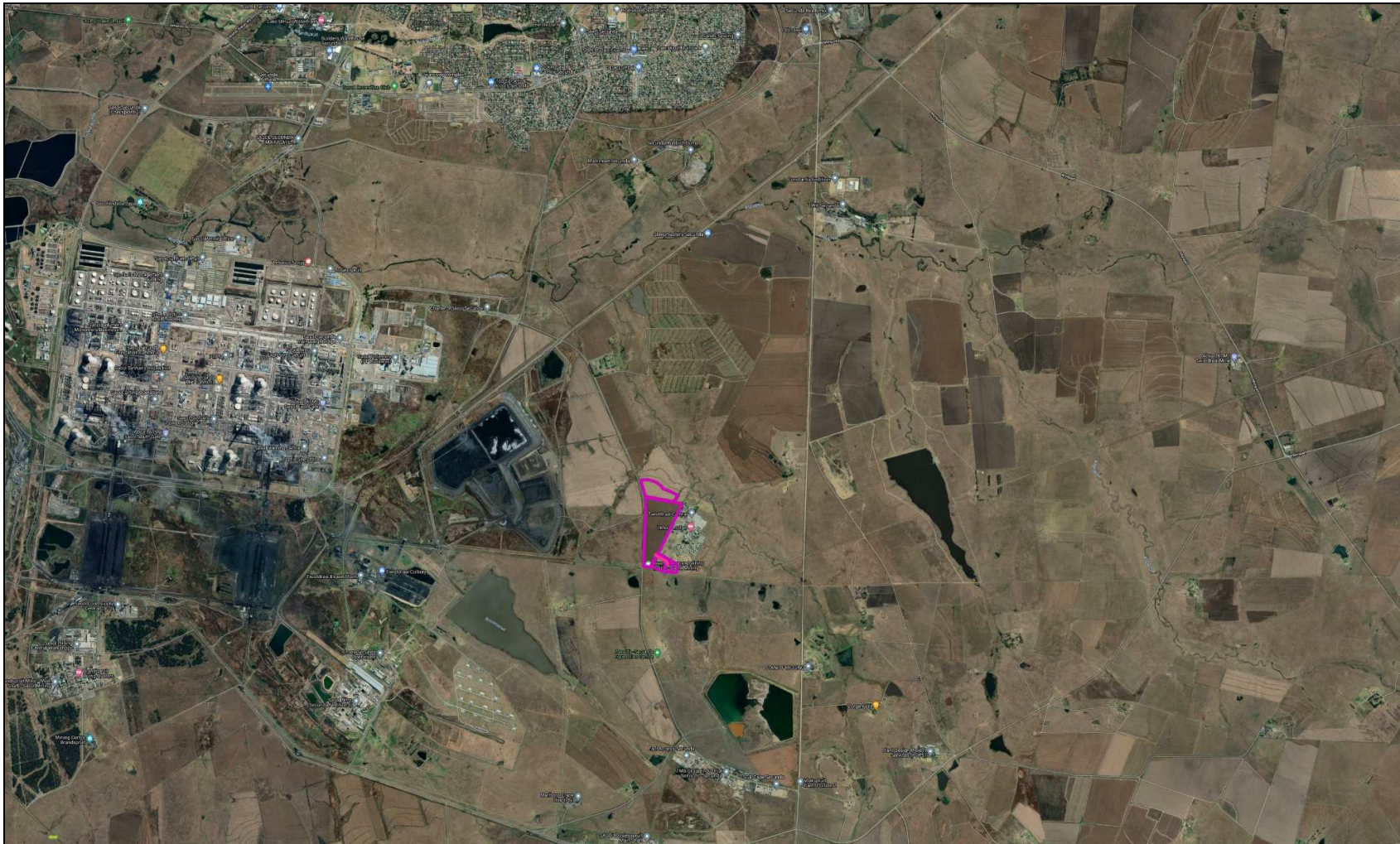
The VIA (2021) goes on to note that the the natural vegetation or land cover types of the region are described as *Grassland*, with *Wetlands* (along the Klipspruit and Bossiespruit rivers and tributaries), with large tracts of agricultural fields (altered vegetation) throughout the study area. The remaining natural vegetation within the entire study area is classified as *Soweto Highveld Grassland* of the *Mesic Highveld Grassland Bioregion*, within the *Grassland Biome*.

Land use activities within the broader region are predominantly described as maize farming (predominantly dryland agriculture) and cattle farming, with the mining activities and the Sasol Secunda CTL Plant prominently visible within the study area. The town of Secunda is located to the north and hosts a number of secondary industries, retail services and recreational facilities. The Secunda Airfield is located south-west of the town at a distance of approximately 6km (north-west) from the proposed Becrux PV facility, at the closest.

The VIA (2021) also notes that the topography or terrain morphology of the region is broadly described as *Slightly Undulating Plains* of the *Interior Plain*. The slope of the entire study area is relatively even (flat) with a gradual drop (approximately 100m) from the north-eastern and southern sections of the study area to the *Klipspruit* River which flows south of Secunda. This perennial river and the *Bossiespruit* River, wetlands and farm and mining dams, account for the dominant hydrological features within this region that receives between 650mm to 750mm rainfall per annum.



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 Development Area

0 1 2 3 4 km



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Map 1a: The proposed development relative to Secunda

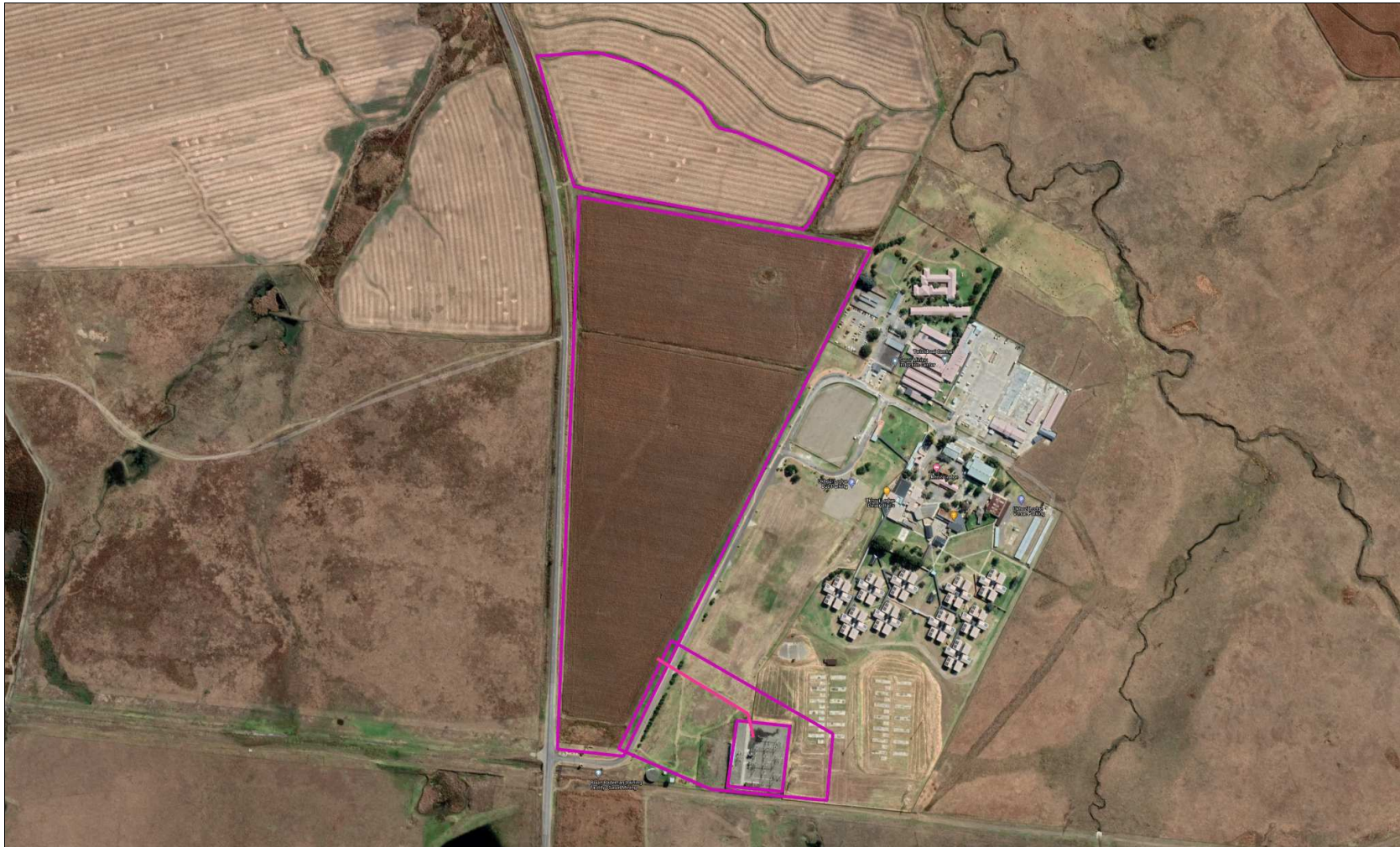
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 Development Area

0 100 200 300 400 500 m



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Map 1b: The proposed development area

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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 21 and 22 October 2021 (Appendix 2)
- A Palaeontologist conducted a site visit on 26 October 2021 (Appendix 3)
- The identified resources were evaluated for their heritage significance and impacts to these resources were assessed
- Alternatives and mitigation options were discussed with the Environmental Assessment Practitioner

2.3 Assumptions and uncertainties

- The *significance* of the sites and artefacts is determined by means of their historical, social, aesthetic, technological and scientific value in relation to their uniqueness, condition of preservation and research potential. It must be kept in mind that the various aspects are not mutually exclusive, and that the evaluation of any site is done with reference to any number of these.
- It should be noted that archaeological and palaeontological deposits often occur below ground level. Should artefacts or skeletal material be revealed at the site during construction, such activities should be halted, and it would be required that the heritage consultants are notified for an investigation and evaluation of the find(s) to take place.

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

2.4 Constraints & Limitations

The survey was conducted on 21st and 22nd of October, 2021 at the start of the summer rainfall season. In the south-western portions of the footprint that are utilized currently for stock farming/grazing, the grass and bush were moderately thick in several places, making it challenging to identify potential ground level archaeological



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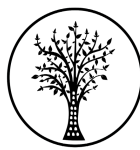
exposures in these places, although no evidence of archaeological material was found in the south-west area generally, even in places that had optimal visibility.

In the east and north of the footprint where planting activities recently took place, visibility was excellent. However, the topsoils were highly disturbed in these portions, rendering the exposed archaeology (all of which had recent abrasions from agricultural machinery) largely limited in potential for modern scientific analyses. We are thus confident that the archaeological sensitivity and scientific potential of the project area has been comprehensively assessed.

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

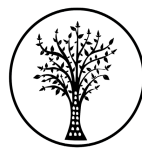
D = Duration

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).



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3. HISTORY AND EVOLUTION OF THE SITE AND CONTEXT

3.1 Desktop Assessment

Background

Sasol Limited is an integrated energy and chemical company based in Sandton, South Africa. The company was formed in 1950 in Sasolburg, South Africa and has a large operation in Sasolburg, Free State and Secunda, Mpumalanga. The company issued a request for information (RFI) in May 2020 for the supply, by IPPs, of up to 600 MW of renewable energy to its South African operations. Sasol indicated on August 3, 2020 that the decision to issue an RFP for two 10 MW solar PV facilities represented the “first step” towards the group realising its commitment to eventually procure 600 MW of renewable- energy capacity. Chief sustainability officer Hermann Wenhold said the RFP also formed part of the group’s broader aspiration to reduce greenhouse gas emissions by 10% by 2030. Sasol is one of several large South African corporates to indicate that they intended to introduce renewable self-generation at their operations, with several mining companies also moving ahead with projects. The self-generation projects were being pursued to both bolster security of supply and improve tariff visibility in a context of steeply rising Eskom and municipal tariffs and an ongoing risk of load-shedding (Creamer 03 August 2020).

The ground intended for the proposed 19.99MWac solar PV plant falls on Portion 6 of Goedehoop 290 IS and is immediately adjacent to Polymer Road and Sasol’s training centre. Maize agriculture and grazing have continued on the farm and the installation of a solar PV plant is in keeping with the broader development character of the immediate surroundings which lie on the peri-urban edge of Secunda and the massive Brandspruit coal mine nearby to the west.

Archaeology

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



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graves are located in the vicinity of the homesteads and it is possible that more graves will be located nearby”.

None of the sites identified in the assessment referenced are located within or near the development area, however the text provides a good assessment of resources that may be present. Furthermore, the proposed development area was included in the area surveyed by Van Schalkwyk (2003, SAHRIS ID 5089) that surveyed a section of the Secunda-Mozambique Gas Pipeline. No archaeological resources were identified in the development in this assessment. Given the heavily disturbed, level agricultural ground chosen for this development, it is unlikely that any *in situ* Stone Age material will be found, nor any Iron Age sites. The possibility of finding graves is also very low.

Built Environment & Cultural Landscapes

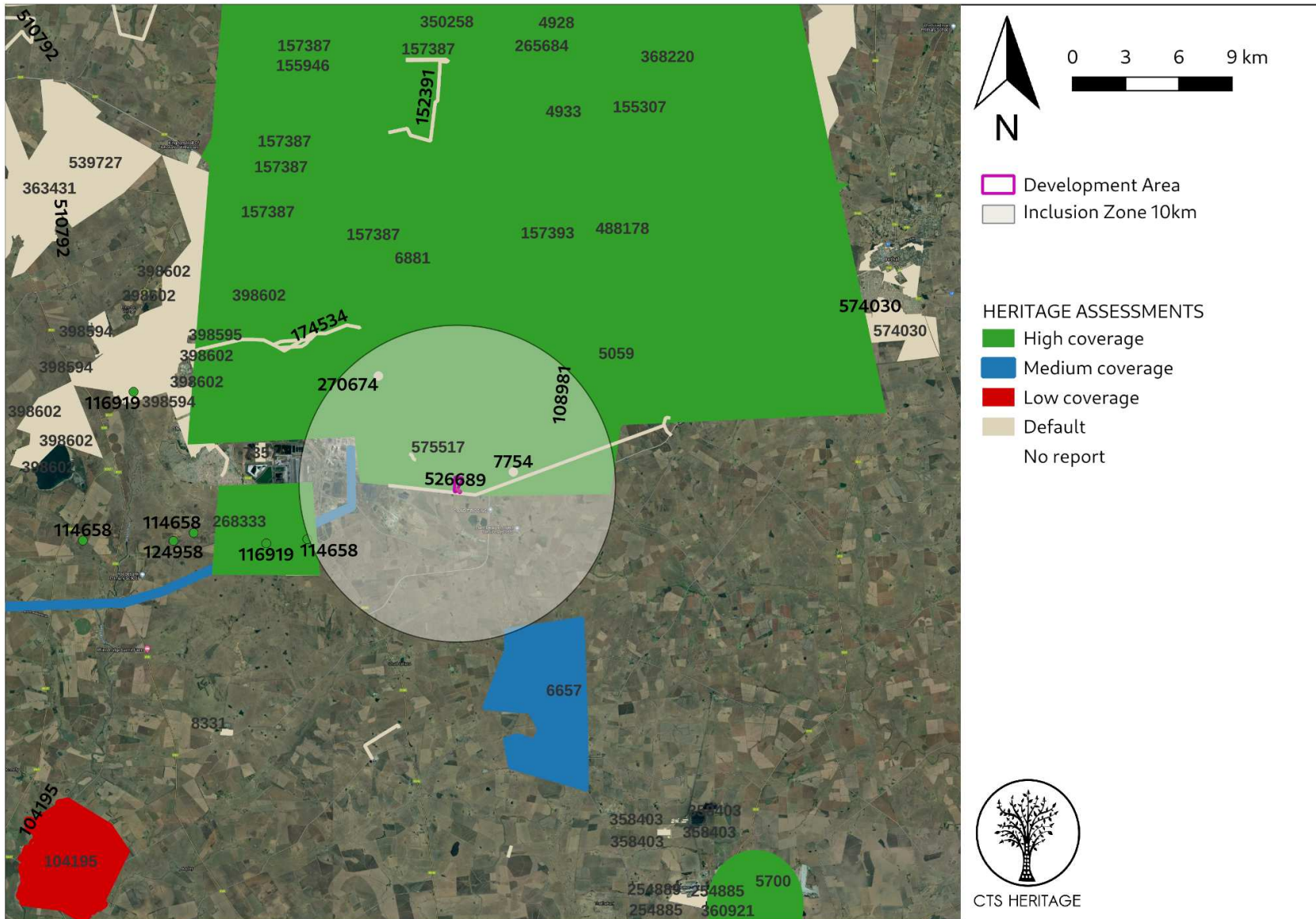
There are no buildings within the feasibility study area and the current landscape consists of remnant farming plots wedged in between heavy industrial activity (Brandspruit Coal Mine) and Secunda’s chemical plants. The installation of a 19.99MWac solar PV will therefore not change the character of the cultural landscape and will be in keeping with the developments in the area.

3.2 Palaeontology

According to the SAHRIS Palaeosensitivity Map, the area proposed for the 19.99MWac solar PV plant is underlain by sediments of zero and very high palaeontological sensitivity (Map 3a). According to the extract from the Council of Science Map for East Rand 2628 (Map 3b), the palaeontologically sensitive geology of the area is ascribed to the Vryheid Formation of the Ecca Group of sediments. Groenewald (2014, SAHRIS NID 167013) completed a field-based palaeontological assessment for the Waaihoek WEF. In this assessment, Groenewald (2014) notes that “The Vryheid Formation consists of interbedded very coarse-grained sandstone and mudstone that yields plant and trace fossils as well as some prominent coal seams.” In this assessment, Groenewald (2014) made the following recommendations for the WEF development within the Vryheid Formation “The PEA and CEO be made aware of the possibility of finding fossils in the Vryheid and Volksrust Formation sediments during excavation of the foundations for the turbines and other infrastructure. A professional palaeontologist is appointed to monitor possible palaeontological finds during excavation of turbine foundations and infrastructure where turbine positions and infrastructure fall on Vryheid and Volksrust Formation sediments.” While the sediments underlying the development area have high levels of palaeontological sensitivity, the nature of the excavations associated with PV facilities tends to be shallow (<3m) and as such, the likelihood of impacting intact Vryheid Formation sediments is low.



