

HERITAGE IMPACT ASSESSMENT

In terms of Section 38(8) of the NHRA for the
DEVELOPMENT OF THE LICHTENBURG 3 PV SOLAR ENERGY FACILITY AND
ASSOCIATED INFRASTRUCTURE ON A SITE NEAR LICHTENBURG, NORTH WEST
PROVINCE.

Prepared by Heritage CTS



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For

Savannah Environmental

November 2018



EXECUTIVE SUMMARY

ABO Wind Lichtenburg 3 PV (Pty) Ltd propose the development of Lichtenburg 3 which encompasses the PV facility, the substation and powerline on the remaining extent of Portion 02 of the Farm Zamenkomst No 04. The project site is located approximately 10km north of Lichtenburg and 7km south-west of Bakerville in Ward 16 of the Ditsobotla Local Municipality, of Ngaka Modiri Molema District, North West Province. The area under investigation is approximately 429ha in extent and comprises one privately owned property which is used for agricultural purposes.

During the field assessment of the site *no archaeological resources, graves or burial grounds were identified* in the project area. However, graves are subterranean in nature and might not have been identified during the initial site visit and survey. The only resource of heritage significance that was identified is an old Farm House located in the north-eastern corner of the remaining extent of Portion 02 of the Farm Zamenkomst No 04. The farm house is of low local significance. Apart from the roof that could use a layer of paint the house seems to be in a relatively good condition. The farmhouse was most likely constructed during the 1920's and is of Vernacular type. It is currently occupied.

Based on the nature of the project, surface activities may impact upon the fossil heritage if preserved in the development footprint. The geological structures suggest that the rocks are much too old to contain fossils other than blue-green algae. Taking account of the defined criteria, the potential impact to fossil heritage resources is negligible to extremely low.

The following findings have been made:

- During the survey an old farm house was identified on the remaining extent of Portion 02 of the Farm Zamenkomst No 04. It falls within the proposed project area, and as such could possibly be impacted or damaged by the proposed development activities. This farmhouse has low local heritage significance in terms of its architectural qualities and as such, has been graded IIIC.
- No other archaeological resources were identified in the project area.
- No graves or burial grounds were identified in the project area. However, graves are subterranean in nature and might not have been identified during the initial site visit and survey.
- Based on the experience of the palaeontologist and the lack of any previously recorded fossils from the area, it is extremely unlikely that any fossils would be preserved in the stromatolites or overlying soils of the Quaternary.
- The anticipated visual impacts range from **moderate** to **low** significance. Anticipated visual impacts on sensitive visual receptors in close proximity to the proposed facility are not considered to be fatal flaws for the proposed SEF.

As such, there is no archaeological objection to the proposed Lichtenburg 3 development.



There is no preferred alternative on heritage grounds alone and as such, the Preferred Alternatives as mapped in Map 7f are preferred.

It is recommended that:

- Although the farm house falls outside of the proposed development footprint, any impacts to the old farm house structure are to be avoided. As this structure has limited architectural heritage significance, no specific mitigation recommendations are provided. Any impacts to this structure will require the approval of the North West Provincial Heritage Resources Authority.

It should be noted that, although there were no other archaeological or heritage resources identified during the project survey; some archaeological material, including artefacts and graves can be buried underground and as such, may not have been identified during the initial survey and site visits. In the case where the proposed development activities bring these materials to the surface, work must cease and SAHRA must be contacted immediately to determine a way forward.

Where sensitive visual receptors are likely to be affected (i.e. residents of homesteads and settlements in close proximity), it is recommended that the developer enter into negotiations regarding the potential screening of visual impacts at the receptor site. This may entail the planting of vegetation, trees or the construction of screens. Ultimately, visual screening is most effective when placed at the receptor itself.



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3	Heritage Screening Assessment
4	CVs of Specialists
5	Visual Impact Assessment



1. INTRODUCTION

1.1 Background Information on Project

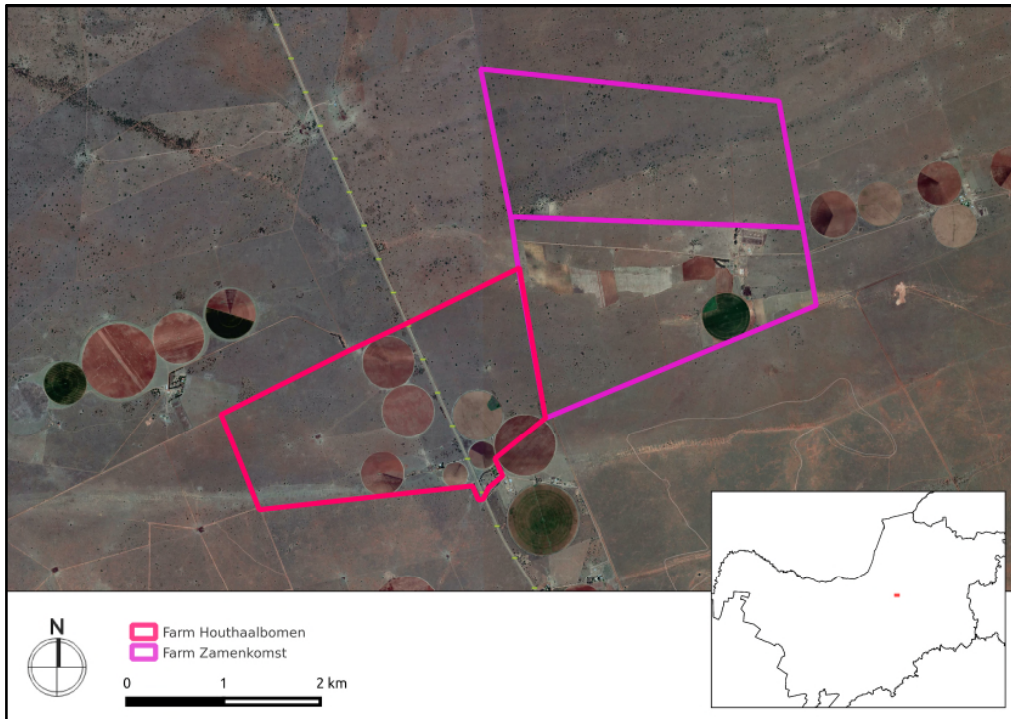
ABO Wind Lichtenburg 3 PV (Pty) Ltd propose the development of Lichtenburg 3 which encompasses the PV facility, the substation and powerline on the remaining extent of Portion 02 of the Farm Zamenkomst No 04. The proposed solar facility is planned to be bid into the Department of Energy's (DoE's) Renewable Energy (RE) Independent Power Producer (IPP) Procurement Programme (REIPPPP) with the aim of evacuating the generated power into the Eskom national electricity grid and aiding in the diversification and stabilisation of the country's electricity supply. The project site is located approximately 10km north of Lichtenburg and 7km south-west of Bakerville in Ward 16 of the Ditsobotla Local Municipality, of Ngaka Modiri Molema District, North West Province. The area under investigation is approximately 429ha in extent and comprises one privately owned property which is used for agricultural purposes. The project site can be accessed via unsurfaced farm roads, which can be accessed via the R505 regional road.