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Map 2a: Spatialisation of heritage assessments conducted in proximity to the broader study area

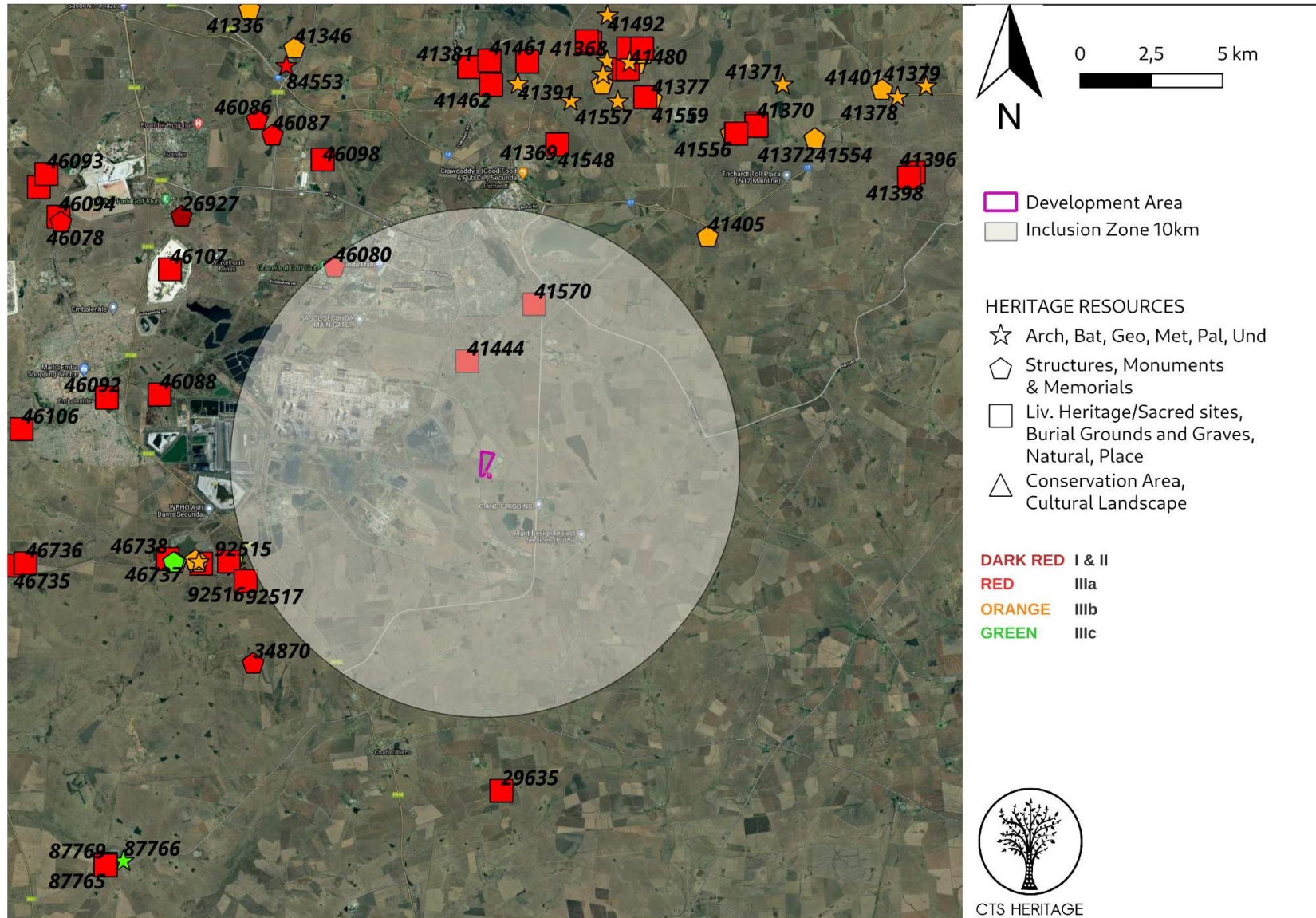
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Map 2b: Spatialisation of heritage resources known in proximity to the broader study area

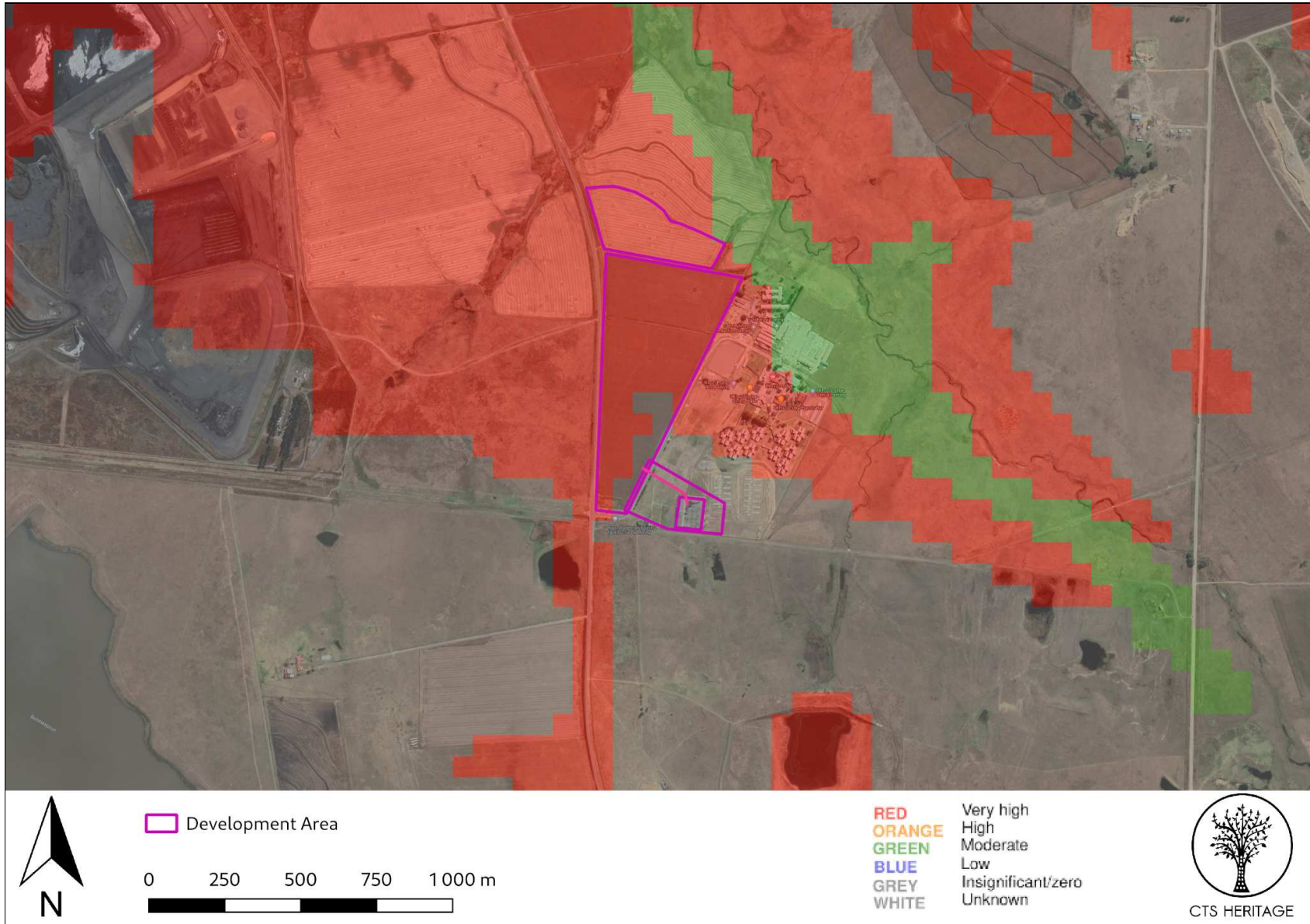
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Map 3a: Palaeontological sensitivity of the area surrounding the broader study area

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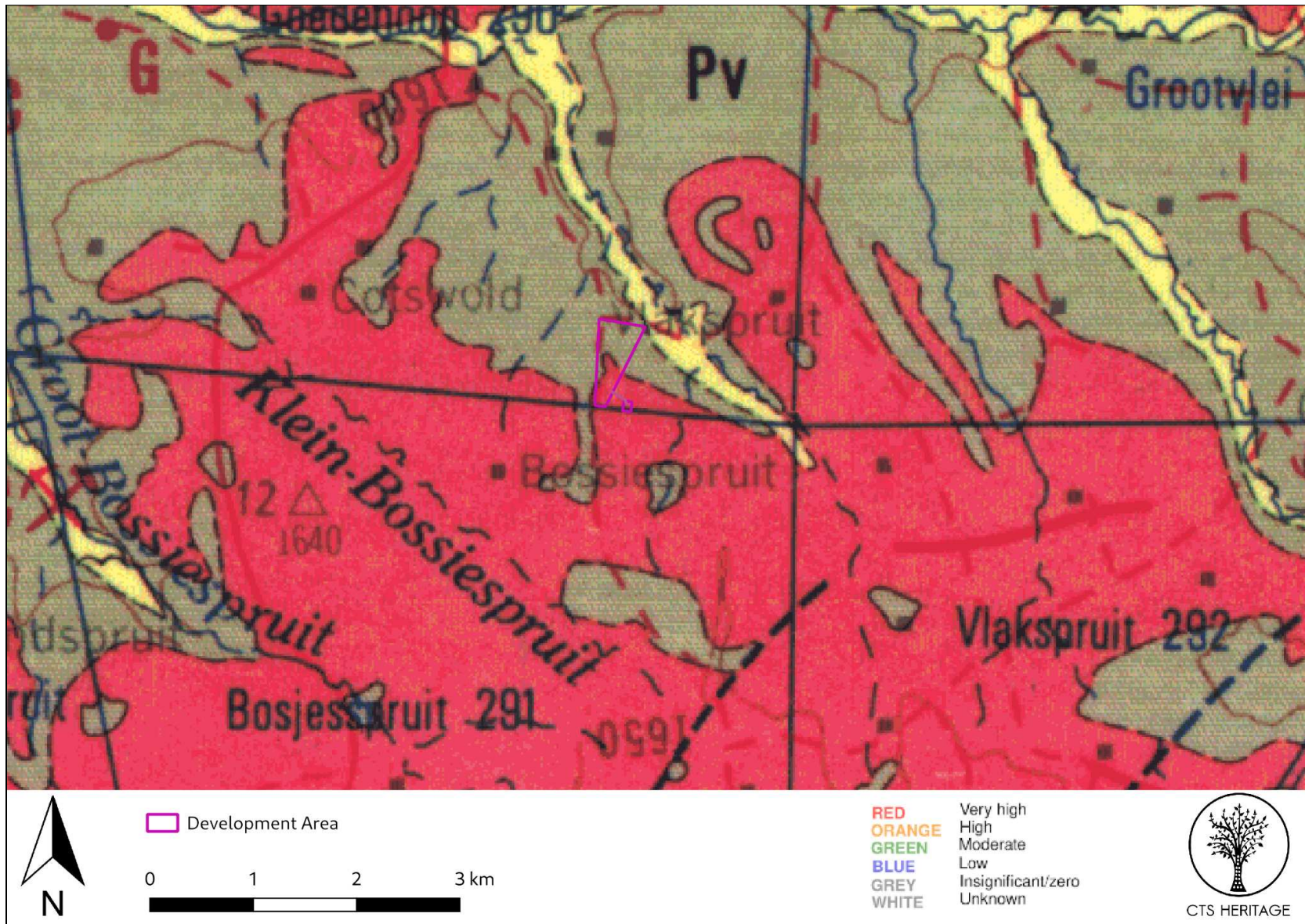


Figure 3b. Geology Map. 1:50 000 Geology Map 2628 East Rand from the Council for Geoscience. The development area is underlain by sediments of the Vryheid Formation (Pv) of the Ecca Group as well as non-fossiliferous Jurassic Dolerites (Jd)

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4. IDENTIFICATION OF HERITAGE RESOURCES

4.1 Summary of findings of Specialist Reports

The archaeological field assessment documented a sparse number of isolated stone artefacts in secondary contexts, suggesting the area may have been traversed intermittently by Stone Age groups potentially through periods in both the Early Stone Age (ESA – ~2.6ma:~300ka) and the Later Stone Age (LSA: ~40ka: ~2ka).

No artefact quality raw-material was found within the footprint, indicating that the stone artefacts were transported into the area by foragers prior to discard. The raw-materials exploited were cobbles of high-quality quartzite that would have been available in a high-energy river system in the broader vicinity of the project area. All archaeological finds were documented in *ex-situ* contexts, which is further supported by the extensive evidence for agricultural activity including the redistribution of topsoils for planting purposes, and the bioturbation resulting from grazing and trampling.

The potential for finding a dateable *in-situ* archaeological horizon based on current surface observations appears to be low.

The palaeontological sensitivity of the area under consideration is presented in Map 3a. The Permian Vryheid Formation sediments could have preserved fossil plants of the *Glossopteris* Flora, including leaf impressions and fructifications of *Glossopteris*, and other extinct groups like the cordaitaleans, some lycopods, sphenophytes, wood and ferns, as well as early gymnosperms. Fossil plants have been recorded from other regions but they are sporadic and their distribution is hard to predict. Coal seams 1-6 are found in this region but although coal is formed from the alteration by temperature and pressure of peats that are an accumulation of plant matter, no plants are recognised within the coal itself. Fossil plants can be found in the fine-grained shale lenses between the coal seams.

The *Glossopteris* flora fossils are of interest to palaeobotanists but in general they are widely scattered and difficult to locate. This flora is well known but there is always a very small chance that some new taxa may be discovered (Plumstead, 1969; Anderson and Anderson, 1985).

Quaternary sands seldom preserve fossils as they are either aeolian in origin or from recent fluvial activity, in other words they are not in primary context. Fossil pans, spring mounds or stabilised sand dunes may preserve fossils but these features are not indicated on the Google Earth map that shows the land has having been modified by agricultural practices.

In this Witbank coalfield of Mpumalanga, coal seams 1-5 (from base to top) are present at various levels below the ground surface. Seams 2 and 4 are the thickest seams (Snyman, 1998, based on core material) and the uppermost seam, No 5, is between 12 and 45m below the surface. In all areas, the uppermost seam is overlain by soils, shales and sandstones of varying thicknesses. No fossils were found during the site visit walk through.

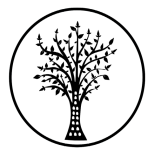


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4.2 Heritage Resources identified

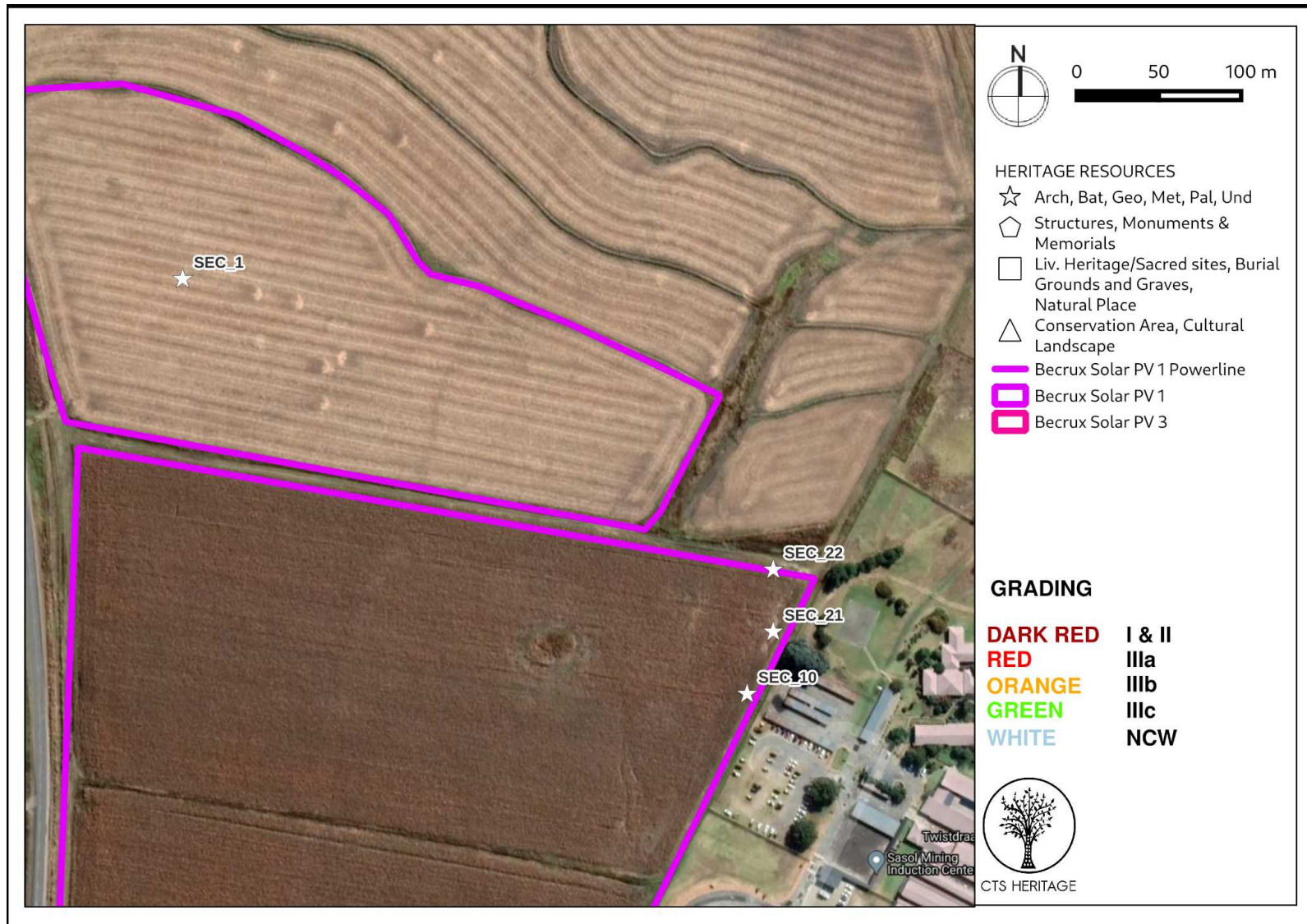
Table 1: Observations noted during the field assessment

Site No.	Site Name	Description	Co-ordinates		Grading	Mitigation
SEC_1	Secunda 1	Possible upper grinding stone. The shape of the riverine cobble suggests it could have been the grinding stone, but the abraded surface is eroded.	2,656,741	2,921,916	NCW	NA
SEC_20	Secunda 10	Kombewa flake. Possibly later Acheulean	2,656,968	2,922,261	NCW	NA
SEC_21	Secunda 21	Bifacial fragment. Artefact edges are rolled suggestive of a redeposited context	2,656,934	2,922,277	NCW	NA
SEC_22	Secunda 22	Upper grinding stone. Artefact preserved ochre stains, but overall was damaged by the ploughing activities	26,569	2,922,277	NCW	NA



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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 ephemeral isolated archaeological finds were exclusively associated with the planted regions of the project area, and occurred in secondary contexts, so therefore have limited potential for modern scientific analyses (due to the *ex situ* spatial contexts of the finds and limited possibility of radiometric dating).

The field assessment conducted revealed no significant archaeological resources located within the development footprint. Four observations of archaeological resources were identified. These have all been determined to be not conservation-worthy (NCW) and have been sufficiently recorded in this assessment.

In terms of impacts to palaeontological heritage, based on the nature of the project, surface activities may impact upon the fossil heritage if preserved in the proposed Solar Facility area. The geological structures suggest that the rocks are the correct age and type to contain fossils, i.e. fossil plant impressions of the *Glossopteris* flora, but the rocks are covered by soils, sandy soils and vegetation. The site visit confirmed that there were no rocky outcrops and no fossils in the sandy soils. Since there is a small chance that fossils from the below ground Vryheid Formation may be disturbed, a Fossil Chance Find Protocol has been added to this report. Taking account of the defined criteria, the potential impact to fossil heritage resources is extremely low.

The impact of the proposed development on the sense of place of the regions was assessed in the VIA completed for the proposed development (2021). According to the VIA (2021), “Sense of place refers to a unique experience of an environment by a user, based on his or her cognitive experience of the place. Visual criteria, specifically the visual character of an area (informed by a combination of aspects such as topography, level of development, vegetation, noteworthy features, cultural / historical features, etc.), plays a significant role.

An impact on the sense of place is one that alters the visual landscape to such an extent that the user experiences the environment differently, and more specifically, in a less appealing or less positive light.

The environment surrounding the proposed PV facility has a predominantly rural and undeveloped character. These generally undeveloped landscapes are considered to have a high visual quality, except where urban development and mining/industrial activities represent existing visual disturbances.

The anticipated visual impact of the proposed PV facility on the regional visual quality, and by implication, on the sense of place, is difficult to quantify, but is generally expected to be of low significance. This is due to the relatively low viewer incidence within close proximity to the proposed development site and the presence of existing mining and industrial activities within the region.”



Table 4.1: Impacts of the proposed development to archaeological resources

NATURE: It is possible that significant archaeological resources may be impacted by the proposed development				
		Without Mitigation		With Mitigation
MAGNITUDE	M (6)	4 archaeological sites of low scientific significance were identified within the area proposed for development	L (2)	4 archaeological sites of low scientific significance were identified within the area proposed for development
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	M (3)	It is possible that significant archaeological resources will be impacted	L (1)	It is unlikely that significant archaeological resources will be impacted
SIGNIFICANCE	M	$(6+5+1) \times 3 = 36$	L	$(2+5+1) \times 1 = 8$
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?	P	Possible	L	Not Likely
CAN IMPACTS BE MITIGATED		Yes		
MITIGATION:				
<ul style="list-style-type: none"> 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 (4)	According to the SAHRIS Palaeosensitivity Map, the area proposed for development is underlain by sediments that have very high palaeontological sensitivity.	L (2)	According to the SAHRIS Palaeosensitivity Map, the area proposed for development is underlain by sediments that have very high palaeontological sensitivity.
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	L	$(4+5+1) \times 1 = 10$	L	$(2+5+1) \times 1 = 8$
STATUS		Negative		Negative
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?	P	Possible	L	Not Likely
CAN IMPACTS BE MITIGATED		Yes		



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MITIGATION:

- 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 the SIA completed for the project, the majority of social impacts associated with the project are anticipated to occur during the construction phase of the development and are typical of the type of social impacts generally associated with construction activities. These impacts will be temporary and short-term (~12 months) but could have long-term effects on the surrounding social environment if not planned or managed appropriately. It is therefore necessary that the detailed design phase be conducted in such a manner so as not to result in permanent social impacts associated with the ill-placement of project components or associated infrastructure or result in the mis-management of the construction phase activities.

The positive and negative social impacts identified at this stage includes:

- Direct and indirect employment opportunities
- Economic multiplier effects
- Influx of jobseekers and change in population
- Safety and security impacts
- Impacts on daily living and movement patterns
- Nuisance impacts, including noise and dust
- Visual impacts and sense of place impacts
- Development of clean, renewable energy infrastructure
- Impacts associated with the loss of agricultural land

The proposed Becrux solar energy facility and associated infrastructure is unlikely to result in permanent damaging social impacts. From a social perspective it is concluded that the project could be developed subject to the implementation of the recommended mitigation measures and management actions contained in the report.

Based on the conclusions of the SIA report (2021) and the limited impacts anticipated to heritage resources, the the anticipated socio-economic benefits outweigh the likely impacts to heritage resources.

5.3 Proposed development alternatives

No alternatives are proposed at this stage. In addition, as no impacts to significant heritage resources are proposed, no alternatives are put forward in this assessment.



5.4 Cumulative Impacts

According to the VIA (2021) There is only one authorised solar energy facility within the larger region. This is the proposed Eskom 66MW Solar PV facility at the Tutuka coal-fired power station, approximately 25km south-east of the proposed Becrux PV facility. Given the constrained visual exposure of the proposed Becrux PV facility and the long distances between the facilities, no cumulative visual exposure (or combined visual impact) is expected. Furthermore, due to the low incidence of archaeological and palaeontological resources identified for this area, no negative cumulative impact is anticipated to these resources.