Photovoltaic (PV) technology is proposed for the generation of electricity. The solar energy facility will have a contracted capacity of up to 100MW, and will make use of either Fixed-tilt, Single-Axis Tracking, or Double-Axis Tracking PV technology. The PV structures / modules will occupy an area approximately 255ha in extent, while supporting infrastructure such as internal access roads (18ha), auxiliary buildings (1ha), and an onsite substation (1ha) will occupy the remaining extent. During construction a temporary laydown area approximately 5ha in extent will be required. The project will comprise approximately 300 000 to 400 000 solar panels which once installed will stand 3.5m above ground level. The solar panels will have a maximum of approximately 80 centralised inverter stations at a height of approximately 3m, or approximately 1120 string inverters mounted at a minimum height of approximately 300mm above ground.

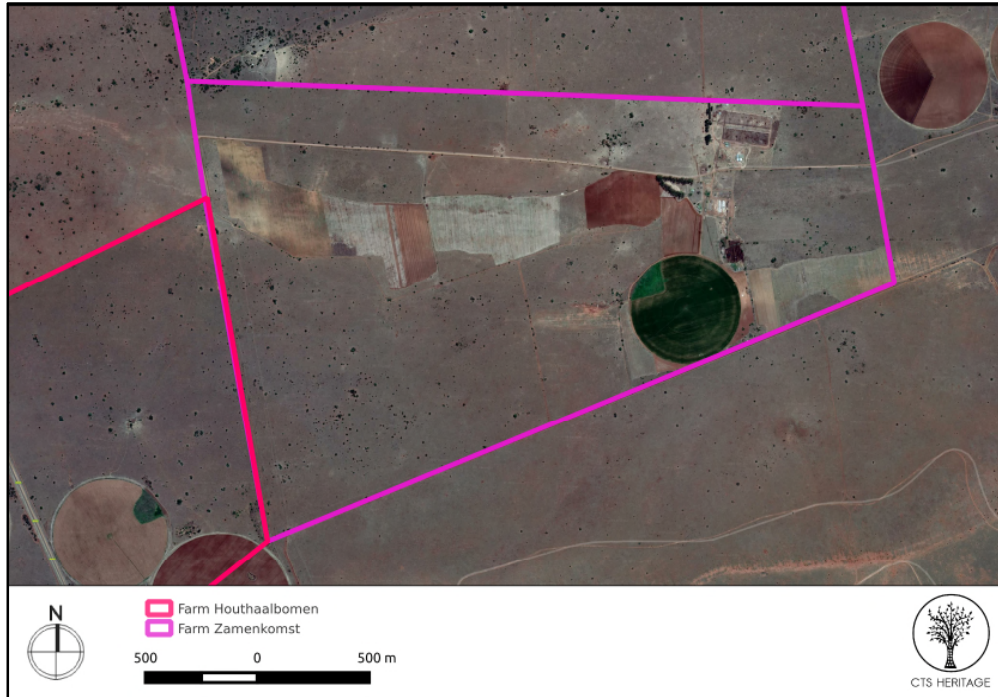
A 132kV on-site substation is required, and will occupy an area approximately 150m x 150m in extent. A single 132kV power line is required to connect the solar energy facility to Eskom's national electricity grid. The power line will have a capacity of 132kV, be approximately 24m in height, will be developed in a power line servitude of 31m – 36m in width (i.e. 15.5m – 18m either side of centre line), and will make use of monopole or lattice tower structures.



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Map 1a: The proposed project area



Map 1b: The proposed development area for L3

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1.2 Description of Property and Affected Environment

The project area falls within the Grassland Biome, which contains a wide variety of grasses typical of arid areas. The project area falls within a heavily disturbed area, as the area has been transformed by agricultural activities and animal grazing. Much of the project area is covered in grass species, contains agricultural fields and grazing areas for cows and sheep.

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
- An archaeologist and palaeontologist were contracted to conduct a survey of archaeological and palaeontological resources likely to be disturbed by the proposed development. The site visits took place over 2 days in September 2018.
- The identified resources were assessed to evaluate their heritage significance
- Alternatives and mitigation options were discussed with the Environmental Assessment Practitioner
- The results of the VIA were integrated into the HIA

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.

3. HISTORY AND EVOLUTION OF THE SITE AND CONTEXT

3.1 Previous Heritage Impact Assessments

Lichtenburg town was established in 1873 and named "Town of Light". General Del la Rey was buried in Lichtenburg after a fatal



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shooting incident at Langlaagte. During the 1800's, more and more farmers settled in the area. During the Second Boer War, the strategically important town of Lichtenburg was occupied by both Boer and Briton for short spells. In November 1900, a large British force under Col. Robert Baden-Powell was transferred to Lichtenburg and secured the town, and much of the territory with it. In addition, the town is known from Rudyard Kipling's poem, Lichtenberg, which relays the story of a foreign combatant in the second South African War. In 1926, Lichtenburg experienced a gold rush that lasted approximately 10 years. Lichtenburg district is now mostly a farming area, combining cattle and crop-farming and large areas of former diamond mine diggings are now used as grazing.

According to van Schalkwyk et al (1995, SAHRIS NID 6237) in their report completed for the Bakerville Diamond Fields, "land use in the area goes back to the Early Stone Age, as can be determined by the number of stone artifacts found near the old mining commissioners office. This material seems to be disturbed from its primary context because of the mining activities. It is postulated that similar occurrences will be found in other parts of the diggings, but that this material would have been disturbed out of context." As a result of the dominant land use in the area, many of the heritage resources identified by van Schalkwyk et al (1995) are associated with past and present agriculture, and consist of farming implements (many of them found together with discarded mining equipment), a few windmills, and dipping-troughs. One such trough, located at Elandsputte on the farm Uitgevonden 355JP, was the site where the first diamond was discovered. This structure is a proclaimed national monument (now Provincial Heritage Site). Van Schalkwyk et al (1995) identified a number of burial grounds within their surveyed area (Map 5 and 5a). Heritage resources known from this area include burial grounds and graves, archaeological artefacts and old structures, often associated with farming activities or diamond mining.