Table 5: Cumulative Impact Table

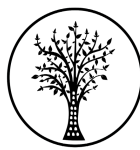
NATURE: Cumulative Impact to the sense of place and known archaeological and palaeontological resources				
		Overall impact of the proposed project considered in isolation		Cumulative impact of the project and other projects in the area
MAGNITUDE	L (4)	Low	M (5)	Moderate
DURATION	M (3)	Medium-term	H (4)	Long-term
EXTENT	L (1)	Low	L (1)	Low
PROBABILITY	L (2)	Improbable	H (3)	Probable
SIGNIFICANCE	L	$(4+3+1) \times 2 = 16$	M	$(5+4+1) \times 3 = 30$
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.

7. CONCLUSION

As noted above, the area proposed for development is located in an area that has a distinct rural and agricultural character, with mining activity (mine dumps/slimes dams) located west of the proposed development site at a distance of less than 1km. Furthermore, there is much existing electrical infrastructure located in the broader area. According to the VIA (2021), "Overall, the post mitigation significance of the visual impacts is expected to range from **moderate** to **low**. An additional mitigating factor for the proposed PV facility is the fact that it utilises a renewable source of energy (considered as an international priority) to generate electricity and is therefore



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generally perceived in a more favourable light. The PV facility does not emit any harmful by-products or pollutants and is therefore not negatively associated with possible health risks to observers... If mitigation is undertaken as recommended, it is concluded that the significance of most of the anticipated visual impacts will remain at or be managed to acceptable levels. As such, the PV facility and associated infrastructure would be considered to be acceptable from a visual impact perspective and can therefore be authorised.”

The findings of this assessment also largely correlate with the findings of other heritage assessments completed in the area. The area proposed for development has an overall low level of archaeological and palaeontological sensitivity and it is very unlikely that the proposed development will have a negative impact to significant archaeological and palaeontological heritage.

There is no objection to the proposed development on heritage grounds on condition that the recommendations below are implemented.

8. RECOMMENDATIONS

There is no objection to the proposed development of the Becrux 1 PV Facility and associated overhead powerline in terms of impacts to heritage resources on condition that:

- The mitigation measures articulated in the VIA (2021) completed for this project are implemented
- The attached Chance Fossil Finds Procedure (Appendix 3) is implemented during the course of construction activities.
- Should any buried archaeological resources or human remains 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.

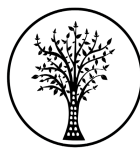


9. REFERENCES

Heritage Impact Assessments				
Nid	Report Type	Author/s	Date	Title
157393	Shahzaadee Karodia Khan, Johan Nel	01/02/2014	Heritage Statement	HERITAGE STATEMENT FOR THE BASIC ASSESSMENT UNDERTAKEN FOR A POWERLINE UPGRADE, SYFERFONTEIN MINE, SECUNDA, MPUMALANGA PROVINCE
164217	Francois P Coetzee	15/08/2011	HIA Phase 1	Cultural Heritage Survey of the Proposed Sasol Fine Ash Dams on the Farm Rietvley 320 IS, Secunda, Mpumalanga
268333	Francois P Coetzee, Joanna Behrens	23/04/2015	HIA Phase 2	PHASE II: CULTURAL HERITAGE PROJECT OF THE FARM RIETVLEY 320 IS, SASOL FINE ASH DAM (FAD) 6. Investigation focussing on Site 1, Site 3 and Site 6 on the farm Rietvley 320 IS (Portions 3, 8, 9, 10 and Remaining Extent 2), Govan Mbeki Local Municipality, Gert Sibande District Municipality, Mpumalanga
5059	Johnny Van Schalkwyk	01/05/2003	AIA Phase 1	Archaeological Survey of a Section of the Secunda-Mozambique Gas Pipeline Bethal and Highveld Ridge
6657	Johnny Van Schalkwyk	01/05/1998	AIA Phase 1	A Survey of Cultural Resources for the Proposed Escom Rail Line, Highveld Ridge District, Mpumalanga
7870	Julius CC Pistorius	01/07/2008	AIA Phase 1	A Phase I Heritage Impact Assessment Study for Sasol's Proposed New Gas and Liquid Pipelines (Along a Corridor) from Sasol Synfuels in Secunda (Mpumalanga) to Sasol Infrachem and Natref in Sasolburg (Free State) on the Highveld in the Republic of South Af
108981	Leonie Marais-Botes	01/11/2011	HIA Phase 1	Phase 1 Heritage Impact Assessment for the proposed improvement and rehabilitation of National Route 23 - section between Platrand and Standerton & Section 2 between Standerton and Greylingstad
270672	Julius CC Pistorius	12/05/2015	HIA Phase 1	A PHASE I HERITAGE IMPACT ASSESSMENT (HIA) STUDY FOR THE PROPOSED LAKE UMUZI SOUTH BANK EXTENSION IN SECUNDA IN THE MPUMALANGA PROVINCE
270674	Heidi Fourie	14/05/2015	PIA Desktop	Lake Umuzi South Bank Extension Palaeontological Impact Assessment: Desktop study
7754	Udo Kusel	09/08/2011	AIA Phase 1	Cultural Heritage Resources Impact Assessment for proposed Sasol Electricity generation from Raw Gas cooling Erf 8488 Govan Mbeki Local Municipality Gert Sibande District Municipality

Other References

Creamer, T. 03 August 2020. Sasol calls for bids for 10 MW solar plants at Mpumalanga, Free State operations. Article published on 03 August 2020 in Creamer Media's Engineering News accessed 14 October 2021.



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APPENDICES



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APPENDIX 1: Heritage Screening Assessment (2021)



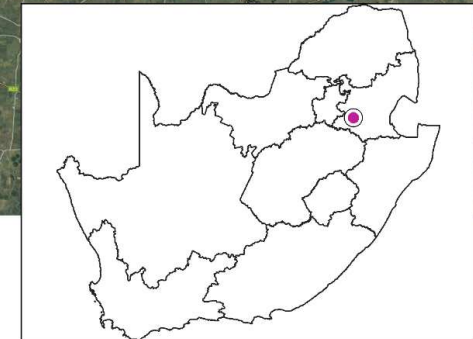
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HERITAGE SCREENER

CTS Reference Number:	CTS21_215
SAHRIS CaseID:	
Client:	SavannahSA
Date:	October 2021
Title:	Becrux Solar PV One 19MWac Power Plant



Development Area



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

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1. Proposed Development Summary

The SOLA Group is proposing the development of a 19MWac Solar Photovoltaic (PV) Energy Facility and associated infrastructure on a site located near Secunda in the Govan Mbeki Local Municipality, which forms part of the Gert Sibande District Municipality in the Mpumalanga Province. The purpose of the facility will be to provide electricity to Sasol via an overhead power line of up to 11kV.

2. Application References

Name of relevant heritage authority(s)	SAHRA
Name of decision making authority(s)	Mpumalanga Department of Agriculture, Rural Development, Land and Environmental Affairs

3. Property Information

Latitude / Longitude	-26.57184812, 29.21976400
Erf number / Farm number	Portion 6 of farm Goedehoop 290 IS
Local Municipality	Govan Mbeki
District Municipality	Gert Sibande DC
Province	Mpumalanga
Current Use	Agricultural
Current Zoning	Agricultural

4. Nature of the Proposed Development

Total Surface Area of development	19.99 ha (study area 29.81ha)
Depth of excavation (m)	Up to 1m
Height of development (m)	2-3m for the solar array

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5. Category of Development

x	Triggers: Section 38(8) of the National Heritage Resources Act
x	Triggers: Section 38(1) of the National Heritage Resources Act
	1. Construction of a road, wall, powerline, pipeline, canal or other similar form of linear development or barrier over 300m in length.
	2. Construction of a bridge or similar structure exceeding 50m in length.
	3. Any development or activity that will change the character of a site-
x	a) exceeding 5 000m ² in extent
	b) involving three or more existing erven or subdivisions thereof
	c) involving three or more erven or divisions thereof which have been consolidated within the past five years
x	4. Rezoning of a site exceeding 10 000m ²
	5. Other (state):

6. Additional Infrastructure Required for this Development

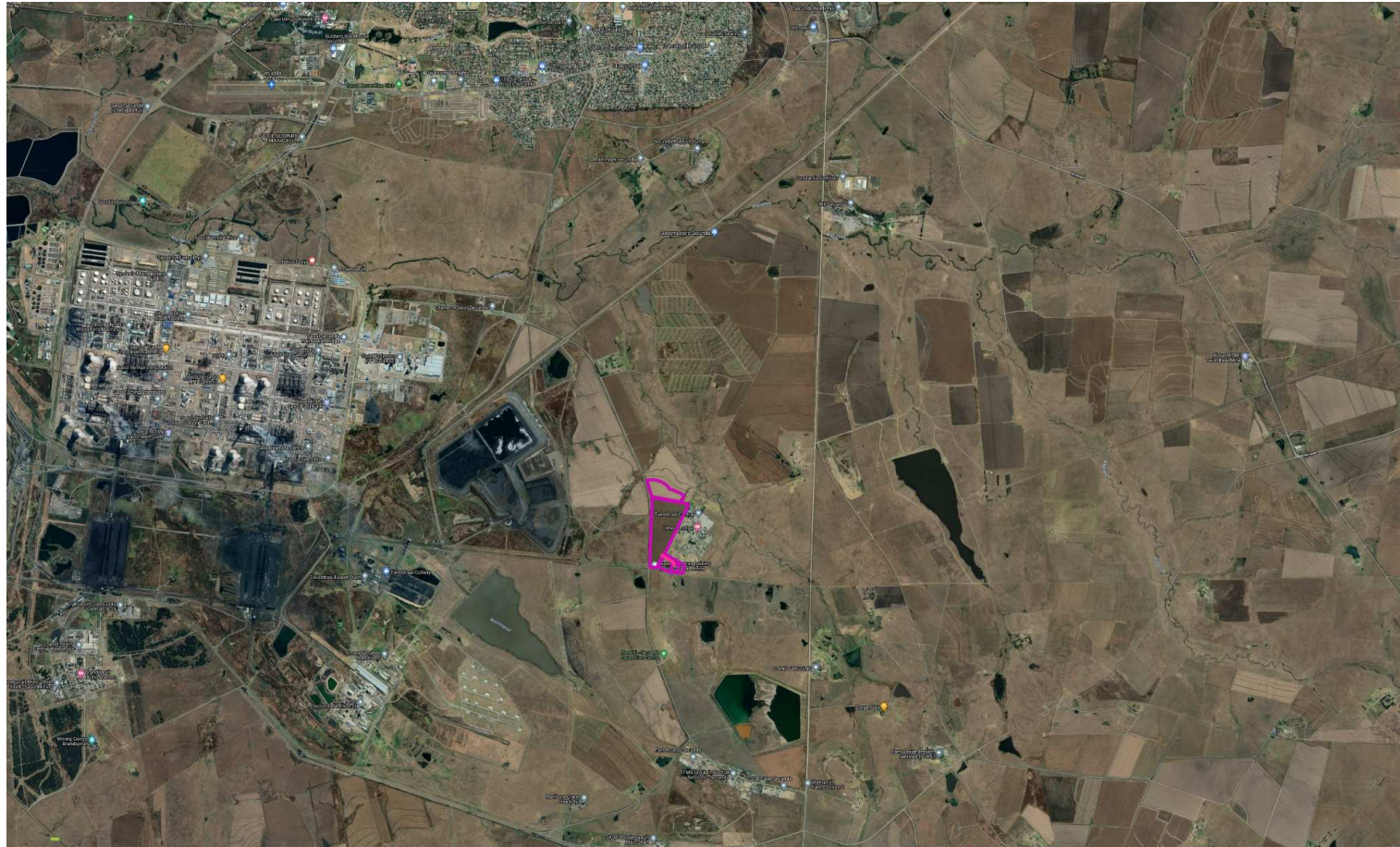
Besides the 19MWac solar PV array on the majority of the development area, a 11kV overhead power line will also be erected. An underground AC powerline (<500m) may be installed and is assessed as part of the impact assessment studies being conducted.

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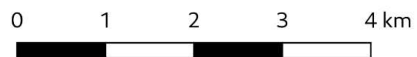
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7. Mapping (please see Appendix 3 and 4 for a full description of our methodology and map legends)

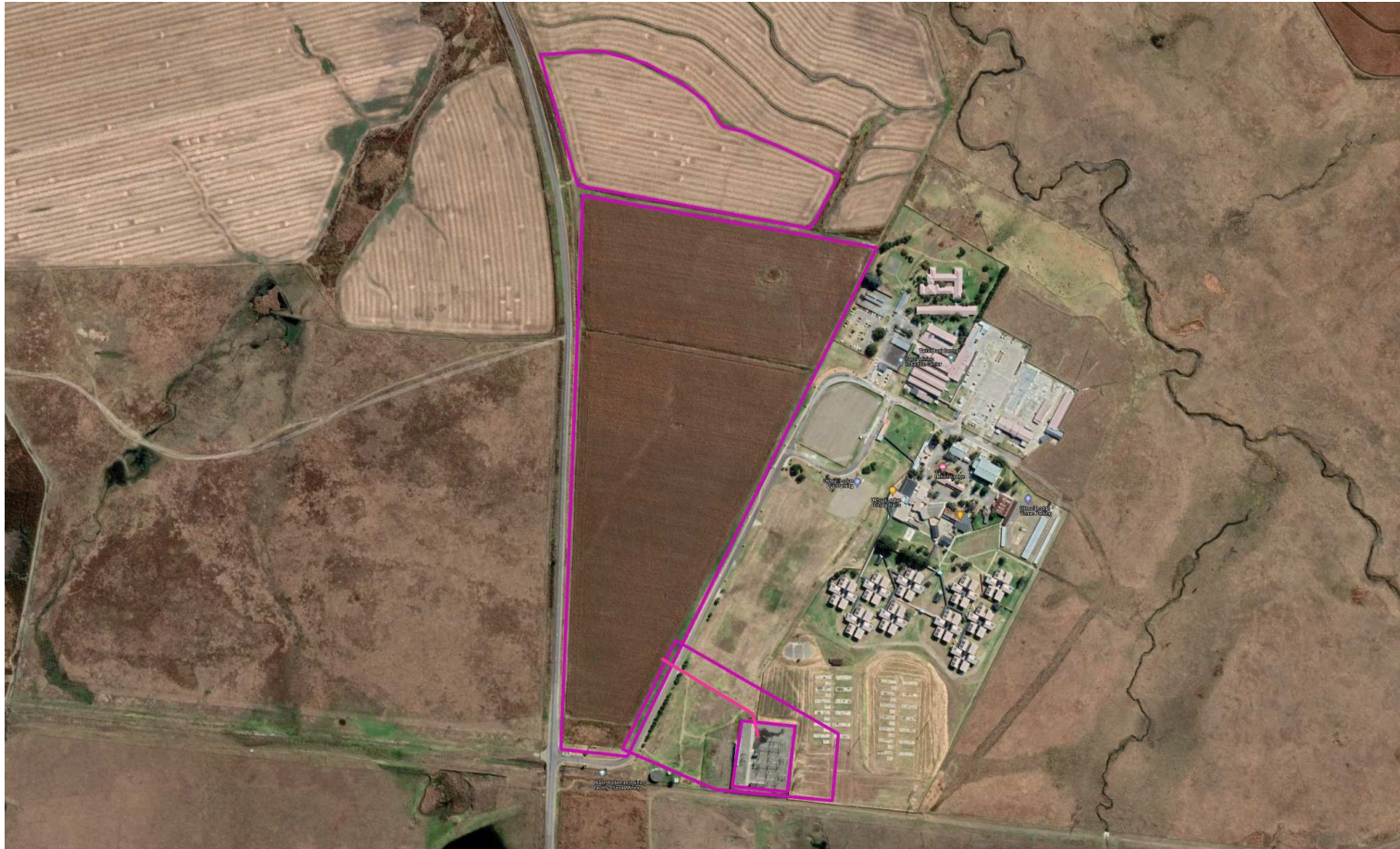


 Development Area



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Figure 1b Overview Map. Satellite image (2019) indicating the proposed development area at closer range. Note the small polygon over an **existing sub station**.



 Development Area

0 100 200 300 400 500 m



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Figure 1c. Overview Map. Satellite image (2019) indicating the proposed development area at closer range.



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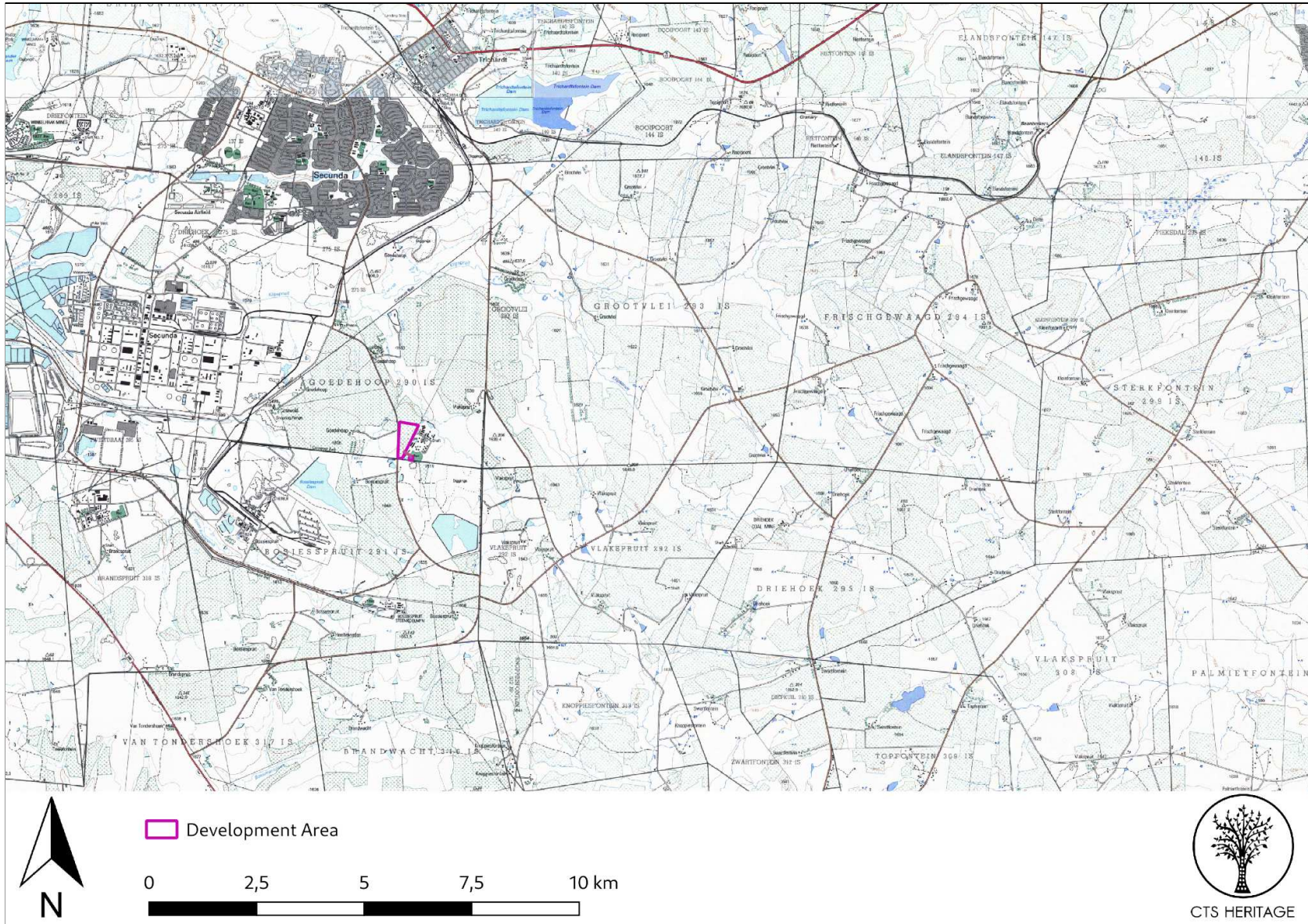


Figure 1d. Overview Map. 1:50 000 Topo Map for the development area - Secunda is nearby to the north of the development area.