During the desktop assessment phase, it was noted that the proposed development is located on geological deposits belonging to the Monte Christo Formation of the Chuniespoort Group. These deposits have a very high sensitivity for impacts to palaeontological resources (Map 2). This group is known to contain a Range of shallow marine to intertidal stromatolites (domes, columns *etc*) and organic-walled microfossils. In addition, it is within this group that fossiliferous Late Cenozoic cave breccias have been identified such as within the Cradle of Humankind region. As such, a field assessment was undertaken to verify the sensitivity of these sediments for impacts to palaeontology.

Table 1: Known Heritage Resources located within the 30km inclusion zone (see Heritage Screening Assessment)

Site ID	Site no	Full Site Name	Site Type	Grading	Declaration
26804	9/2/235/0008	Historic cattle dip, Elandsputte, Lichtenburg District	Building	Grade II	PHS
26803	9/2/235/0005	Nerderduitse Gereformeerde Church, 27 Gerrit Maritz Street, Lichtenburg	Building	Grade II	PHS
26788	9/2/238/0015	Water mill, Malmani Eye, Marico District	Building	Grade II	PHS
33370	GY01	Mafikeng Cement 1	Burial Grounds & Graves	Grade IIIa	

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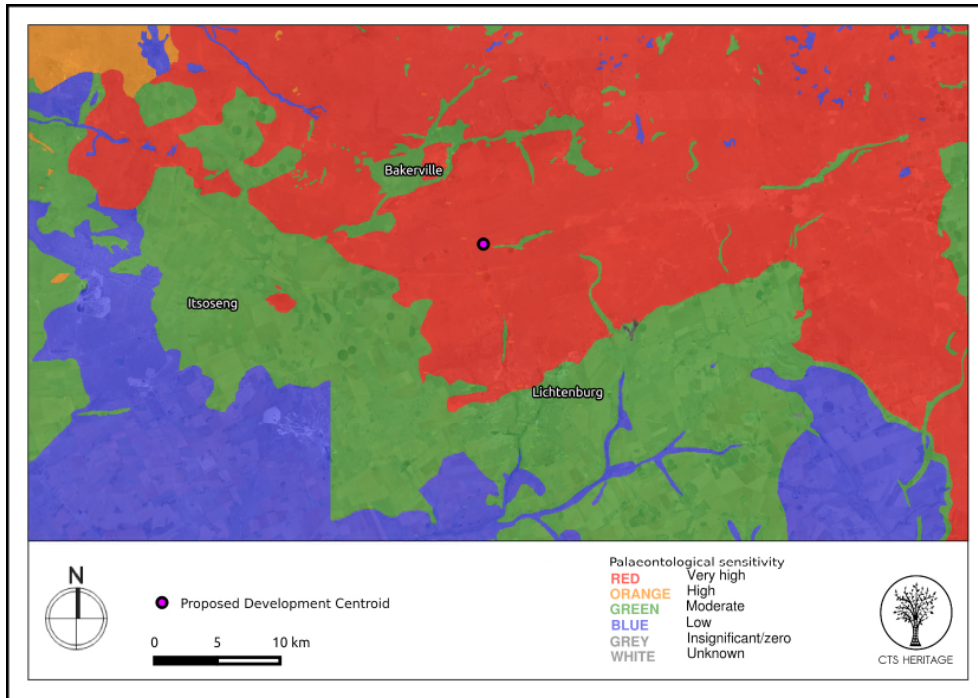
33372	GY02	Mafikeng Cement 2	Burial Grounds & Graves	Grade IIIa	
33817	ZPPCS4	Zeerust 4	Building		
33818	ZPPCS5	Zeerust 5	Burial Grounds & Graves	Grade IIIa	
32832	AEPC 3	Steenkoolspruit farm, Ogies Emalahleni Mpumalanga Province (mapped incorrectly on SAHRIS)	Burial Grounds & Graves	Grade IIIa	
51468	WSF 01	Watershed Solar Facility 01	Artefacts	Grade IIIc	
51470	WSF 02	Watershed Solar Facility 02	Artefacts	Grade IIIc	
51472	WSF 03	Watershed Solar Facility 03	Burial Grounds & Graves	Grade IIIa	
44979	HIB01	Hibernia 01	Burial Grounds & Graves	Grade IIIa	
33373	GY03	Mafikeng Cement 3	Burial Grounds & Graves	Grade IIIa	
83780	MALA015	eMalahleni 015	Burial Grounds & Graves	Grade IIIa	

3.2 Geology and geomorphology, climate, vegetation

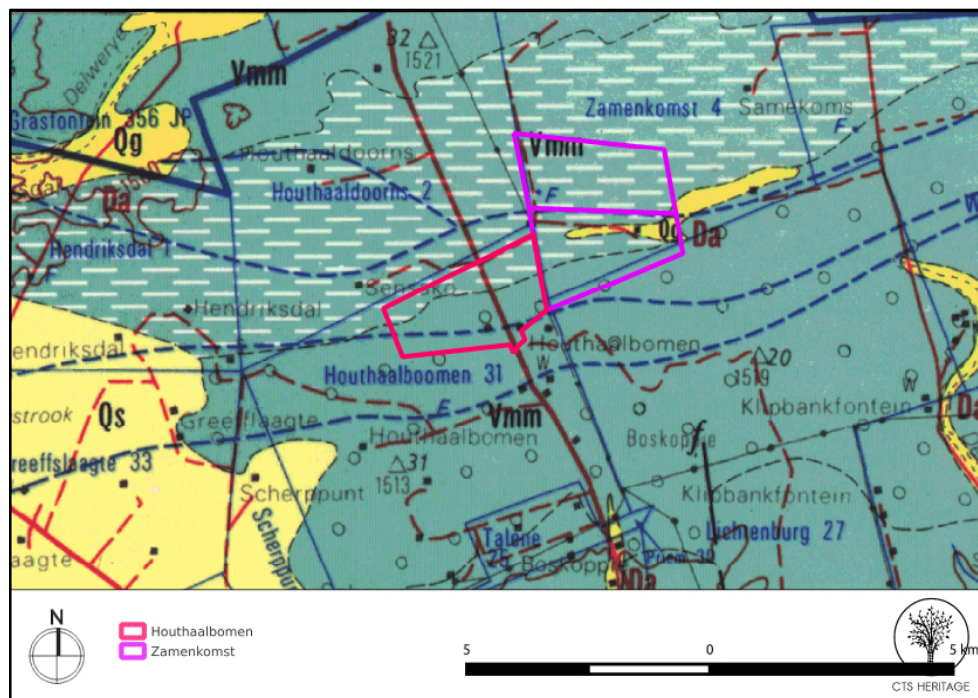
The sites for the PV facility lie on rocks of the Malmani Subgroup, Chuniespoort Group. The Malmani Subgroup is up to 2000m thick and comprises five formations distinguished by the amount of chert, stromatolite morphology, intercalated shales and erosion surfaces (Eriksson et al., 2006). The basal Oaktree Formation overlies the Black Reef Formation, and is made up of carbonaceous shales, stromatolitic dolomites and locally developed quartzites. Above this is the Monte Christo Formation comprising erosive breccia, overlain by stromatolitic and oolitic platformal dolomites. Next is the Lyttleton Formation of shales quartzites and stromatolitic dolomites. The Eccles Formation comprises a series of erosional breccias and the overlying Frisco Formation is made up mostly of stromatolitic dolomites.



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Map 2: Palaeontological sensitivity of the proposed development area



Map 3: Geology underlying the proposed project area extracted from the Council of Geoscience Map (1:250 000) 2626 West Rand

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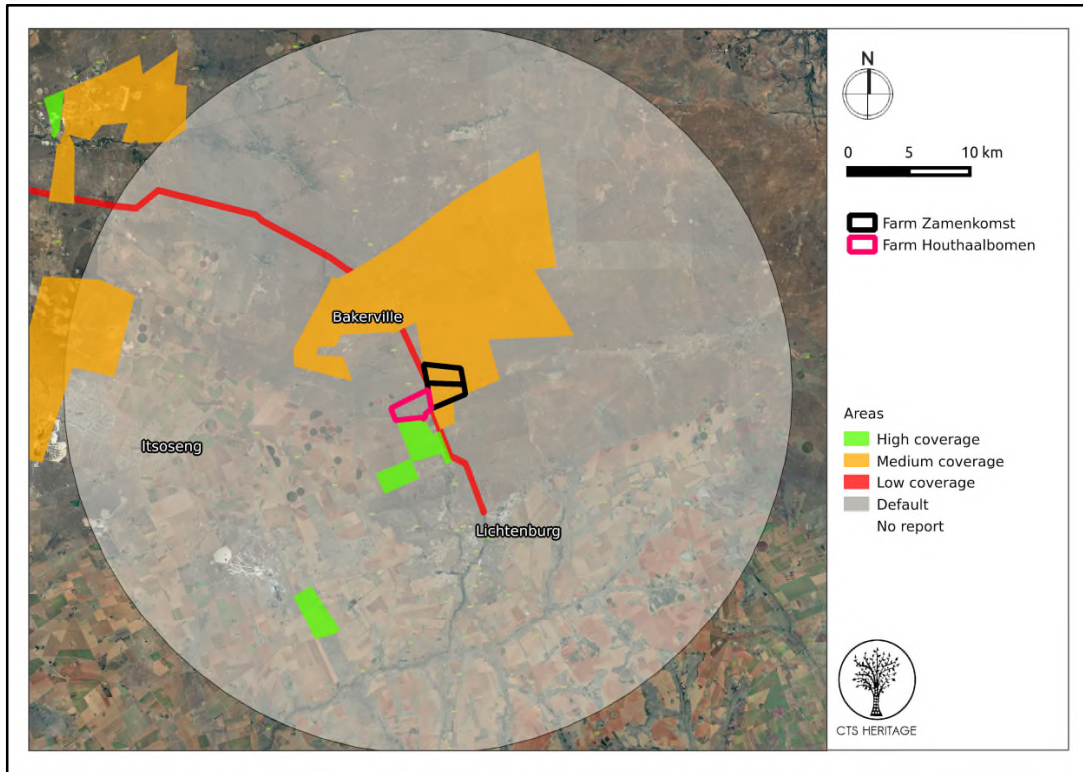
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Table 2: Explanation of symbols for the geological map and approximate ages (Erikssen et al., 2006. Johnson et al., 2006; McCarthy et al., 2006; Robb et al., 2006; van der Westhuizen et al., 2006). SG = Supergroup; Fm = Formation.

Symbol	Group/Formation	Lithology	Approximate Age
Q	Quaternary	Alluvium, sand, calcrete	Neogene, ca 25 Ma to present
T-Qk	Kalahari Group	Sand, limestone	
Jd	Jurassic dykes	Dolerite dykes, intrusive	Jurassic, approx. 180 Ma
C-Pd	Dwyka Group, Karoo Supergroup	Tillite, sandstone, mudstones, shales	Upper Carboniferous
Vdi	Diabase	diabase	
Vt	Timeball Hill Fm and Rooihogte Fm, Pretoria Group, Ventersdorp SG	Quartzite	< 2420 Ma
Vm	Malmani Subgroup, Chuniespoort Group, Transvaal Supergroup	Dolomite, chert	Ca 2750 – 2650 Ma
Vbr	Black Reef Fm,	Quartzite, conglomerate, shale, basalt	Ca 2650 – 2640 Ma
Val	Allanridge Fm, Ventersdorp Supergroup	Andesite	>2700 Ma