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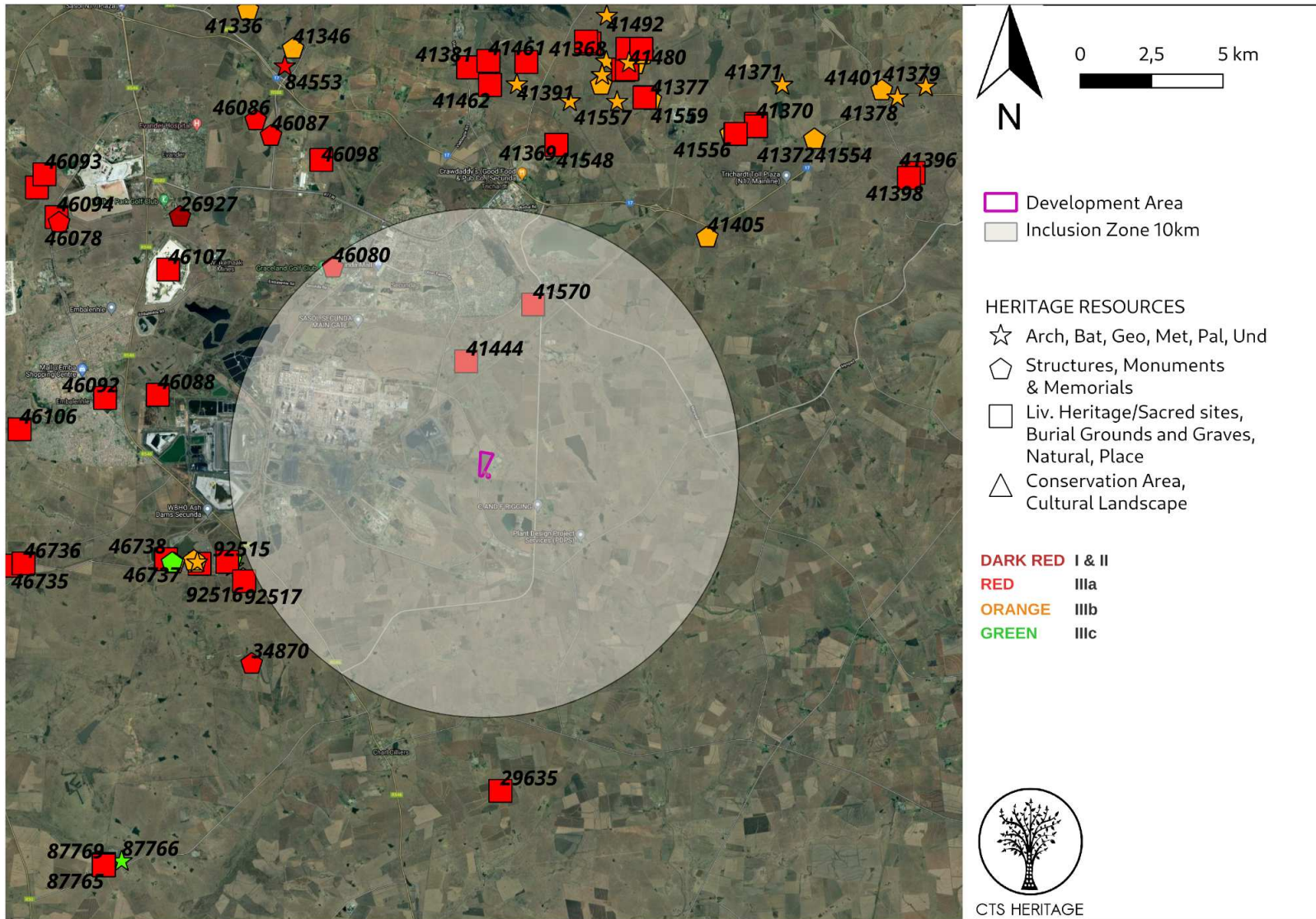
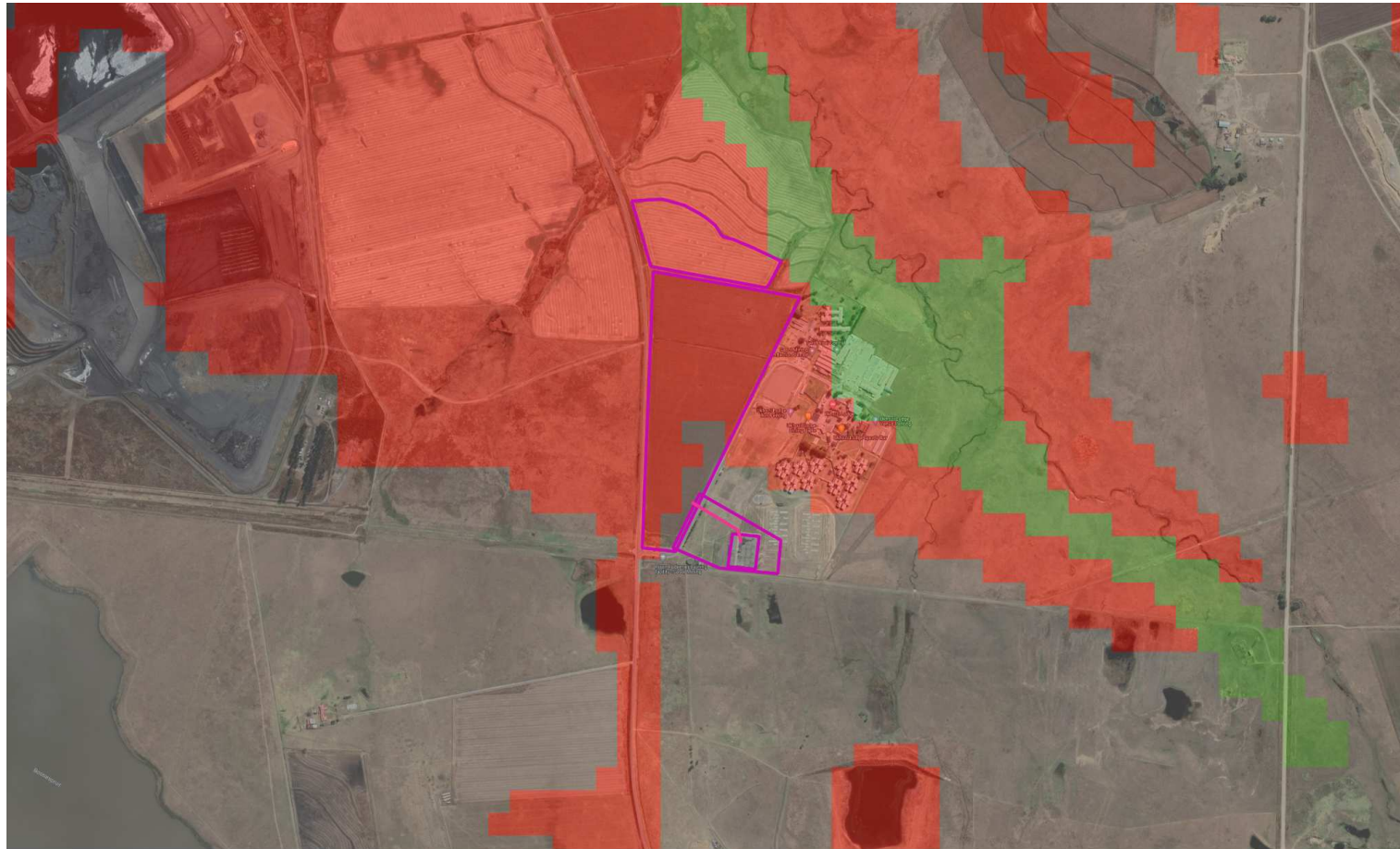


Figure 3a. Heritage Resources Map. Heritage Resources previously identified in and near the study area, with SAHRIS Site IDs indicated. Please See Appendix 4 for full description of heritage resource types.



 Development Area

0 250 500 750 1 000 m



RED	Very high
ORANGE	High
GREEN	Moderate
BLUE	Low
GREY	Insignificant/zero
WHITE	Unknown



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

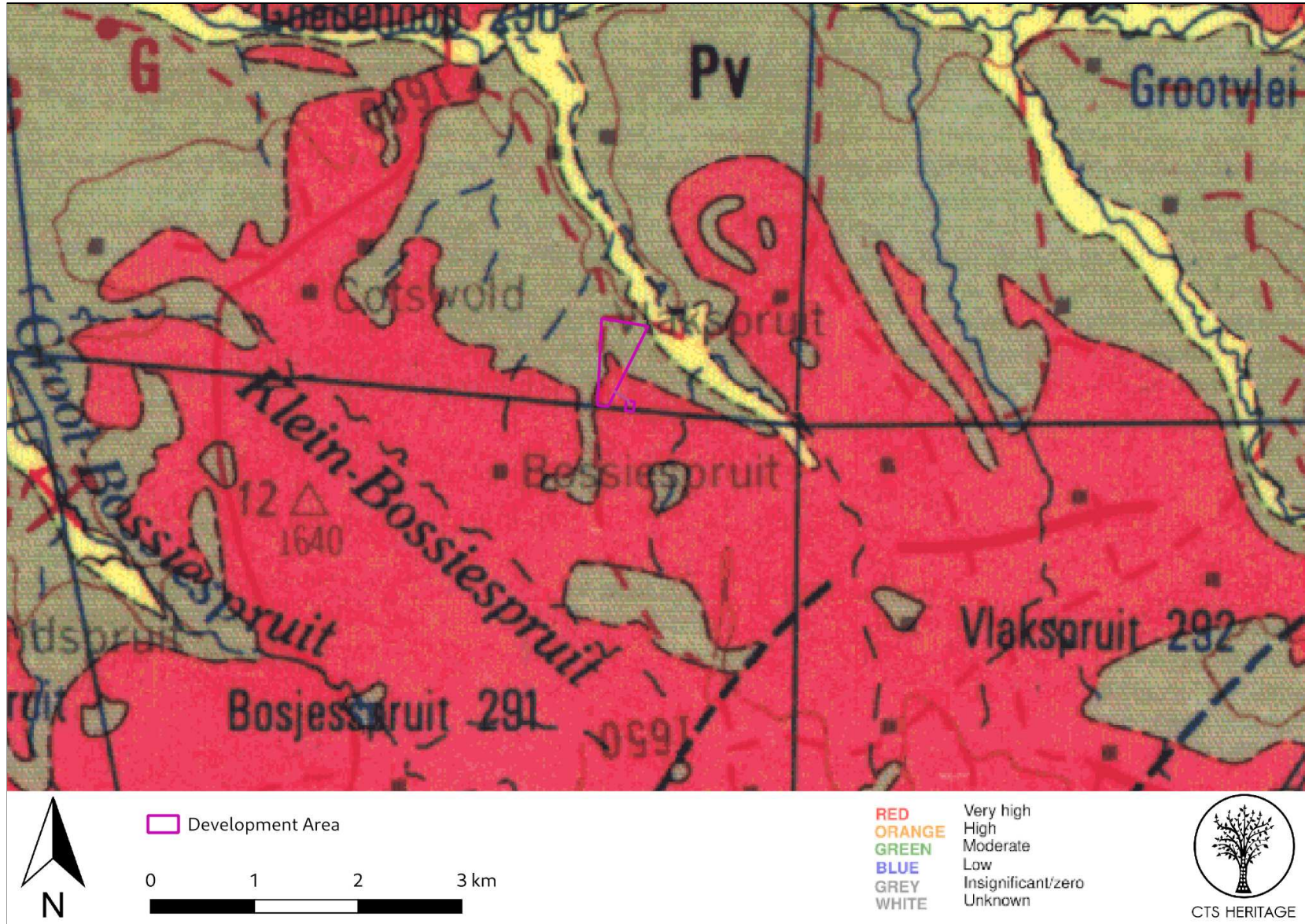


Figure 4b. Geology Map. 1:50 000 Geology Map 2628 East Rand from the Council for Geoscience. The development area is underlain by sediments of the Vryheid Formation (Pv) of the Ecca Group as well as non-fossiliferous Jurassic Dolerites (Jd)



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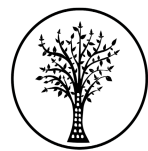


Figure 6.1 GoogleStreetView. Image looking east onto the Sasol entrance from Polymer Road which is at the most southern end of the development area.

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Figure 6.2 GoogleStreetView. Image looking east onto the open field intended for the solar PV array from Polymer Road.

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8. Heritage statement and character of the area

Background

Sasol Limited is an integrated energy and chemical company based in Sandton, South Africa. The company was formed in 1950 in Sasolburg, South Africa and has a large operation in Sasolburg and Secunda, Mpumalanga. The company issued a request for information (RFI) in May 2020 for the supply, by IPPs, of up to 600 MW of renewable energy to its South African operations. Sasol indicated on August 3, 2020 that the decision to issue an RFP for two 10 MW solar PV facilities represented the “first step” towards the group realising its commitment to eventually procure 600 MW of renewable- energy capacity. Chief sustainability officer Hermann Wenhold said the RFP also formed part of the group’s broader aspiration to reduce greenhouse gas emissions by 10% by 2030. Sasol is one of several large South African corporates to indicate that they intended to introduce renewable self-generation at their operations, with several mining companies also moving ahead with projects. The self-generation projects were being pursued to both bolster security of supply and improve tariff visibility in a context of steeply rising Eskom and municipal tariffs and an ongoing risk of load-shedding (Creamer 03 August 2020).

The ground intended for the proposed 19MWac solar PV plant falls on Portion 6 of Goedehoop 290 IS and is immediately adjacent to Polymer Road and Sasol’s training centre. Maize agriculture and grazing have continued on the farm and the installation of a solar PV plant is in keeping with the broader development character of the immediate surroundings which lie on the peri-urban edge of Secunda and the massive Brandspruit coal mine nearby to the west.

Archaeology

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

None of the sites identified in the assessment referenced are located within or near the development area, however the text provides a good assessment of resources that may be present. Furthermore, the proposed development area was included in the area surveyed by Van Schalkwyk (2003, SAHRIS ID 5089) that surveyed a section of the Secunda-Mozambique Gas Pipeline. No archaeological resources were identified in the development in this assessment. Given the heavily disturbed, level agricultural ground chosen for this development, it is highly unlikely that any in situ Stone Age material will be found, nor any Iron Age sites. The possibility of finding graves is also very low.

Built Environment & Cultural Landscapes

There are no buildings within the feasibility study area and the current landscape consists of remnant farming plots wedged inbetween heavy industrial activity (Brandspruit Coal Mine) and Secunda’s chemical plants. The installation of a 19MWac solar PV will therefore not change the character of the cultural landscape and will be in keeping with the developments in the area.

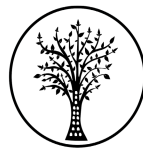
Palaeontology

According to the SAHRIS Palaeosensitivity Map, the area proposed for the 19MWac solar PV plant is underlain by sediments of zero and very high palaeontological sensitivity (Figure

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4a). According to the extract from the Council of Science Map for East Rand 2628 (Figure 4b), the palaeontologically sensitive geology of the area is ascribed to the Vryheid Formation of the Ecca Group of sediments. Groenewald (2014, SAHRIS NID 167013) completed a field-based palaeontological assessment for the Waaihoek WEF. In this assessment, Groenewald (2014) notes that “The Vryheid Formation consists of interbedded very coarse-grained sandstone and mudstone that yields plant and trace fossils as well as some prominent coal seams.” In this assessment, Groenewald (2014) made the following recommendations for the WEF development within the Vryheid Formation “The PEA and CEO be made aware of the possibility of finding fossils in the Vryheid and Volksrust Formation sediments during excavation of the foundations for the turbines and other infrastructure. A professional palaeontologist is appointed to monitor possible palaeontological finds during excavation of turbine foundations and infrastructure where turbine positions and infrastructure fall on Vryheid and Volksrust Formation sediments.” While the sediments underlying the development area have high levels of palaeontological sensitivity, the nature of the excavations associated with PV facilities tends to be shallow (<3m) and as such, the likelihood of impacting intact Vryheid Formation sediments is low. However, as per Groenewald (2014), it is recommended that palaeontological monitoring of excavations by a professional palaeontologist takes place.

RECOMMENDATIONS

(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 as the site is completely transformed - excavations for the solar PV are shallow and will not intrude on fossil bearing layers in the Vryheid Formation as they will be restricted to the topsoil layers however it is recommended that a palaeontological assessment of the impacts be made by a professional palaeontologist.

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APPENDIX 1

List of heritage resources within close proximity to the development area from SAHRIS

Site ID	Site no	Full Site Name	Site Type	Grading
46080	SHON 005	Sasol Shondoni 005	Structures	Grade IIIa
41570	SEC123	Secunda 123	Burial Grounds & Graves	
41444	SEC132	Secunda 132	Burial Grounds & Graves	

APPENDIX 2

Reference List from SAHRIS

NID	Author(s)	Date	Type	Title
157393	Shahzaadee Karodia Khan, Johan Nel	01/02/2014	Heritage Statement	HERITAGE STATEMENT FOR THE BASIC ASSESSMENT UNDERTAKEN FOR A POWERLINE UPGRADE, SYFERFONTEIN MINE, SECUNDA, MPUMALANGA PROVINCE
164217	Francois P Coetzee	15/08/2011	HIA Phase 1	Cultural Heritage Survey of the Proposed Sasol Fine Ash Dams on the Farm Rietvley 320 IS, Secunda, Mpumalanga
268333	Francois P Coetzee, Joanna Behrens	23/04/2015	HIA Phase 2	PHASE II: CULTURAL HERITAGE PROJECT OF THE FARM RIETVLEY 320 IS, SASOL FINE ASH DAM (FAD) 6. Investigation focussing on Site 1, Site 3 and Site 6 on the farm Rietvley 320 IS (Portions 3, 8, 9, 10 and Remaining Extent 2), Govan Mbeki Local Municipality, Gert Sibande District Municipality, Mpumalanga
5059	Johnny Van Schalkwyk	01/05/2003	AIA Phase 1	Archaeological Survey of a Section of the Secunda-Mozambique Gas Pipeline Bethal and Highveld Ridge
6657	Johnny Van Schalkwyk	01/05/1998	AIA Phase 1	A Survey of Cultural Resources for the Proposed Escom Rail Line, Highveld Ridge District, Mpumalanga
7870	Julius CC Pistorius	01/07/2008	AIA Phase 1	A Phase I Heritage Impact Assessment Study for Sasol's Proposed New Gas and Liquid Pipelines (Along a Corridor) from Sasol Synfuels in Secunda (Mpumalanga) to Sasol Infrachem and Natref in Sasolburg (Free

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				State) on the Highveld in the Republic of South Af
108981	Leonie Marais-Botes	01/11/2011	HIA Phase 1	Phase 1 Heritage Impact Assessment for the proposed improvement and rehabilitation of National Route 23 - section between Platrand and Standerton & Section 2 between Standerton and Greylingstad
270672	Julius CC Pistorius	12/05/2015	HIA Phase 1	A PHASE I HERITAGE IMPACT ASSESSMENT (HIA) STUDY FOR THE PROPOSED LAKE UMUZI SOUTH BANK EXTENSION IN SECUNDA IN THE MPUMALANGA PROVINCE
270674	Heidi Fourie	14/05/2015	PIA Desktop	Lake Umuzi South Bank Extension Palaeontological Impact Assessment: Desktop study
7754	Udo Kusel	09/08/2011	AIA Phase 1	Cultural Heritage Resources Impact Assessment for proposed Sasol Electricity generation from Raw Gas cooling Erf 8488 Govan Mbeki Local Municipality Gert Sibande District Municipality

Other References

Creamer, T. 03 August 2020. Sasol calls for bids for 10 MW solar plants at Mpumalanga, Free State operations. Article published on 03 August 2020 in Creamer Media's Engineering News accessed 14 October 2021.

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APPENDIX 3 - Keys/Guides

Key/Guide to Acronyms

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

Full guide to Palaeosensitivity Map legend

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

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APPENDIX 4 - Methodology

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

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

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

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

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

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

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

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

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

DETERMINATION OF THE 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

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

Low coverage will be used for:

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

Medium coverage will be used for

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

High coverage will be used for

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

RECOMMENDATION GUIDE

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

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

This recommendation is made when:

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

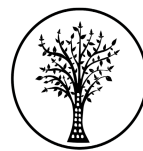
(2) The heritage resources and the area proposed for development are only partially recorded - The surveys undertaken in the area have not adequately captured the heritage resources and/or there are sites which require mitigation or management plans. Further specific heritage work is recommended for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

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

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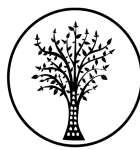
- improvement on some components of the heritage assessments already undertaken, for instance with a renewed field survey and/or with a specific specialist for the type of heritage resources expected in the area
- compilation of a report for a component of a heritage impact assessment not already undertaken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

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

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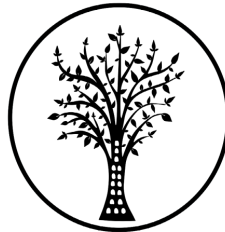
APPENDIX 2: Archaeological Assessment (2021)

ARCHAEOLOGICAL SPECIALIST STUDY

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

Proposed development of the Becrux 1 and 3 PV facilities near Secunda, Mpumalanga Province

Prepared by



CTS HERITAGE

In Association with

Savannah Environmental

October 2021



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EXECUTIVE SUMMARY

The SOLA Group is proposing the development of two 10MW Solar Photovoltaic (PV) Energy Facilities, Becrux PV 1 and Becrux PV 3, and associated infrastructure on two sites located near Secunda in the Govan Mbeki Local Municipality, which forms part of the Gert Sibande District Municipality in the Mpumalanga Province. The purpose of the facilities will be to provide electricity to Sasol via an overhead power line of up to 33k.

The survey was conducted on foot, and sought to assess the presence and significance of archaeological occurrences within the project area. Field assessment documented a sparse number of isolated stone artefacts in secondary contexts, suggesting the area may have been traversed intermittently by Stone Age groups potentially through periods in both the Early Stone Age (ESA - ~2.6ma:~300ka) and the Later Stone Age (LSA: ~40ka: ~2ka).

No artefact quality raw-material was found within the footprint, indicating that the stone artefacts were transported into the area by foragers prior to discard. The raw-materials exploited were cobbles of high-quality quartzite that would have been available in a high-energy river system in the broader vicinity of the project area. All archaeological finds were documented in *ex-situ* contexts, which is further supported by the extensive evidence for agricultural activity including the redistribution of topsoils for planting purposes, and the bioturbation resulting from grazing and trampling.