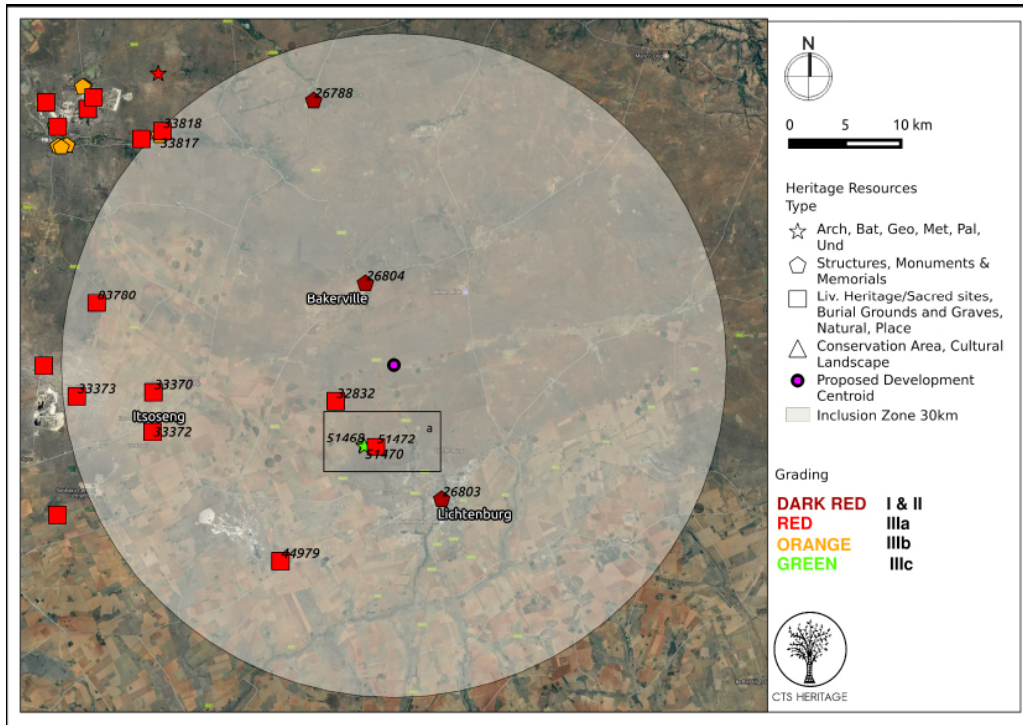
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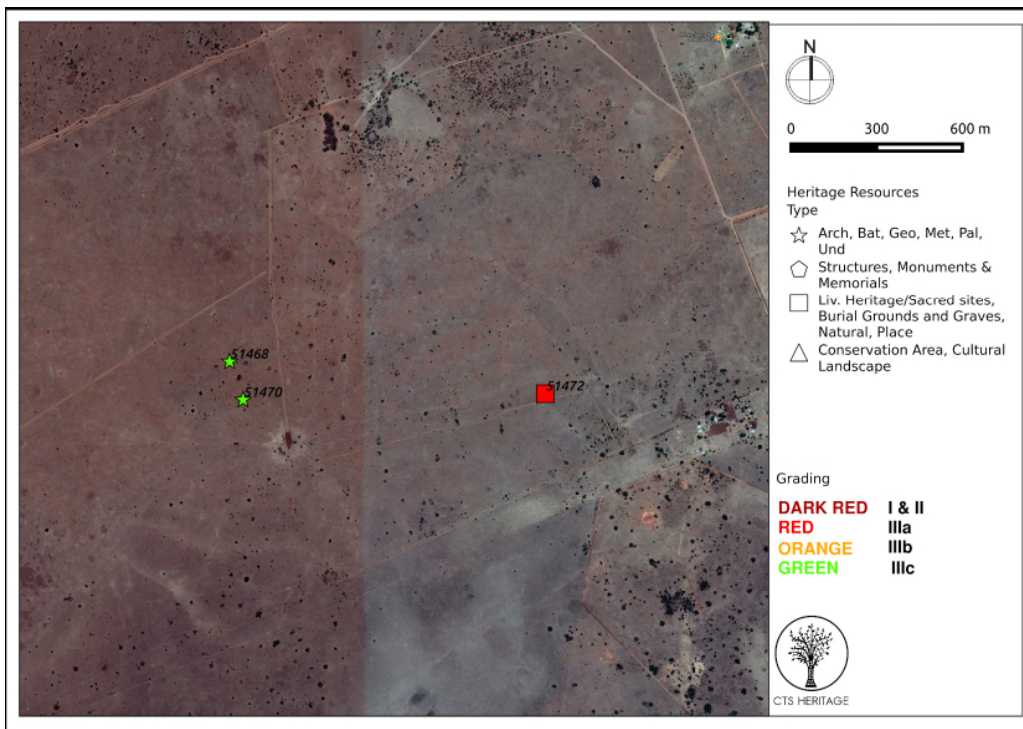
Map 4: Spatialisation of heritage assessments conducted in proximity to the proposed development



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Map 5: Spatialisation of known heritage resources in proximity to the proposed development



Map 5a: Spatialisation of known heritage resources in proximity to the proposed development (inset)

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4. IDENTIFICATION OF HERITAGE RESOURCES

4.1 Summary of findings of Specialist Reports

Archaeology (Appendix 1)

The background information search yielded information about the archaeology and history of the North West Province, and particularly the Lichtenburg region. The physical survey focused on the areas proposed for Lichtenburg 3 on the remaining extent of Portion 02 of the Farm Zamenkomst No 04 in Ditsobotla Local Municipality, of the Ngaka Modiri Molema District.

The area has been disturbed and transformed by agricultural activities. As such pre-existing agricultural plough fields, grazing areas and farm buildings were identified in the project area. Furthermore, throughout the farming areas several heaps of rocks that were removed from the agricultural fields were identified.

Palaeontology (Appendix 2)

The palaeontological sensitivity of the area under consideration is presented in Map 2. The site proposed for development is in the Malmani Group which contains a number of stromatolitic dolomites. These were formed in warm shallow sea and are the accumulation of layer upon layer of minerals deposited by blue-green algae (also known as cyanobacteria) and rarely some filamentous algae. Minerals deposited by the algae include calcium carbonate, calcium sulphate and magnesium carbonate. Very rarely are the algal cells preserved in the stromatolites and these are microscopic. Stromatolites are essentially trace fossils and these ones are 2750 to 2650 million years old and very abundant.

Visual Impacts (Appendix 5)

Lichtenburg 3 is expected to have a fairly contained core area of visual exposure, generally restricted to a 2km radius from the site. Receptors located within this zone include observers located at Samekoms (2), Houthaalbomen (1) and observers travelling along the R505 arterial road.

Visibility beyond 2km is more scattered and interrupted due to the undulating nature of the topography. The general exposure of the facility is largely restricted to vacant land and agricultural fields. Observers located at Samekoms (1) and observers travelling along the R505 north-west of the site are likely to be exposed to the infrastructure from distances exceeding 2km.

The intensity of visual exposure is expected to subside beyond a 5km radius with the predominant visibility expected to the south-west and the north-east. This zone includes limited potentially sensitive visual receptors and comprises mainly vacant land and agricultural fields. Observers that may be exposed to the PV facility structures include residents at Greeflaagte (1 and 2) and Welverdiend (2). Visibility will be at distances exceeding 6km.



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Visibility beyond 10km from the proposed development is expected to be negligible and highly unlikely due to the distance between the object (development) and the observer.

4.2 Heritage Resources identified

Archaeology (Appendix 1)

During the field assessment of the site *no archaeological resources, graves or burial grounds were identified* in the development area. However, graves are subterranean in nature and might not have been identified during the initial site visit and survey.

The only resource of heritage significance that was identified is an old Farm House located in the north-eastern corner of the remaining extent of Portion 02 of the Farm Zamenkomst No 04. The farm house is of low local significance. Apart from the roof that could use a layer of paint the house seems to be in a relatively good condition. The farmhouse was most likely constructed during the 1920's and of Vernacular type. It is currently occupied.

Table 3: Resources identified during the field assessment

SAHRIS ID	Site No.	Name	Description	Latitude	Longitude	Grading
128694	ZKT1	Zamenkomst 1	1920's farm house structure	26° 2'22.91"S	26° 8'37.83"E	Grade IIIc



Figure 1 and 2: Western Corner of the farm house and Eastern Corner of the farm house

Palaeontology (Appendix 2)

Based on the nature of the project, surface activities may impact upon the fossil heritage if preserved in the development footprint. The geological structures suggest that the rocks are much too old to contain fossils other than blue-green algae. Taking account of the defined criteria, the potential impact to fossil heritage resources is negligible to extremely low.

Table 4: Palaeontological observations

Stop	Latitude	Longitude	Location and Observation
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6	-26° 02.121'	26° 07.291'	Zamenkomst – patch of weathered rock
8	-26° 02.266'	26° 07.299'	Zamenkomst entrance – no in situ rocks
9	-26° 02.444'	26° 07.339'	Zamenkomst – section portion entrance; no rocks
10	-26° 02.336'	26° 07.433'	Zamenkomst – some weathered rocks
11	-26° 03.234'	26° 07.501'	Zamenkomst – no exposed rocks

Visual Impacts (Appendix 5)

Most significant in terms of heritage impacts are impacts to “sense of place”. According to the VIA, 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.

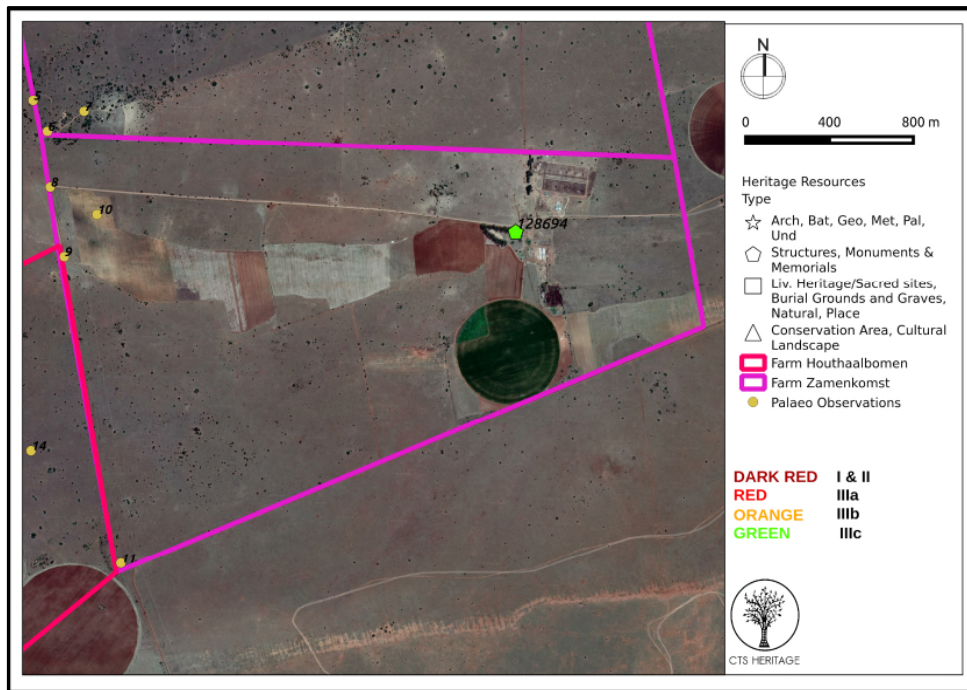
The greater environment has a rural, undeveloped character and a natural appearance. These generally undeveloped landscapes are considered to have a high visual quality, except where urban development represents existing visual disturbances.

The anticipated visual impact of the proposed SEF 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 the existing mining activities and electricity infrastructure.

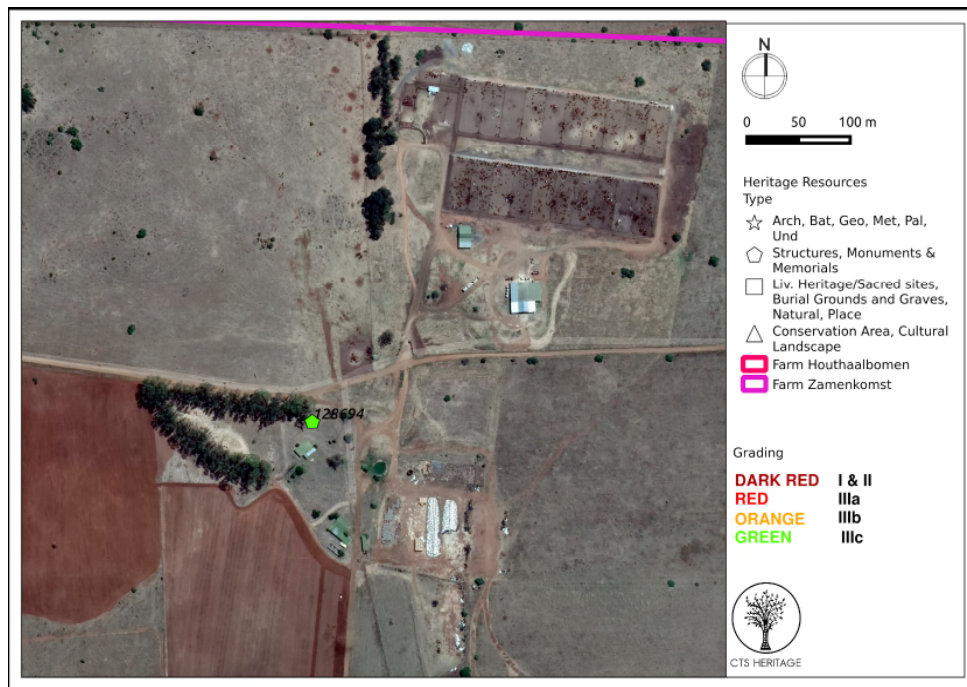


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4.3 Mapping and spatialisation of heritage resources



Map 6: Heritage resources in the vicinity of the proposed development



Map 6a: Heritage resources - closer look at the old farm house marked by the green hexagon

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5. ASSESSMENT OF THE IMPACT OF THE DEVELOPMENT

5.1 Assessment of impact to Heritage Resources

The farm house is of low local significance and has local heritage value only. The old farm house is located in close proximity to the proposed development area, but will not be impacted by the proposed development. A fence is currently constructed around the farm house which is acting as a barrier protecting it from unnecessary impacts. It is recommended that any impacts to this structure be avoided. However, as this structure has limited architectural heritage significance, no specific mitigation recommendations are provided.

It is important to note that, although no significant heritage resources were identified within our field assessment, in such rural, agricultural contexts unmarked, or lightly marked, burials may exist within the development footprint and care must be taken to avoid impacts to these hidden remains.