The potential for finding a dateable *in-situ* archaeological horizon based on current surface observations appears to be low. The documented Stone Age archaeology is therefore classified as scientifically LOW-SIGNIFICANCE. However, the presence of intact sub-surface archaeology cannot be discounted.

Recommendations

There is no objection to the proposed development of the proposed Becrux PV 1 and 3 facilities and their associated infrastructure on condition that:

- Should any previously unrecorded archaeological resources or possible burials be identified during the course of construction activities, work must cease in the immediate vicinity of the find, and SAHRA must be contacted regarding an appropriate way forward.



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CONTENTS

1. INTRODUCTION	3
1.1 Background Information on Project	3
1.2 Description of Property and Affected Environment	3
2. METHODOLOGY	6
2.1 Purpose of Archaeological Study	6
2.2 Summary of steps followed	6
2.3 Constraints & Limitations	7
3. HISTORY AND EVOLUTION OF THE SITE AND CONTEXT	8
4. IDENTIFICATION OF HERITAGE RESOURCES	12
4.1 Field Assessment	12
4.2 Archaeological Resources identified	17
4.3 Selected photographic record	18
5. ASSESSMENT OF THE IMPACT OF THE DEVELOPMENT	21
5.1 Assessment of impact to Archaeological Resources	21
6. CONCLUSION AND RECOMMENDATIONS	22
7. REFERENCES	23



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1. INTRODUCTION

1.1 Background Information on Project

The SOLA Group is proposing the development of two 10MW Solar Photovoltaic (PV) Energy Facilities, Becrux PV 1 and Becrux PV 3, and associated infrastructure on two sites located near Secunda in the Govan Mbeki Local Municipality, which forms part of the Gert Sibande District Municipality in the Mpumalanga Province. The purpose of the facilities will be to provide electricity to Sasol via an overhead power line of up to 33kV.

1.2 Description of Property and Affected Environment

The footprint of the proposed solar Photovoltaic Energy Facility and associated infrastructure is located across several agricultural camps, approximately 5.1km south-west of the town of Secunda, in the Mpumalanga Province of South Africa. In the south-western portion of the footprint, where original/natural landscape is retained, semi-arid grassland and shrubland is evident with sub-volcanic bedrock (mostly granites) outcropping in the form of secondary colluvial nodules in several locations.

The project area has an undulating topography with two springs and a non-perennial drainage in the south-western portion. The south-western portions are leased out by the current land-owner for cattle grazing with evidence of marginal donga formation in several places where vegetation has been completely removed through grazing, and where cattle have aggregated for watering/feeding. The eastern and northern portions of the footprint appear to be used for maize agriculture, and were planted in the period immediately preceding this archaeological survey. The upper soils in the planted regions have thus been extensively turbated in the planting process, and topsoils have been removed in excess of 1.5m depths in several places as a consequence of agriculture and/or road-building. The surface sediments across >60% of the footprint are bioturbated soils with substantial components of silt and clay, interspersed with organic material likely included as stimulants for the planting.



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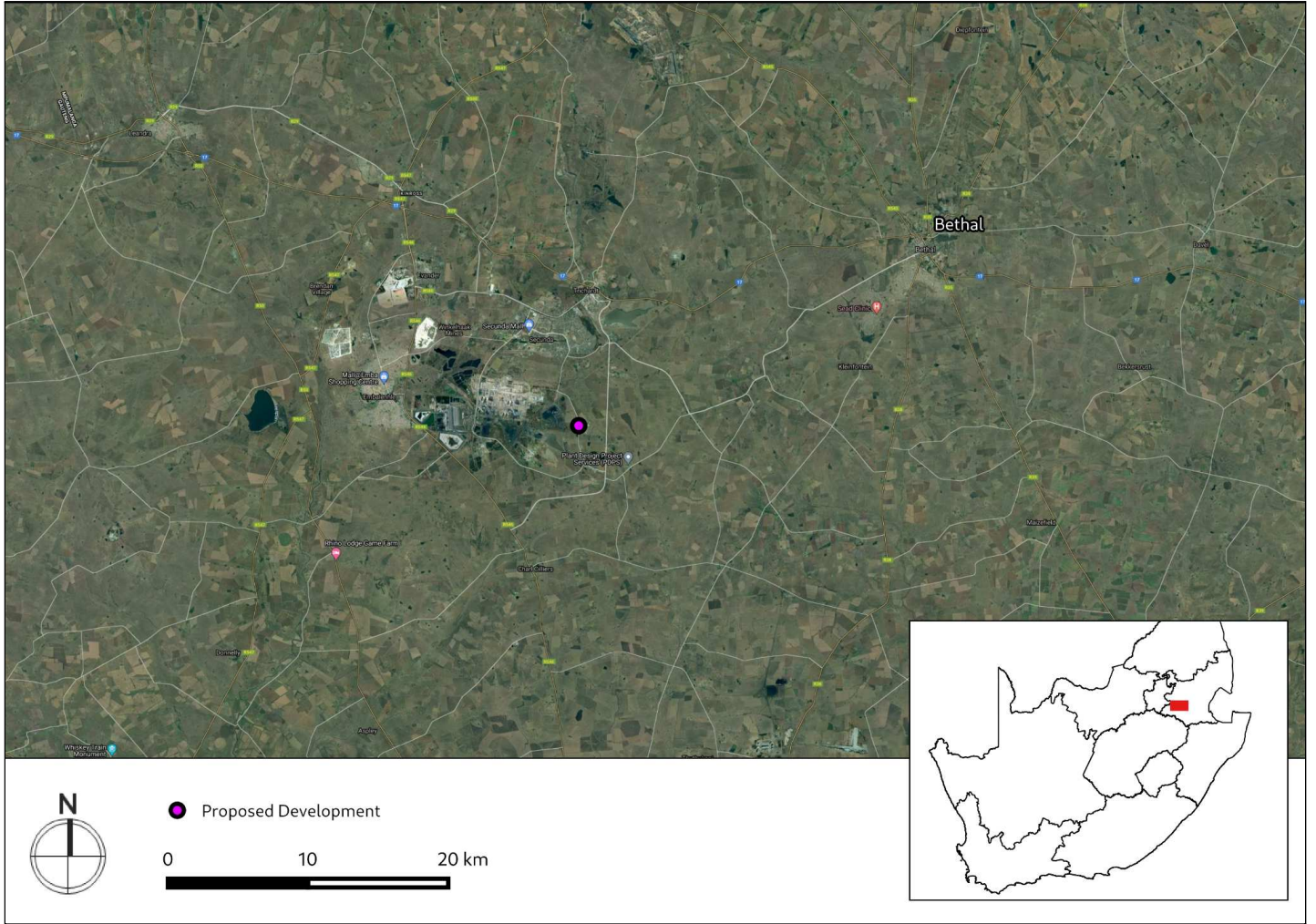


Figure 1.1: Close up satellite image indicating proposed location of study area



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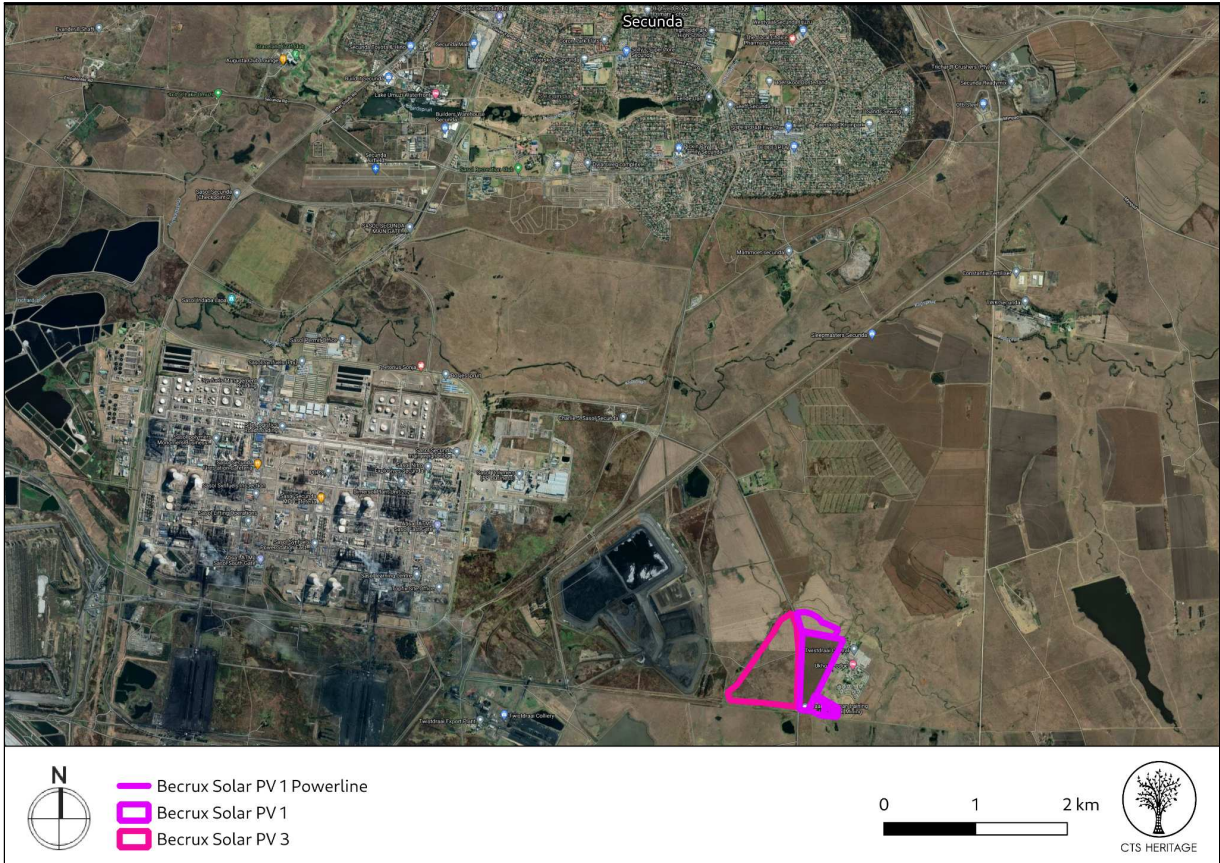


Figure 1.2: Study Area relative to Secunda

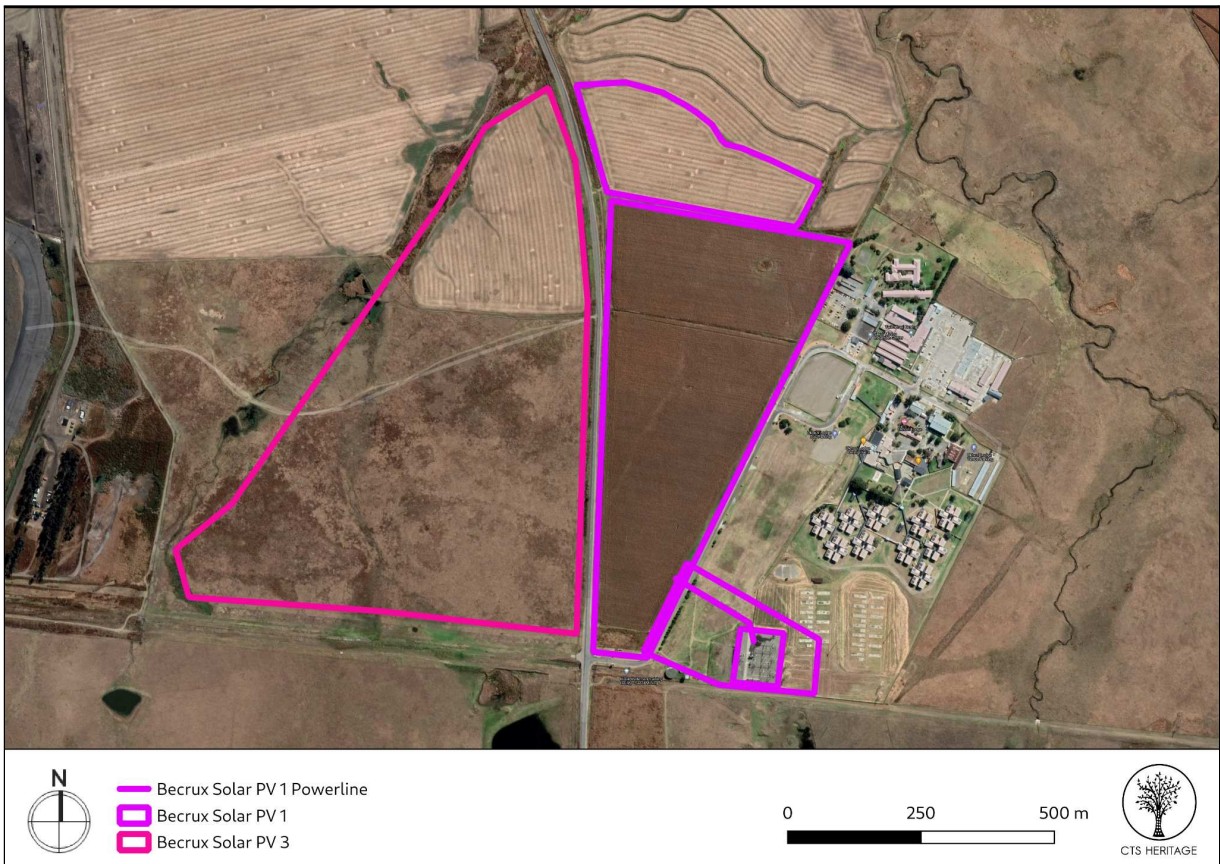


Figure 1.3: Study Area



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 21 and 22 October 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.

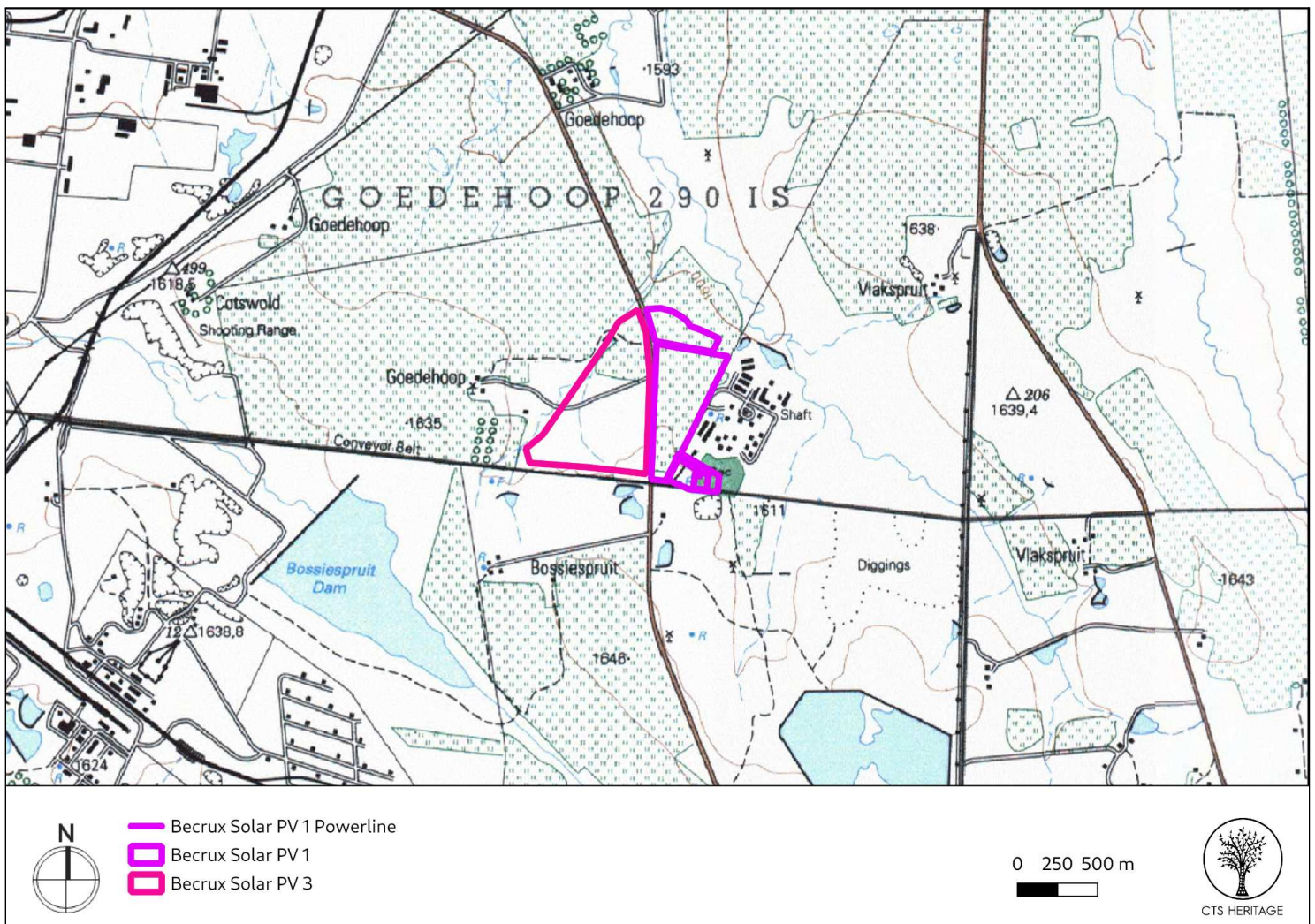


Figure 1.4: Topographic map of the area proposed for development



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2.3 Constraints & Limitations

The survey was conducted on 21st and 22nd of October, 2021 at the start of the summer rainfall season. In the south-western portions of the footprint that are utilized currently for stock farming/grazing, the grass and bush were moderately thick in several places, making it challenging to identify potential ground level archaeological exposures in these places, although no evidence of archaeological material was found in the south-west area generally, even in places that had optimal visibility.

In the east and north of the footprint where planting activities recently took place, visibility was excellent. However, the topsoils were highly disturbed in these portions, rendering the exposed archaeology (all of which had recent abrasions from agricultural machinery) largely limited in potential for modern scientific analyses. We are thus confident that the archaeological sensitivity and scientific potential of the project area has been comprehensively assessed.



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3. HISTORY AND EVOLUTION OF THE SITE AND CONTEXT

Background

Sasol Limited is an integrated energy and chemical company based in Sandton, South Africa. The company was formed in 1950 in Sasolburg, South Africa and has a large operation in Secunda, Mpumalanga. The company issued a request for information (RFI) in May 2020 for the supply, by IPPs, of up to 600 MW of renewable energy to its South African operations. Sasol indicated on August 3, 2020 that the decision to issue an RFP for two 10 MW solar PV facilities represented the “first step” towards the group realising its commitment to eventually procure 600 MW of renewable-energy capacity. Chief sustainability officer Hermann Wenhold said the RFP also formed part of the group’s broader aspiration to reduce greenhouse gas emissions by 10% by 2030. Sasol is one of several large South African corporates to indicate that they intended to introduce renewable self-generation at their operations, with several mining companies also moving ahead with projects. The self-generation projects were being pursued to both bolster security of supply and improve tariff visibility in a context of steeply rising Eskom and municipal tariffs and an ongoing risk of load-shedding (Creamer 03 August 2020).

The ground intended for the proposed 10MW solar PV plant falls on Goedehoop 290 IS and is immediately adjacent to Polymer Road and Sasol’s training centre. Maize agriculture and grazing have continued on the farm and the installation of a solar PV plant is in keeping with the broader development character of the immediate surroundings which lie on the peri-urban edge of Secunda and the massive Brandspruit coal mine nearby to the west.

Archaeology

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

None of the sites identified in the assessment referenced are located within or near the development area, however the text provides a good assessment of resources that may be present. Furthermore, the proposed development area was included in the area surveyed by Van Schalkwyk (2003, SAHRIS ID 5089) that surveyed a section of the



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Secunda-Mozambique Gas Pipeline. No archaeological resources were identified in the development of this assessment. Given the heavily disturbed, level agricultural ground chosen for this development, it is highly unlikely that any *in situ* Stone Age material will be found, nor any Iron Age sites. The possibility of finding graves is also very low.

Built Environment & Cultural Landscapes

There are no buildings on the property and the current landscape consists of remnant farming plots wedged in between heavy industrial activity (Brandspruit Coal Mine) and Secunda's chemical plants. The installation of a 10MW solar PV will therefore not change the character of the cultural landscape and will be in keeping with the developments in the area.

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

SAHRIS ID	Site No.	Site Name	Site Type	Grading
46080	SHON 005	Sasol Shondoni 005	Structures	Grade IIIa
41570	SEC123	Secunda 123	Burial Grounds & Graves	Grade IIIa
41444	SEC132	Secunda 132	Burial Grounds & Graves	Grade IIIa



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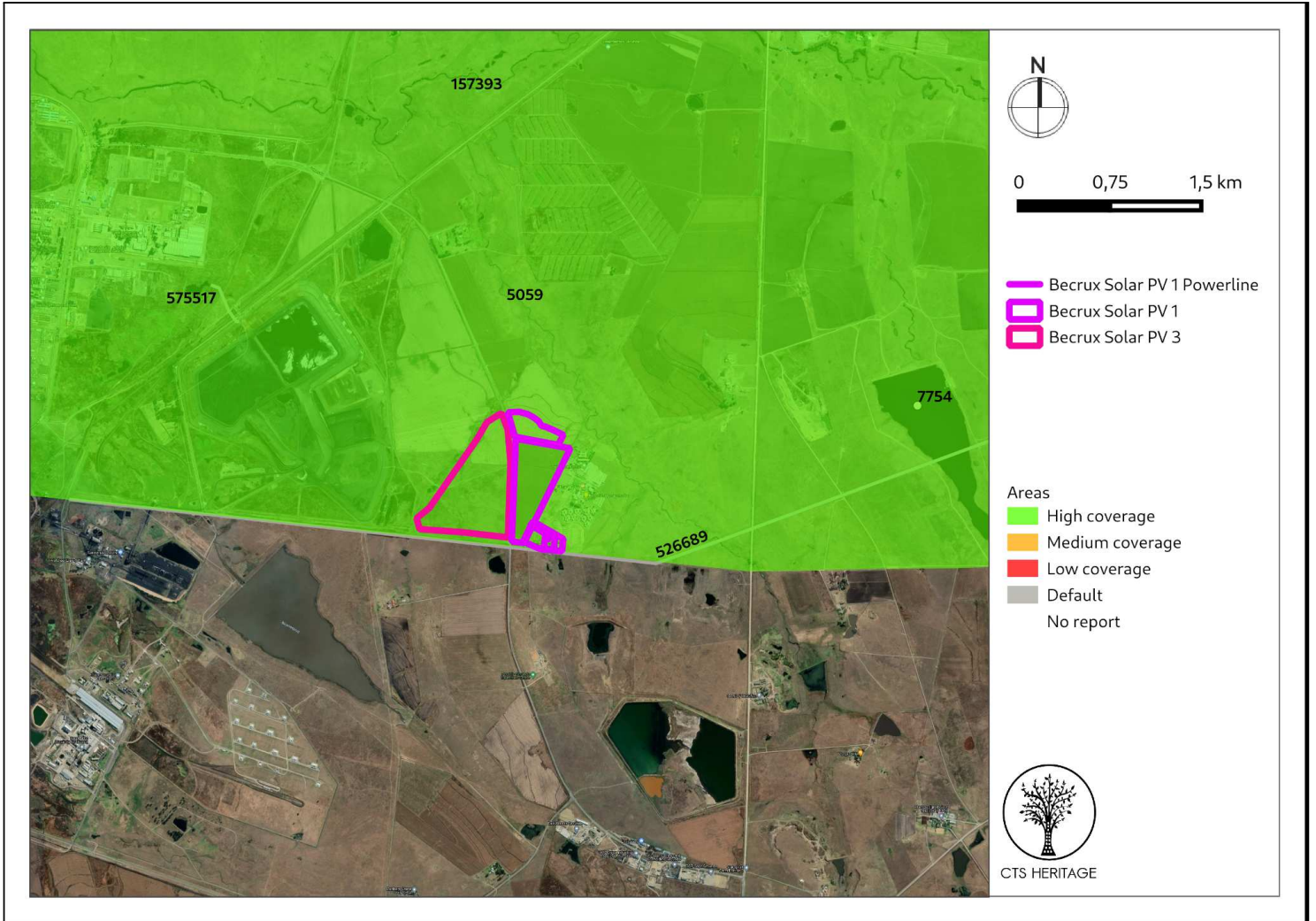


Figure 2: Close up satellite image indicating proposed location of the study area in relation to heritage studies previously conducted



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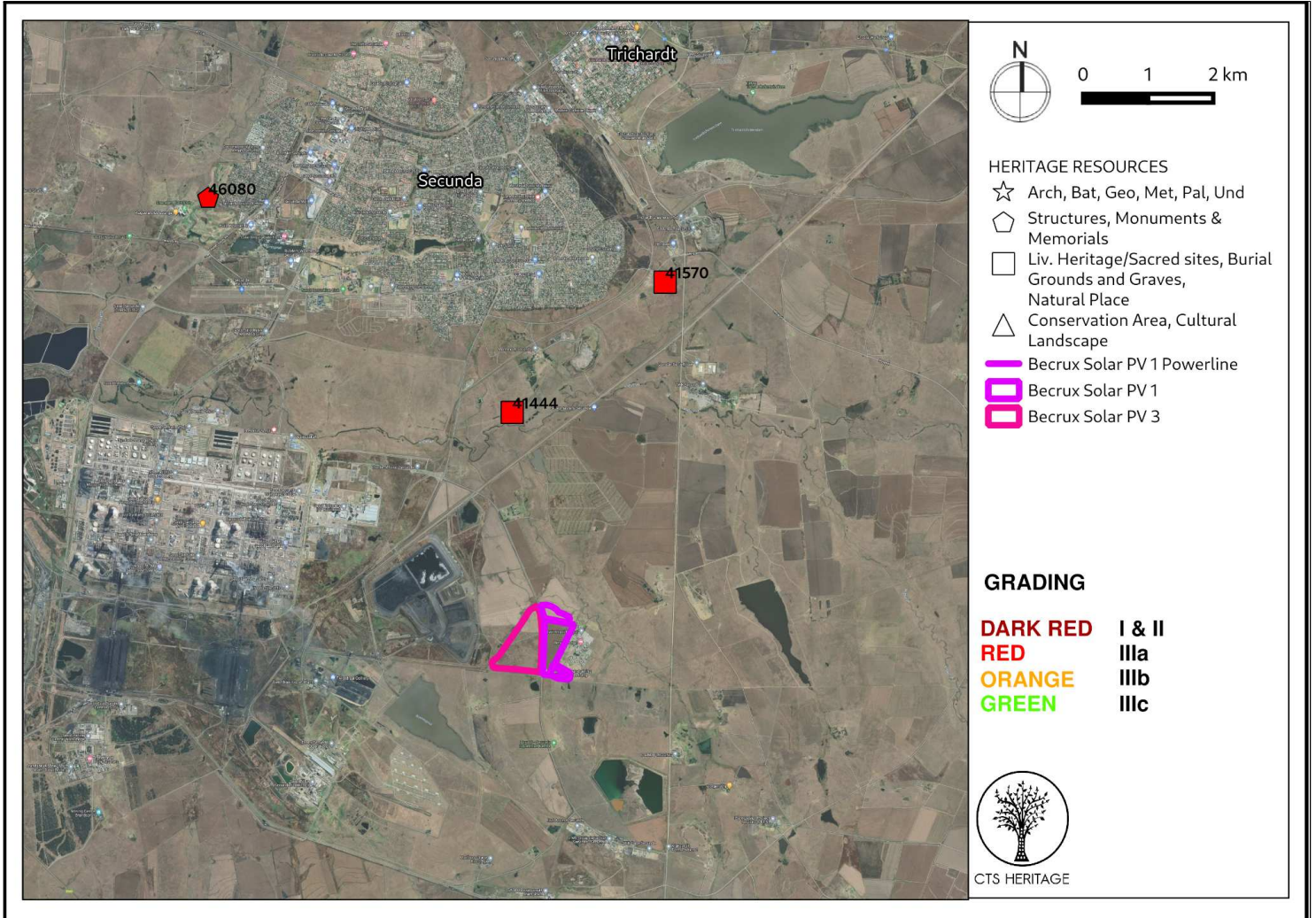


Figure 3. Heritage Resources Map. Heritage Resources previously identified in and near the study area, with SAHRIS Site IDs indicated (see Heritage Screening Assessment for insets)



4. IDENTIFICATION OF HERITAGE RESOURCES

4.1 Field Assessment

The survey was conducted on foot, and sought to assess the presence and significance of archaeological occurrences within the project area. Field assessment documented a sparse number of isolated stone artefacts in secondary contexts, suggesting the area may have been traversed intermittently by Stone Age groups potentially through periods in both the Early Stone Age (ESA – ~2.6ma:~300ka) and the Later Stone Age (LSA: ~40ka: ~2ka).

No artefact quality raw-material was found within the footprint, indicating that the stone artefacts were transported into the area by foragers prior to discard. The raw-materials exploited were cobbles of high-quality quartzite that would have been available in a high-energy river system in the broader vicinity of the project area. All archaeological finds were documented in *ex-situ* contexts, which is further supported by the extensive evidence for agricultural activity including the redistribution of topsoils for planting purposes, and the bioturbation resulting from grazing and trampling.

The potential for finding a dateable *in-situ* archaeological horizon based on current surface observations appears to be low. The documented Stone Age archaeology is therefore classified as scientifically LOW-SIGNIFICANCE. However, the presence of intact sub-surface archaeology cannot be discounted. Mitigation measures for such a possibility are expanded on in the recommendations.



Figure 4.1: Intensive grass cover affecting visibility in certain locations



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Figure 4.2: Waterlogged meadow



Figure 4.3: Bioturbated planted fields



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Figure 4.4: Section showing the level of the original land surface - demonstrating the amount of surface sediment lost through agricultural activities.



Figure 4.5: Cattle grazing plot



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Figure 4.6: Bioturbated planted fields



Figure 4.7: Ploughed field exhibiting artefacts redeposited in a secondary context



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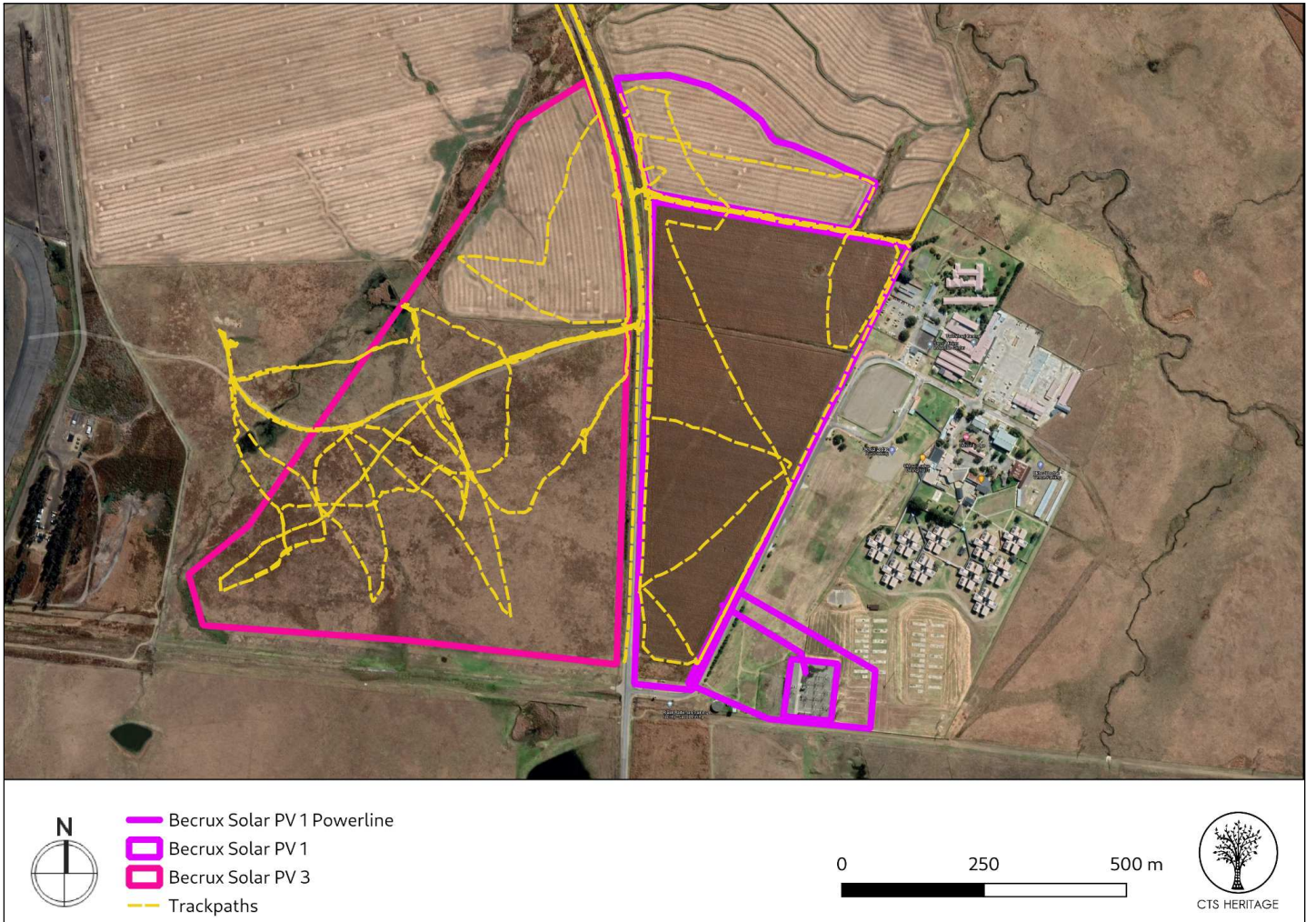


Figure 5: Overall track paths of foot survey



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4.2 Archaeological Resources identified

Table 1: Observations noted during the field assessment

Site No.	Site Name	Description	Co-ordinates		Grading	Mitigation
SEC_1	Secunda 1	Possible upper grinding stone. The shape of the riverine cobble suggests it could have been the grinding stone, but the abraded surface is eroded.	2,656,741	2,921,916	NCW	NA
SEC_20	Secunda 10	Kombewa flake. Possibly later Acheulean	2,656,968	2,922,261	NCW	NA
SEC_21	Secunda 21	Bifacial fragment. Artefact edges are rolled suggestive of a redeposited context	2,656,934	2,922,277	NCW	NA
SEC_22	Secunda 22	Upper grinding stone. Artefact preserved ochre stains, but overall was damaged by the ploughing activities	26,569	2,922,277	NCW	NA



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4.3 Selected photographic record

(a full photographic record is available upon request)



Figure 6.1: Secunda 1



Figure 6.2: Secunda 1



Figure 6.3: Secunda 20



Figure 6.4: Secunda 21



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Figure 6.5 Secunda 22



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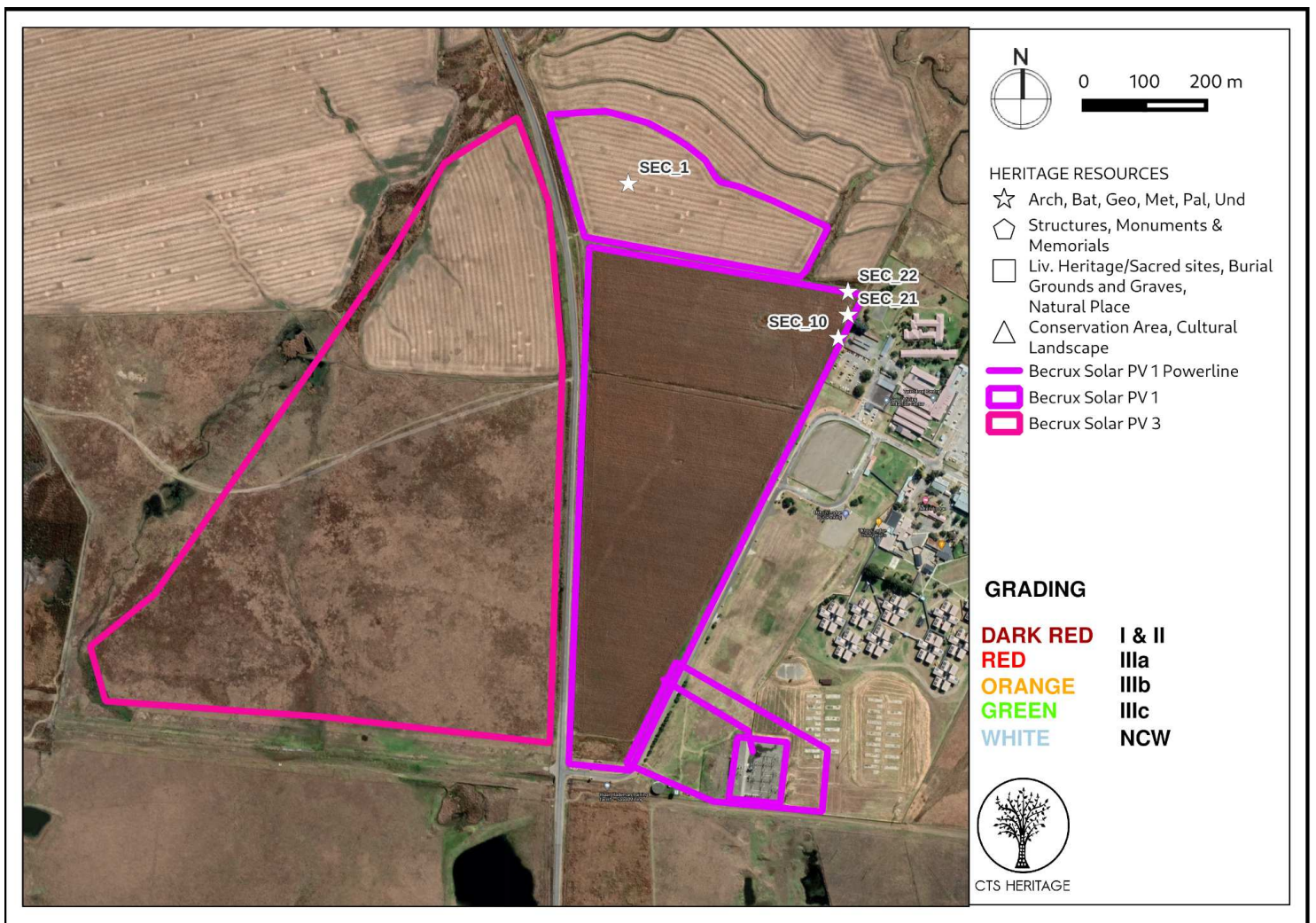
5. ASSESSMENT OF THE IMPACT OF THE DEVELOPMENT

5.1 Assessment of impact to Archaeological Resources

The ephemeral isolated archaeological finds were exclusively associated with the planted regions of the project area, and occurred in secondary contexts, so therefore have limited potential for modern scientific analyses (due to the *ex situ* spatial contexts of the finds and limited possibility of radiometric dating).

The field assessment conducted revealed no significant archaeological resources located within the development footprint. Four observations of archaeological resources were identified. These have all been determined to be not conservation-worthy (NCW) and have been sufficiently recorded in this assessment.

Based on the outcomes of this assessment, the area proposed for development has an overall low rating for archaeological sensitivity and significance. It is very unlikely that the proposed development of PV facilities on these properties will negatively impact on significant archaeological heritage resources.





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Figure 7.1: Map of heritage resources identified during the field assessment, relative to the proposed study area and associated archaeological sensitivity

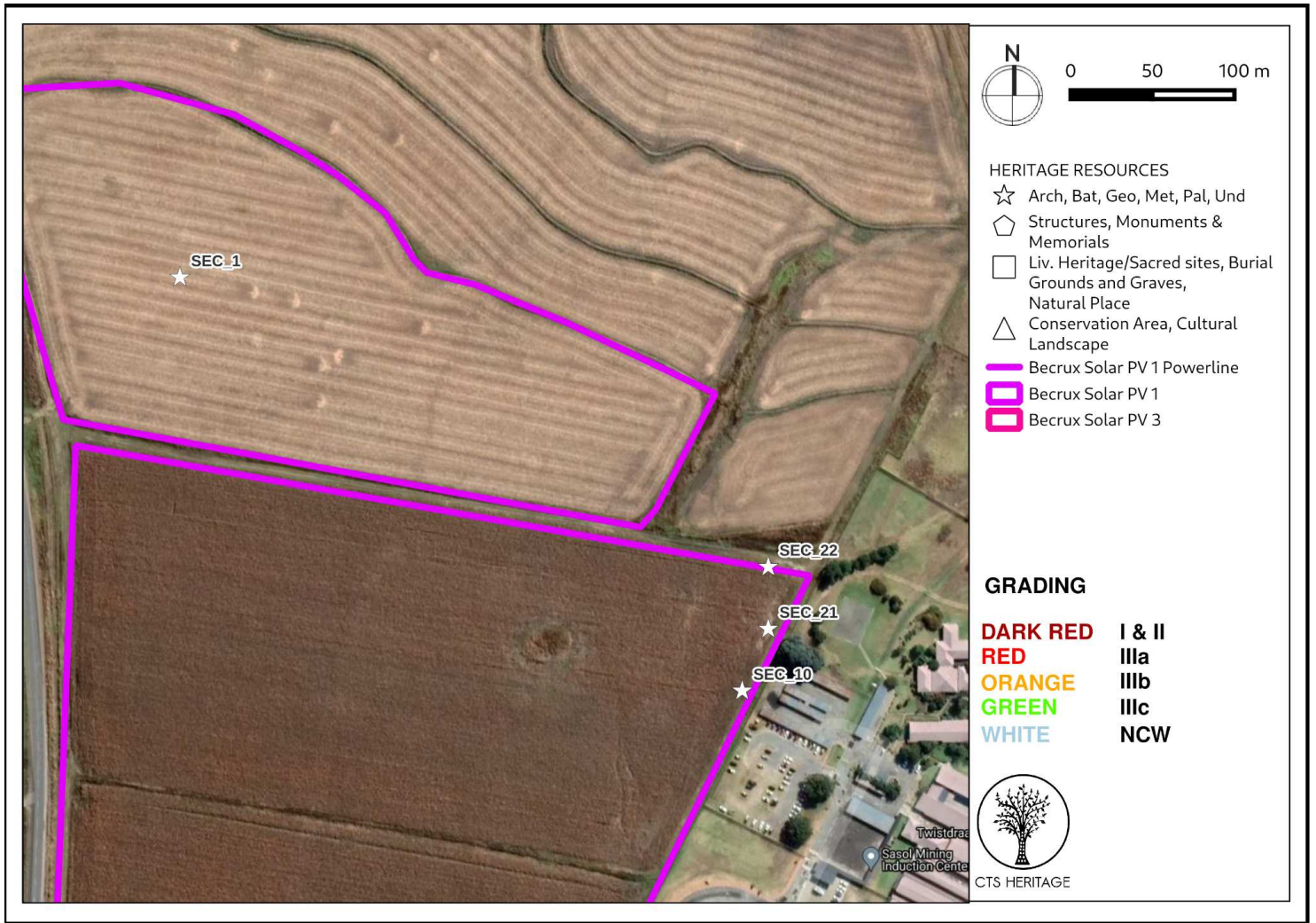


Figure 7.2: Map of heritage resources identified during the field assessment

6. CONCLUSION AND RECOMMENDATIONS

The area proposed for development has an overall low level of archaeological sensitivity and it is very unlikely that the proposed development will have a negative impact to significant archaeological heritage.