It is unlikely that any palaeontological heritage resources will be impacted by the proposed development.

The construction and operation of the proposed Lichtenburg 3 and its associated infrastructure, may have a visual impact on the study area, especially within (but not restricted to) a 3km radius of the proposed facility. The visual impact will differ amongst places, depending on the distance from the facility.

Overall, the significance of the visual impacts is expected to range from **moderate to low** as a result of the generally undeveloped character of the landscape. The facility would be visible within an area that incorporates certain sensitive visual receptors who would consider visual exposure to this type of infrastructure to be intrusive. Such visual receptors include people travelling along roads and residents of rural homesteads and settlements. See Impact Statement below.

Table 4: Impacts to heritage resources

NATURE: The construction phase of the project will require excavation, which may impact on heritage resources if present. No heritage resources of significance were identified during the field assessments for archaeology and palaeontology				
		Archaeology		Palaeontology
MAGNITUDE	L (2)	No archaeological resources were identified within the development area	L (2)	Loose sands do not preserve plant fossils; stromatolites are common trace fossils and not considered palaeontologically important in this age deposit. They outcrop sporadically. The impact would be very unlikely.
DURATION	H (5)	Where an impact to a resources occurs, the impact will be permanent.	H (5)	Where an impact to a resources occurs, the impact will be permanent.
EXTENT	L (1)	Localised within the site boundary	L (1)	Since only the possible fossils within the area would be microscopic blue-green algae in some stromatolites, the spatial scale will be localised within the site boundary.



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PROBABILITY	L (1)	It is extremely unlikely that any significant archaeological resources will be impacted	L (1)	It is extremely unlikely that any fossils would be found in the stromatolites which are themselves common trace fossils.
SIGNIFICANCE	L	$(2+5+1) \times 1 = 8$	L	$(2+5+1) \times 1 = 8$
STATUS		Neutral		Neutral
REVERSIBILITY	L	Any impacts to heritage resources that do occur are irreversible	L	Any impacts to heritage resources that do occur are irreversible
IRREPLACEABLE LOSS OF RESOURCES?	L	Unlikely	L	Unlikely
CAN IMPACTS BE MITIGATED		NA as no impacts are anticipated		NA as no impacts are anticipated
MITIGATION: No impacts are anticipated and as such, no mitigation is required				
RESIDUAL RISK: Should any significant resources be impacted (however unlikely) residual impacts may occur, including a negative impact due to the loss of potentially scientific cultural resources.				

5.2 Sustainable Social and Economic Benefit

The potential social impacts identified for the project and listed in Table 5.1 and Table 5.2 have been identified based on an assessment of available information and the current understanding of the proposed project. A number of potential positive and negative social impacts have been identified for the project. Based on the findings of the Social Impact Assessment Scoping Report, no red flags or fatal flaws have been identified from a social perspective which could preclude the development.

Table 5.1: Summary of potential social impacts identified for the detailed design and construction phase.

Impact	Status	Significance
Creation of direct and indirect employment and skills development opportunities.	Positive	Medium
Economic multiplier effects	Positive	Medium
In-migration of people (non-local workforce and jobseekers).	Negative	Medium
Safety and security impacts	Negative	Medium
Impacts on daily living and movement patterns	Negative	Low
Nuisance impact (noise and dust)	Negative	Low
Visual and sense of place impacts	Negative	Medium