Recommendations

There is no objection to the proposed development of the proposed Becrux PV 1 and 3 facilities and their associated infrastructure on condition that:

- Should any previously unrecorded archaeological resources or possible burials be identified during the course of construction activities, work must cease in the immediate vicinity of the find, and SAHRA must be contacted regarding an appropriate way forward.



7. REFERENCES

Heritage Impact Assessments				
Nid	Report Type	Author/s	Date	Title
157393	Shahzaade e Karodia Khan, Johan Nel	01/02/2014	Heritage Statement	HERITAGE STATEMENT FOR THE BASIC ASSESSMENT UNDERTAKEN FOR A POWERLINE UPGRADE, SYFERFONTEIN MINE, SECUNDA, MPUMALANGA PROVINCE
164217	Francois P Coetzee	15/08/2011	HIA Phase 1	Cultural Heritage Survey of the Proposed Sasol Fine Ash Dams on the Farm Rietvley 320 IS, Secunda, Mpumalanga
268333	Francois P Coetzee, Joanna Behrens	23/04/2015	HIA Phase 2	PHASE II: CULTURAL HERITAGE PROJECT OF THE FARM RIETVLEY 320 IS, SASOL FINE ASH DAM (FAD) 6. Investigation focussing on Site 1, Site 3 and Site 6 on the farm Rietvley 320 IS (Portions 3, 8, 9, 10 and Remaining Extent 2), Govan Mbeki Local Municipality, Gert Sibande District Municipality, Mpumalanga
5059	Johnny Van Schalkwyk	01/05/2003	AIA Phase 1	Archaeological Survey of a Section of the Secunda-Mozambique Gas Pipeline Bethal and Highveld Ridge
6657	Johnny Van Schalkwyk	01/05/1998	AIA Phase 1	A Survey of Cultural Resources for the Proposed Escom Rail Line, Highveld Ridge District, Mpumalanga
7870	Julius CC Pistorius	01/07/2008	AIA Phase 1	A Phase I Heritage Impact Assessment Study for Sasol's Proposed New Gas and Liquid Pipelines (Along a Corridor) from Sasol Synfuels in Secunda (Mpumalanga) to Sasol Infrachem and Natref in Sasolburg (Free State) on the Highveld in the Republic of South Af
108981	Leonie Marais-Bot es	01/11/2011	HIA Phase 1	Phase 1 Heritage Impact Assessment for the proposed improvement and rehabilitation of National Route 23 - section between Platrand and Standerton & Section 2 between Standerton and Greylingstad
270672	Julius CC Pistorius	12/05/2015	HIA Phase 1	A PHASE I HERITAGE IMPACT ASSESSMENT (HIA) STUDY FOR THE PROPOSED LAKE UMUZI SOUTH BANK EXTENSION IN SECUNDA IN THE MPUMALANGA PROVINCE
270674	Heidi Fourie	14/05/2015	PIA Desktop	Lake Umuzi South Bank Extension Palaeontological Impact Assessment: Desktop study
7754	Udo Kusel	09/08/2011	AIA Phase 1	Cultural Heritage Resources Impact Assessment for proposed Sasol Electricity generation from Raw Gas cooling Erf 8488 Govan Mbeki Local Municipality Gert Sibande District Municipality

Other References:

Creamer, T. 03 August 2020. Sasol calls for bids for 10 MW solar plants at Mpumalanga, Free State operations. Article published on 03 August 2020 in Creamer Media's Engineering News accessed 14 October 2021.



CTS HERITAGE

APPENDIX 3: Palaeontological Assessment (2021)

Palaeontological Impact Assessment for the two proposed PV facilities south of Secunda, Mpumalanga Province

Site Visit Report (Phase 2)

For

CTS Heritage

27 October 2021

Prof Marion Bamford
Palaeobotanist
P Bag 652, WITS 2050
Johannesburg, South Africa
Marion.bamford@wits.ac.za


Expertise of Specialist

The Palaeontologist Consultant: Prof Marion Bamford
Qualifications: PhD (Wits Univ, 1990); FRSSAf, ASSAf
Experience: 32 years research; 24 years PIA studies

Declaration of Independence

This report has been compiled by Professor Marion Bamford, of the University of the Witwatersrand, sub-contracted by CTS Heritage, Cape Town, South Africa. The views expressed in this report are entirely those of the author and no other interest was displayed during the decision making process for the Project.

Specialist: Prof Marion Bamford

Signature: 

Executive Summary

The SOLA Group, at the request of SASOL, is proposing to establish two photo voltaic facilities (PVs) south of Secunda just east of the Brandspruit Coal Mine, on Farm Goedehoop 290 IS, Mpumalanga Province. A Phase 2 Palaeontological Impact Assessment was requested for this project because the site is on very highly sensitive rocks according to the SAHRIS Palaeosensitivity map. To comply with regulations of the South African Heritage Resources Agency (SAHRA) in terms of Section 38(8) of the National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA), a site visit and report for the Palaeontological Impact Assessment (PIA) were completed for the proposed project.

No fossils of any kind were seen during the site visit. The recently ploughed agricultural land has deep, dark soils, more or less flat topography, and no rocky outcrops.

The proposed site lies on shales and sandstones of the Vryheid Formation (Ecca Group, Karoo Supergroup) that are potentially fossiliferous. Potential fossils would be impressions of the *Glossopteris* flora (*Glossopteris* leaves, lycopods, sphenophytes, ferns and early gymnosperms). Although no fossils were seen during the site visit, a Fossil Chance Find Protocol should be added to the EMPr. Based on this information, it is recommended that no further palaeontological site visit is required. If fossils are found once excavations for foundations and infrastructure commences then they should be rescued and a palaeontologist called to collect a representative sample. As far as the palaeontology is concerned, the project may be authorised.

Table of Contents

Expertise of Specialist.....	1
Declaration of Independence.....	1
1. Background.....	4
2. Methods and Terms of Reference.....	6
3i. Project location and geological context.....	7
3ii. Palaeontological context.....	9
3iii Site visit and survey observations	10
4. Impact assessment	15
5. Assumptions and uncertainties.....	16
6. Recommendation.....	16
7. References.....	17
8. Chance Find Protocol	18
Appendix A (examples of fossils)	19
Appendix B (short CVs of specialists)	22

i. Background

At the request of SASOL, the SOLA Group is proposing the development of a 10MW Solar Photovoltaic (PV) Energy Facility and associated infrastructure on a site located near Secunda in the Govan Mbeki Local Municipality, which forms part of the Gert Sibande District Municipality in the Mpumalanga Province. The purpose of the facility will be to provide electricity to Sasol via an overhead power line of up to 33kV.

This project includes two proposed PV facilities on the Farm Goedehoop 290 IS, the Betacrux PV 1 facility to the east (green polygon in Figures 1-2) and the Betacrux 3 PV facility to the west (yellow polygon in Figures 1-2). They will be linked to the existing substation (white outline in orange section of Figure 2). The whole project area lies immediately to the east of the Brandspruit Coal Mine

The total surface area of Betacrux 1 is 29.81 ha, and Betacrux 3 is much the same area again. Expected depth of excavations will be <0.5m, and the height of the PV collectors about 2-3m for the solar array. Besides the 10MW solar PV array on the majority of the development area, a 33kV overhead power line will also be erected. A short underground, 196m in length, AC powerline may be installed and is assessed as part of the impact assessment studies being conducted

The site visit survey was done by Rick Tolchard on Tuesday 26th October 2021. In order to comply with the regulations of the South African Heritage Resources Agency (SAHRA) in terms of Section 38(8) of the National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA), a site visit (or phase 2) Palaeontological Impact Assessment (PIA) was completed for the proposed project and is presented herein.

Table 1: Specialist report requirements in terms of Appendix 6 of the EIA Regulations (amended 2017)

	A specialist report prepared in terms of the Environmental Impact Regulations of 2017 must contain:	Relevant section in report
ai	Details of the specialist who prepared the report	Appendix B
aii	The expertise of that person to compile a specialist report including a curriculum vitae	Appendix B
b	A declaration that the person is independent in a form as may be specified by the competent authority	Page 1
c	An indication of the scope of, and the purpose for which, the report was prepared	Section i.
ci	An indication of the quality and age of the base data used for the specialist report:	Yes

	SAHRIS palaeosensitivity map accessed – date of this report	
cii	A description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change	Section 4
d	The date and season of the site investigation and the relevance of the season to the outcome of the assessment	Section 3iii
e	A description of the methodology adopted in preparing the report or carrying out the specialised process	Section ii.
f	The specific identified sensitivity of the site related to the activity and its associated structures and infrastructure	Section 4
g	An identification of any areas to be avoided, including buffers	None
h	A map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	No palaeontological sensitivities identified
i	A description of any assumptions made and any uncertainties or gaps in knowledge;	Section viii.
j	A description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives, on the environment	Section
k	Any mitigation measures for inclusion in the EMPr	Section 8, Appendix A
l	Any conditions for inclusion in the environmental authorisation	Section 8
m	Any monitoring requirements for inclusion in the EMPr or environmental authorisation	Section 8, Appendix A
ni	A reasoned opinion as to whether the proposed activity or portions thereof should be authorised	Section 6
nii	If the opinion is that the proposed activity or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan	Section 8
o	A description of any consultation process that was undertaken during the course of carrying out the study	N/A – consultation done by EAP
p	A summary and copies if any comments that were received during any consultation process	N/A – consultation done by EAP
q	Any other information requested by the competent authority.	Section 8



Figure 1: Google Earth map showing the proposed PV facilities (yellow and green polygons) on Farm Goedehoop 290 IS relative to the towns of Secunda and Trichardt.



Figure 2: Google Earth map with the outline of the areas of interest. Green polygon represents Betacrux 1 and the yellow polygon is for Betacrux 3. The proposed powerlines are shown in white in the orange area (southeast).

ii. Methods and Terms of Reference

The Terms of Reference (ToR) for this study were to undertake a PIA and provide feasible management measures to comply with the requirements of SAHRA.

The methods employed to address the ToR included:

1. Consultation of geological maps, literature, palaeontological databases, published and unpublished records to determine the likelihood of fossils occurring in the affected areas. Sources included records housed at the Evolutionary Studies Institute at the University of the Witwatersrand and SAHRA databases;
2. Where necessary, site visits by a qualified palaeontologist to locate any fossils and assess their importance;
3. Where appropriate, collection of unique or rare fossils with the necessary permits for storage and curation at an appropriate facility (*not applicable to this assessment*); and
4. Determination of fossils' representivity or scientific importance to decide if the fossils can be destroyed or a representative sample collected (*not applicable to this assessment*).

iii. Geology and Palaeontology

iv. Project location and geological context

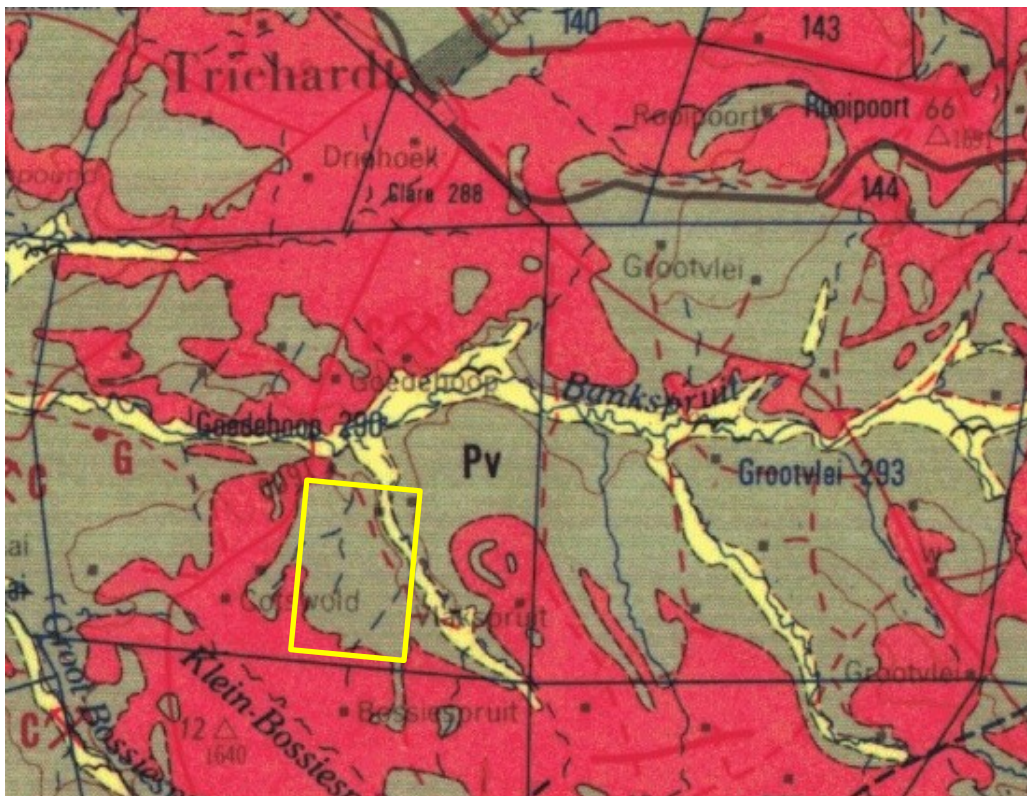


Figure 3: Geological map of the area south of Trichardt and Secunda with the project area on Farm Goedehoop 290 IS shown within the yellow outline. Abbreviations of the rock types are explained in Table 2. Map enlarged from the Geological Survey 1: 250 000 map 2628 East Rand.

Table 2: Explanation of symbols for the geological map and approximate ages (Johnson et al., 2006; Partridge et al., 2006; Eriksson et al., 2006, 2012). SG = Supergroup; Fm = Formation; Ma = million years; grey shading = formations impacted by the project.

Symbol	Group/Formation	Lithology	Approximate Age
Qs	Quaternary sands and soils	Partly consolidated fine-grained sediments with silcrete nodules	Last 2.5 Ma
Jd	Jurassic dolerite	Dolerite dykes and sills	Jurassic, ca 183 Ma
Pv	Vryheid Fm, Ecca Group, Karoo SG	Shales, sandstone, coal	Early Permian, Middle Ecca <269 - 266 Ma

The site lies in the north eastern sector of the Karoo Basin with Karoo Supergroup rocks intruded by dolerite dykes and unconformably overlain by much younger alluvium and soils of probable Quaternary age (Figure 3). The Karoo Supergroup rocks unconformably overlie the much older rocks of the Transvaal Supergroup in the Transvaal Basin and some of them are exposed to the south of the town (Figure 3).

The Main Karoo Basin and Karoo Supergroup rocks cover a very large proportion of South Africa. The Karoo Basin is bounded along the southern margin by the Cape Fold Belt and along the northern margin by the much older Transvaal Supergroup rocks. Representing some 120 million years (300 – 183Ma), the Karoo Supergroup rocks have preserved a diversity of fossil plants, insects, vertebrates and invertebrates.

During the Carboniferous period South Africa was part of the huge continental landmass known as Gondwanaland and it positioned over the South Pole. As a result, there were several ice sheets that formed and melted, and covered most of South Africa (Visser, 1986, 1989; Isbell et al., 2012). Gradual melting of the ice as the continental mass moved northwards and the earth warmed, formed sedimentary deposits in the large inland sea. These are the oldest rocks in the Karoo system, and are exposed around the outer part of the ancient Karoo Basin and are known as the Dwyka Group. They comprise tillites, diamictites, mudstones, siltstones and sandstones that were deposited as the basin filled (Johnson et al., 2006).

Overlying the Dwyka Group rocks are rocks of the Ecca Group that are Early Permian in age. There are eleven formations recognised in this group but they do not all extend throughout the Karoo Basin. In the Free

State and KwaZulu Natal, from the base upwards are the Pietermaritzburg Formation, **Vryheid Formation** and the Volksrust Formation. All of these sediments have varying proportions of sandstones, mudstones, shales and siltstones and represent shallow to deep water settings, deltas, rivers, streams and overbank depositional environments.

Overlying the Ecca Group rocks are the Beaufort Group Rocks that are late Permian and early Triassic in age. They are not exposed in this region.

Intruding through all these sediments are dolerite dykes (but not in this section) that formed during the Jurassic Drakensberg basaltic eruptions. Unconformably overlying the older rocks are the considerably younger Quaternary or Kalahari sands. As the continent dried out during the Late Quaternary period windblown sands from the Kalahari Basin were redeposited farther to the east, and together with fluvially borne sands from the major rivers such as the Vaal River, the sands covered some of the lower lying areas (Partridge et al., 2006). Soils cover most of the area and these are much younger than the rocks below.

v. Palaeontological context

The palaeontological sensitivity of the area under consideration is presented in Figure 4. The Permian Vryheid Formation sediments could have preserved fossil plants of the *Glossopteris* Flora, including leaf impressions and fructifications of *Glossopteris*, and other extinct groups like the cordaitaleans, some lycopods, sphenophytes, wood and ferns, as well as early gymnosperms. Fossil plants have been recorded from other regions but they are sporadic and their distribution is hard to predict. Coal seams 1-6 are found in this region but although coal is formed from the alteration by temperature and pressure of peats that are an accumulation of plant matter, no plants are recognised within the coal itself. Fossil plants can be found in the fine-grained shale lenses between the coal seams.

The *Glossopteris* flora fossils are of interest to palaeobotanists but in general they are widely scattered and difficult to locate. This flora is well known but there is always a very small chance that some new taxa may be discovered (Plumstead, 1969; Anderson and Anderson, 1985).

Quaternary sands seldom preserve fossils as they are either aeolian in origin or from recent fluvial activity, in other words they are not in primary context. Fossil pans, spring mounds or stabilised sand dunes may preserve fossils but these features are not indicated on the Google Earth map that shows the land has having been modified by agricultural practices.

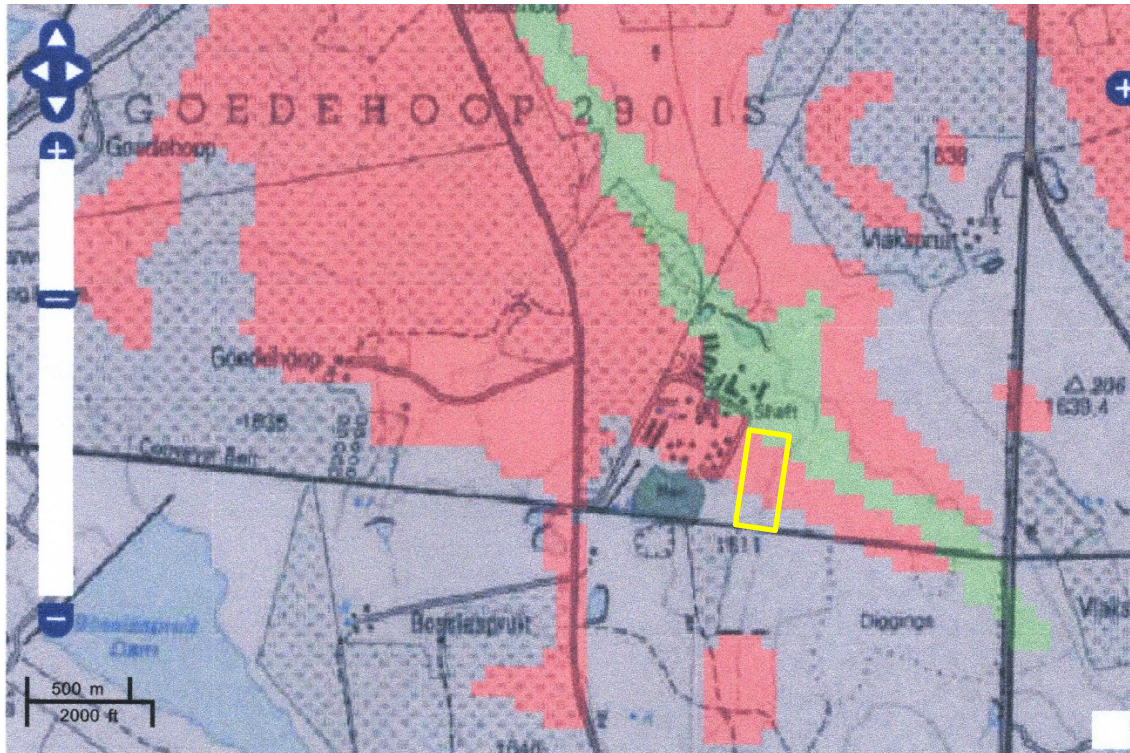


Figure 4: SAHRIS palaeosensitivity map for the site for the Secunda PVs, Betacrus 1 and 3 shown within the outline. Background colours indicate the following degrees of sensitivity: red = very highly sensitive; orange/yellow = high; green = moderate; blue = low; grey = insignificant/zero.

In this Witbank coalfield of Mpumalanga, coal seams 1-5 (from base to top) are present at various levels below the ground surface. Seams 2 and 4 are the thickest seams (Snyman, 1998, based on core material) and the uppermost seam, No 5, is between 12 and 45m below the surface. In all areas, the uppermost seam is overlain by soils, shales and sandstones of varying thicknesses.

From the SAHRIS map (Figure 4), the area is indicated as very highly sensitive (red) for the Vryheid Formation. Therefore, a site visit and survey is required. This was completed.

vi. Site visit survey and observations

A site visit was completed on 26th October 2021 by Rick Tolchard and the survey observations are given below. Photographs were taken by him and are shown in Figures 6 - 9. The season is early summer but seasonality has no effect on the fossils because they are dead.

No fossils were found during the site visit walk through.

Table 3: GPS coordinates for some of the survey stops on Farm Goedehoop 290 TS, observations and relevant photographs. Refer to the Google map in Figure 5 for the stops (1-15). Photographs taken by Rick Tolchard.

Stop Pal -	Stop GPS co-ords	Survey observations	Figure
1	S26°34'05.581 24" E29°13'06.398 38" 1630m	Access point on main road to eastern section, Betacrux 1 PV area, northern part. Field has been ploughed. Deep dark soils and no rocks or rocky outcrops	6A, B
2	S26°34'06.471 70" E29°13'11.357 32" 1640m	Field has been ploughed. Deep dark soils and no rocks or rocky outcrops	6C,D
3	S26°34'08.220 49" E29°13'22.270 96" 1638m	Field has been ploughed. Deep dark soils and no rocks or rocky outcrops	
4	S26°34'14.466 53" E29°13'19.641 22" 1643m	Field has been ploughed. Deep dark soils and no rocks or rocky outcrops	
5	S26°34'24.734 13" E29°13'13.758 33" 1644m	Field has been ploughed. Deep dark soils and no rocks or rocky outcrops	
6	S26°34'31.379 99" E29°13'09.913 6" 1651m	Field has been ploughed. Deep dark soils and no rocks or rocky outcrops	7A, B
7	S26°34'31.849	Ploughed field with short grasses	7C,D

	81" E29°13'06.134 66" 1654m	along the margins	
8	S26°34'25.755 70" E29°13'05.924 03" 1648m	Field has been ploughed. Deep dark soils and no rocks or rocky outcrops	
9	S26°34'13.586 03" E29°13'06.373 34" 1642m	Field has been ploughed. Deep dark soils and no rocks or rocky outcrops	
10	S26°34'29.550 94" E29°13'12.121 35" 1644m	Field has been ploughed. Deep dark soils and no rocks or rocky outcrops	
11	S26°34'31.208 14" E29°13'13.604 44" 1652m	South-eastern corner looking towards the sub-station	8A, B
12	S26°34'13.348 85" E29°13'04.922 23" 1642m	West side, Betacrux 3 PV area. This field appear to be fallow but has been ploughed in the past. Grasses are taller but still no rocks or rocky outcrops are visible.	
13	S26°34'14.062 94" E29°13'00.453 64" 1641m	Grasses are taller but still no rocks or rocky outcrops are visible. Exposed soil id gritty.	8C, D
14	S26°34'17.124 93" E29°12'51.693 27" 1637m	Grasses are taller but still no rocks or rocky outcrops are visible	9A, B
15	S26°34'18.897 41" E29°12'46.473 33" 1638m	Grasses are taller but still no rocks or rocky outcrops are visible. No fossils	9C, D



Figure 5: Google earth map with the Betacrux 1 and 3 site visit observation points as noted, 1-15. Refer to Table 3 for the GPS points and site observations.



Figures 6: Photographs from the site visit to Goedehoop 290 IS for the proposed PV facility. Betacrux 1 site. A-B = Stop 1, note exposed ground that has been ploughed, covered with deep dark soil and with no rocky outcrops. C-D = Stop 2. Ploughed field with no fossils and no rocky outcrops seen.



Figure 7: Photographs from the site visit to Goedehoop 290 IS for the PV facility. Betacru 1. A-B = Stop 6 with marginal area and short grasses, ploughed field. C-D = Stop 7. More ploughed area and deep soils; no rocky outcrops or fossils were seen



Figure 8: Photographs from the site visit to Goedehoop 290 IS Secunda PV facility. A-B = Stop 11, southern section of Betcrux 1 looking towards the existing substation on dolerite. C-D = Betacrux 3 (western project area). Stop 13. Gravelly soils but no rocky outcrops, and short grasses in most of the area. Disturbed area and no rocky outcrops or fossils were seen.



Figure 9: Photographs from the site visit to Goedehoop 290 IS Secunda PV facility. Betacrux 3 area. A-B = Stop 14. C-D = Stop 15. All show previously disturbed areas, now covered in short grasses and tracks. No rocky outcrops or fossils seen.

vii. Impact assessment

An assessment of the potential impacts to possible palaeontological resources considers the criteria encapsulated in Table 4:

TABLE 4A: CRITERIA FOR ASSESSING IMPACTS

PART A: DEFINITION AND CRITERIA		
Criteria for ranking of the SEVERITY/NATURE of environmental impacts	H	Substantial deterioration (death, illness or injury). Recommended level will often be violated. Vigorous community action.
	M	Moderate/ measurable deterioration (discomfort). Recommended level will occasionally be violated. Widespread complaints.
	L	Minor deterioration (nuisance or minor deterioration). Change not measurable/ will remain in the current range. Recommended level will never be violated. Sporadic complaints.
	L+	Minor improvement. Change not measurable/ will remain in the current range. Recommended level will never be violated. Sporadic complaints.
	M+	Moderate improvement. Will be within or better than the recommended level. No observed reaction.
	H+	Substantial improvement. Will be within or better than the recommended level. Favourable publicity.
Criteria for ranking the DURATION of impacts	L	Quickly reversible. Less than the project life. Short term
	M	Reversible over time. Life of the project. Medium term
	H	Permanent. Beyond closure. Long term.
Criteria for ranking the SPATIAL SCALE of impacts	L	Localised - Within the site boundary.
	M	Fairly widespread – Beyond the site boundary. Local
	H	Widespread – Far beyond site boundary. Regional/ national
PROBABILITY (of exposure to impacts)	H	Definite/ Continuous
	M	Possible/ frequent
	L	Unlikely/ seldom

TABLE 4B: IMPACT ASSESSMENT

PART B: ASSESSMENT		
SEVERITY/NATURE	H	-
	M	-
	L	Soils and sands of the Quaternary do not preserve fossils; the Vryheid Fm might preserve fossil plants; so far there are no records of fossils in this region so it is very unlikely that fossils occur on the site. The impact would be very unlikely.
	L+	-
	M+	-
	H+	-
	DURATION	L
	M	-
	H	Where manifest, the impact will be permanent.
SPATIAL SCALE	L	Since the only possible fossils within the area would be fossil plants from the <i>Glossopteris</i> flora in the shales, the spatial scale will be localised within the site boundary. The site visit confirmed that there were no fossils in the soils or in the ploughed fields.
	M	-

PART B: ASSESSMENT		
	H	-
PROBABILITY	H	-
	M	-
	L	It is extremely unlikely that any fossils would be found in the loose soils and sand that will be excavated, but there might be Vryheid Fm plants underneath the soils. Therefore, a Fossil Chance Find Protocol should be added to the eventual EMPr.

Based on the nature of the project, surface activities may impact upon the fossil heritage if preserved in the proposed Solar Facility area. The geological structures suggest that the rocks are the correct age and type to contain fossils, i.e. fossil plant impressions of the *Glossopteris* flora, but the rocks are covered by soils, sandy soils and vegetation. The site visit confirmed that there were no rocky outcrops and no fossils in the sandy soils. Since there is a small chance that fossils from the below ground Vryheid Formation may be disturbed, a Fossil Chance Find Protocol has been added to this report. Taking account of the defined criteria, the potential impact to fossil heritage resources is extremely low.

viii. Assumptions and uncertainties

Based on the geology of the area and the palaeontological record as we know it, it can be assumed that the formation and layout of the dolerites, sandstones, shales and sands are typical for the country and some could contain fossil plant, insect, invertebrate and vertebrate material. The soils and sands of the Quaternary period would not preserve fossils. The site visit confirmed that there were no fossils in the sandy soils that are overlying the Vryheid Formation. It is not known if there are fossils below ground but the shales and mudstones that might have leaf impressions of the *Glossopteris* flora are an average more than 10m below the soil surface in the Secunda-Trichardt area (Snyman, 1998, Fig 15).

ix. Recommendation

Based on experience and the lack of any previously recorded fossils from the area, it is extremely unlikely that any fossils would be preserved in the alluvium, sands and soils of the Quaternary. There is a very small chance that fossil plants of the *Glossopteris* flora may occur in the adjacent and underground shales of the Vryheid Formation. The site visit showed that there are NO FOSSILS visible on the surface. Nonetheless, a Fossil Chance Find Protocol should be added to the EMPr. If fossils are found once drilling and mining or excavations for foundations and infrastructure have commenced then they should be rescued and a palaeontologist called to

assess and collect a representative sample. As far as the palaeontology is concerned, the project may proceed.

x. References

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xi. Chance Find Protocol

Monitoring Programme for Palaeontology - to commence once the excavations / drilling activities begin.

1. The following procedure is only required if fossils are seen on the surface and when excavations commence.
2. When excavations begin the rocks must be given a cursory inspection by the environmental officer or designated person. Any fossiliferous material (plants, insects, bone, coal) should be put aside in a suitably protected place. This way the project activities will not be interrupted.
3. Photographs of similar fossils must be provided to the developer to assist in recognizing the fossil plants, vertebrates, invertebrates or trace fossils in the shales and mudstones (for example see Figure 10). This information will be built into the EMP's training and awareness plan and procedures.
4. Photographs of the putative fossils can be sent to the palaeontologist for a preliminary assessment.
5. If there is any possible fossil material found by the developer/environmental officer then the qualified palaeontologist sub-contracted for this project, should visit the site to inspect the selected material and check the excavations where feasible.
6. Fossil plants or vertebrates that are considered to be of good quality or scientific interest by the palaeontologist must be removed, catalogued and housed in a suitable institution where they can be made available for further study. Before the fossils are removed from the site, a SAHRA permit must be obtained. Annual reports must be submitted to SAHRA as required by the relevant permits.
7. If no good fossil material is recovered then no site inspections by the palaeontologist will be necessary. A final report by the palaeontologist must be sent to SAHRA once the project has been completed and only if there are fossils.
8. If no fossils are found and the excavations have finished then no further monitoring is required.

Appendix A - Examples of fossils from the Vryheid Formation (Ecca Group)



Figure 10: Photographs of a selection of plants from the *Glossopteris* flora from the Ecca Vryheid Formation. Bottom right - an example of the appearance fossil bones in the rock.

Appendix B - Details of specialists

Curriculum vitae (short) - Marion Bamford PhD January 2021

I) Personal details

Surname : **Bamford**
First names : **Marion Kathleen**
Present employment : Professor; Director of the Evolutionary Studies Institute.
Member Management Committee of the NRF/DST Centre of Excellence Palaeosciences, University of the Witwatersrand, Johannesburg, South Africa-
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Fax : +27 11 717 6694
Cell : 082 555 6937
E-mail : marion.bamford@wits.ac.za ; marionbamford12@gmail.com

ii) Academic qualifications

Tertiary Education: All at the University of the Witwatersrand:

1980-1982: BSc, majors in Botany and Microbiology. Graduated April 1983.

1983: BSc Honours, Botany and Palaeobotany. Graduated April 1984.

1984-1986: MSc in Palaeobotany. Graduated with Distinction, November 1986.

1986-1989: PhD in Palaeobotany. Graduated in June 1990.

iii) Professional qualifications

Wood Anatomy Training (overseas as nothing was available in South Africa):

1994 - Service d'Anatomie des Bois, Musée Royal de l'Afrique Centrale, Tervuren, Belgium, by Roger Dechamps

1997 - Université Pierre et Marie Curie, Paris, France, by Dr Jean-Claude Koeniguer

1997 - Université Claude Bernard, Lyon, France by Prof Georges Barale, Dr Jean-Pierre Gros, and Dr Marc Philippe

iv) Membership of professional bodies/associations

Palaeontological Society of Southern Africa
Royal Society of Southern Africa - Fellow: 2006 onwards
Academy of Sciences of South Africa - Member: Oct 2014 onwards
International Association of Wood Anatomists - First enrolled: January 1991
International Organization of Palaeobotany - 1993+
Botanical Society of South Africa
South African Committee on Stratigraphy - Biostratigraphy - 1997 - 2016
SASQUA (South African Society for Quaternary Research) - 1997+
PAGES - 2008 -onwards: South African representative
ROCEEH / WAVE - 2008+
INQUA - PALCOMM - 2011+onwards

vii) Supervision of Higher Degrees

All at Wits University

Degree	Graduated/ completed	Current
Honours	11	0
Masters	10	4
PhD	11	4
Postdoctoral fellows	10	5

viii) Undergraduate teaching

Geology II - Palaeobotany GEOL2008 - average 65 students per year
Biology III - Palaeobotany APES3029 - average 25 students per year
Honours - Evolution of Terrestrial Ecosystems; African Plio-Pleistocene
Palaeoecology; Micropalaeontology - average 2-8 students per year.

ix) Editing and reviewing

Editor: *Palaeontologia africana*: 2003 to 2013; 2014 - Assistant editor
Guest Editor: *Quaternary International*: 2005 volume
Member of Board of Review: *Review of Palaeobotany and Palynology*:
2010 -

Review of manuscripts for ISI-listed journals: 25 local and international journals

x) Palaeontological Impact Assessments

Selected - list not complete:

- Thukela Biosphere Conservancy 1996; 2002 for DWAF
- Vioolsdrift 2007 for Xibula Exploration
- Rietfontein 2009 for Zitholele Consulting
- Bloeddrift-Baken 2010 for TransHex
- New Kleinfontein Gold Mine 2012 for Prime Resources (Pty) Ltd.

- Thabazimbi Iron Cave 2012 for Professional Grave Solutions (Pty) Ltd
- Delmas 2013 for Jones and Wagener
- Klipfontein 2013 for Jones and Wagener
- Platinum mine 2013 for Lonmin
- Syferfontein 2014 for Digby Wells
- Canyon Springs 2014 for Prime Resources
- Kimberley Eskom 2014 for Landscape Dynamics
- Yzermyne 2014 for Digby Wells
- Matimba 2015 for Royal HaskoningDV
- Commissiekraal 2015 for SLR
- Harmony PV 2015 for Savannah Environmental
- Glencore-Tweefontein 2015 for Digby Wells
- Umkomazi 2015 for JLB Consulting
- Ixia coal 2016 for Digby Wells
- Lambda Eskom for Digby Wells
- Alexander Scoping for SLR
- Perseus-Kronos-Aries Eskom 2016 for NGT
- Mala Mala 2017 for Henwood
- Modimolle 2017 for Green Vision
- Klipoortjie and Finaalspan 2017 for Delta BEC
- Ledjadja borrow pits 2018 for Digby Wells
- Lungile poultry farm 2018 for CTS
- Olienhout Dam 2018 for JP Celliers
- Isondlo and Kwasobabili 2018 for GCS
- Kanakies Gypsum 2018 for Cabanga
- Nababeep Copper mine 2018
- Glencore-Mbali pipeline 2018 for Digby Wells
- Remhoogte PR 2019 for A&HAS
- Bospoort Agriculture 2019 for Kudzala
- Overlooked Quarry 2019 for Cabanga
- Richards Bay Powerline 2019 for NGT
- Eilandia dam 2019 for ACO
- Eastlands Residential 2019 for HCAC
- Fairview MR 2019 for Cabanga
- Graspan project 2019 for HCAC
- Lieliefontein N&D 2019 for EnviroPro
- Skeerpoort Farm Mast 2020 for HCAC
- Vulindlela Eco village 2020 for 1World
- KwaZamakhule Township 2020 for Kudzala
- Sunset Copper 2020 for Digby Wells
- McCarthy-Salene 2020 for Prescali
- VLNR Lodge 2020 for HCAC
- Madadeni mixed use 2020 for EnviroPro

xi) Research Output

Publications by M K Bamford up to June 2021 peer-reviewed journals or scholarly books: over 150 articles published; 5 submitted/in press; 10 book chapters.

Scopus h-index = 29; Google scholar h-index = 35; -i10-index = 92
Conferences: numerous presentations at local and international conferences.

xii) NRF Rating

NRF Rating: B-2 (2016-2020)

NRF Rating: B-3 (2010-2015)

NRF Rating: B-3 (2005-2009)

NRF Rating: C-2 (1999-2004)

Mr Frederick Tolchard Brief Curriculum Vitae - January 2021

Academic training

BA Archaeology - University of the Witwatersrand, graduated 2015

BSc (Honours) Palaeontology - University of the Witwatersrand, 2017 with distinction

MSc Palaeontology - University of the Witwatersrand, 2018 - 2019. Graduated 2020 with Distinction

PhD Palaeontology - Wits - 2020 - current

Field Experience

Honours Fieldtrip - Karoo biostratigraphy - April 2017

Research fieldwork - Elliot Formation with Prof Choiniere - April 2018, November 2018; April 2019

Publications

Tolchard, F., Nesbitt, S.J., Desojo, J.B., Viglietti, P.A., Butler, R.J. and Choiniere, J.N., 2019. 'Rauisuchian' material from the lower Elliot Formation of South Africa: Implications for late Triassic biogeography and biostratigraphy. *Journal of African Earth Sciences*, 160, 103610.

Viglietti, P.A., McPhee, B.W., Bordy, E.M., Sciscio, L., Barrett, P.M., Benson, R.B.J., Wills, F., Tolchard, F., Choiniere, J.N., 2020. Biostratigraphy of the Scalenodontoides Assemblage Zone (Stormberg Group, Karoo Supergroup), South Africa. *South African Journal of Geology* 123, 239-248.

PIA fieldwork projects

2018 May - Williston area - SARAQ project, Digby Wells

2018 September - Lichtenburg PVs - CTS Heritage

2018 November - Nomalanga farming - Digby Wells

2019 January - Thubelisha coal - Digby Wells

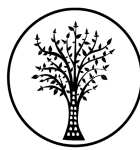
2019 March - Matla coal - Digby Wells

2019 March - Musina-Machado SEZ - Digby Wells

2019 June - Temo coal - Digby Wells

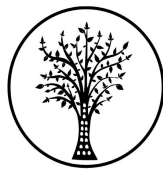
2019 September - Makapanstad Agripark - Plantago

2020 January - Hendrina, Kwazamakuhle - Kudzala
2020 February - Hartebeestpoort Dam - Prescali
2020 March - Twyfelaar Coal mine - Digby Wells
2020 March - Ceres Borrow Pits - ACO Associates
2020 March - Copper Sunset Sand - Digby Wells
2020 October - Belfast loop and Expansion - Nsovo
2020 October - VLNR lodge Mapungubwe - HCAC
2020 November - Delmore Park BWSS - HCAC
2020 December - Kromdraai commercial - HCAC
2021 January - Welgedacht Siding - Elemental Sustainability
2021 March - Shango Kroonstad - Digby Wells
2021 May - Copper Sunset Viljoensdrif sand mining - Digby Wells
2021 August - New Largo Pit - Golder
2021 August - Khutsong Ext 8 housing, Carletonville, for Afzelia
2021 September - Lichtenburg PV facility - CTS Heritage



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APPENDIX 4: Chance Fossil Finds Procedure



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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.

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34 Harries Street, Plumstead, Cape Town, 7800

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



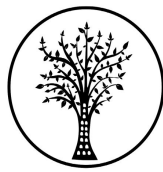
Actions to be taken

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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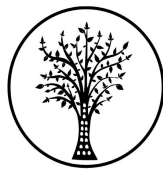
- Exposed finds must be stabilised where they are unstable and the site capped, e.g. with a plastic sheet or sand bags. This protection should allow for the later excavation of the finds with due scientific care and diligence. SAHRA can advise on the most appropriate method for stabilisation.
- If the 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.

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FOSSIL DISCOVERIES: PRELIMINARY RECORDING FORM		
Name of project:		
Name of fossil location:		
Date of discovery:		
Description of situation in which the fossil was found:		
Description of context in which the fossil was found:		
Description and condition of fossil identified:		
GPS coordinates:	<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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