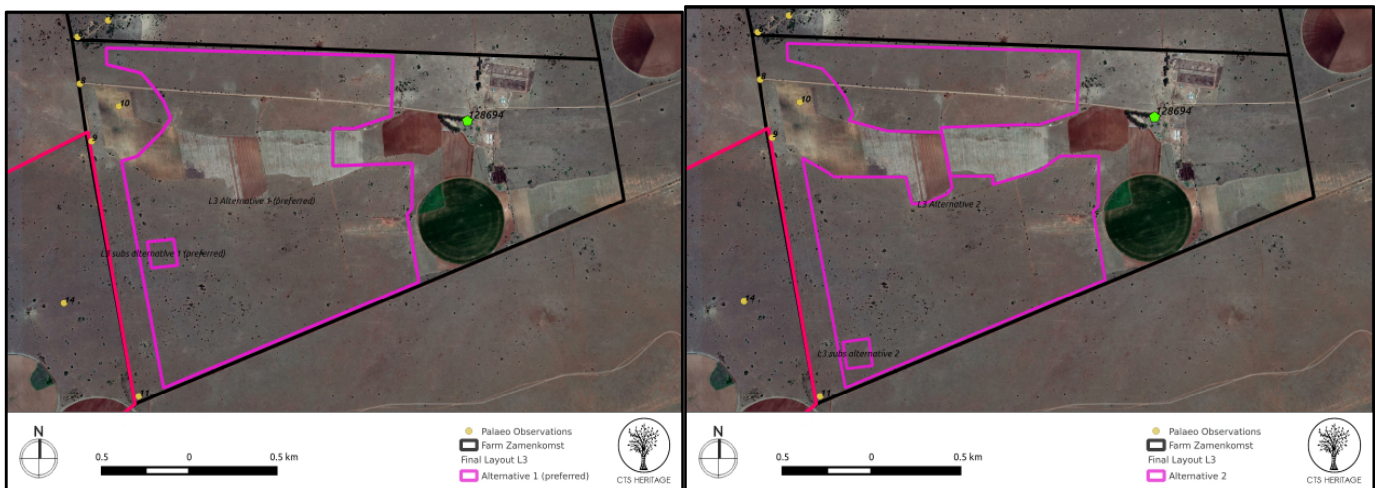


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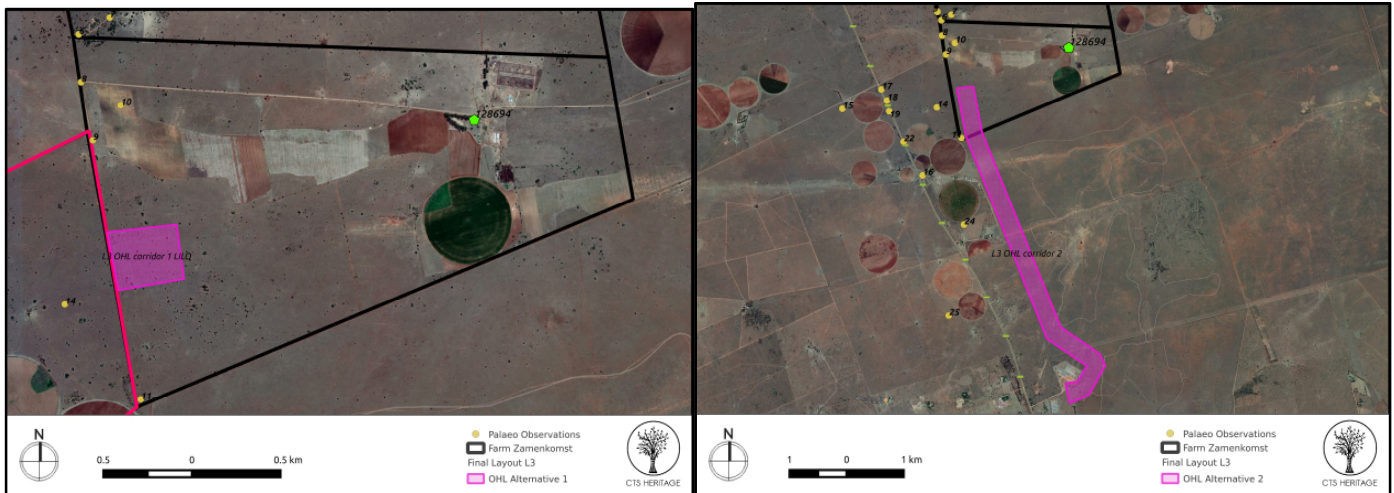
Table 5.2: Summary of potential social impacts identified for the operation phase.

Impact	Status	Significance
Direct and indirect employment and skills development opportunities	Positive	Medium
Development of clean, renewable energy infrastructure	Positive	Medium
Contribution to local economic development and social upliftment	Positive	High
Visual and sense of place impacts	Negative	Low
Impacts associated with the loss of agricultural land.	Negative	Low

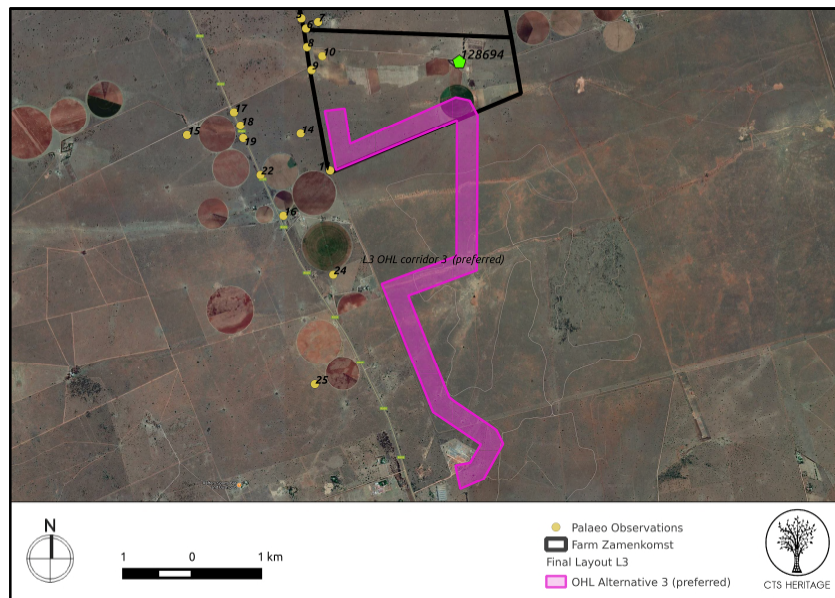
5.3 Proposed development alternatives



Map 7a and b: Site Layout Plan indicating the proposed Alternatives 1 (preferred) and 2 of the development footprint



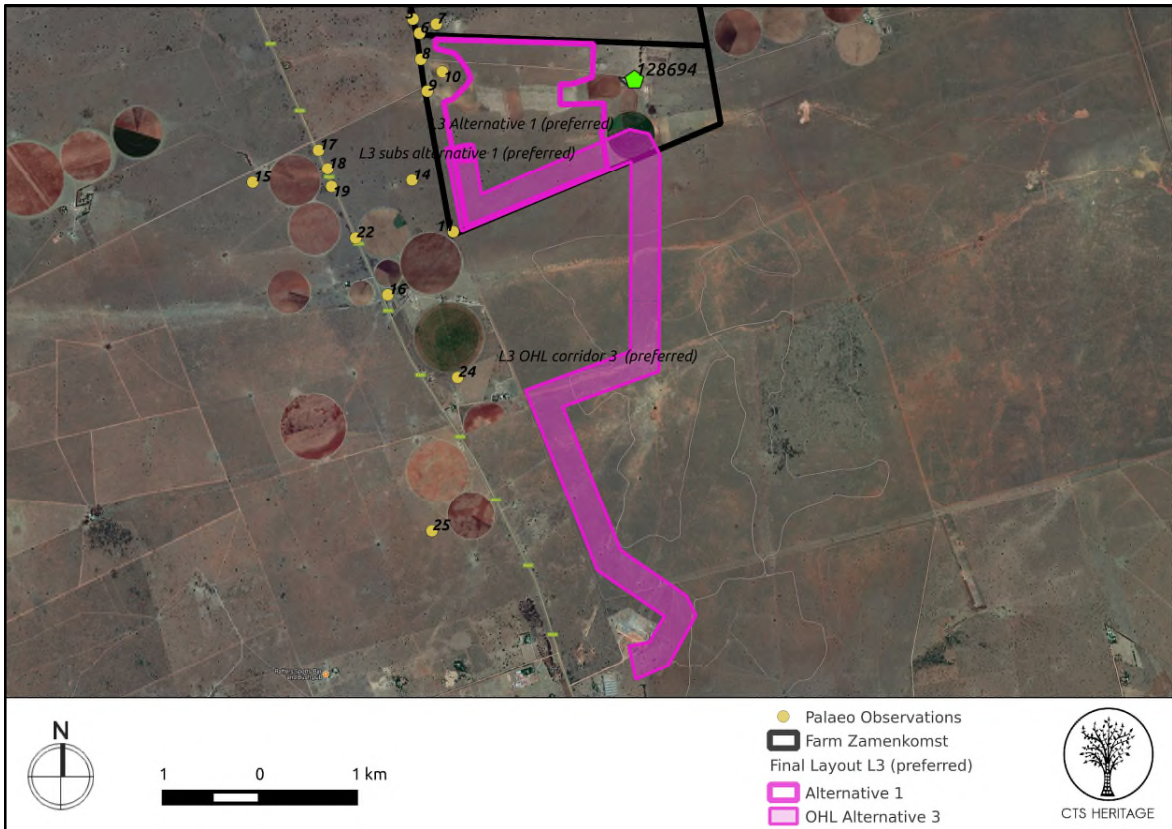
Map 7c and d: Site Layout Plan indicating the proposed Alternatives 1 and 2 for the overhead powerline.



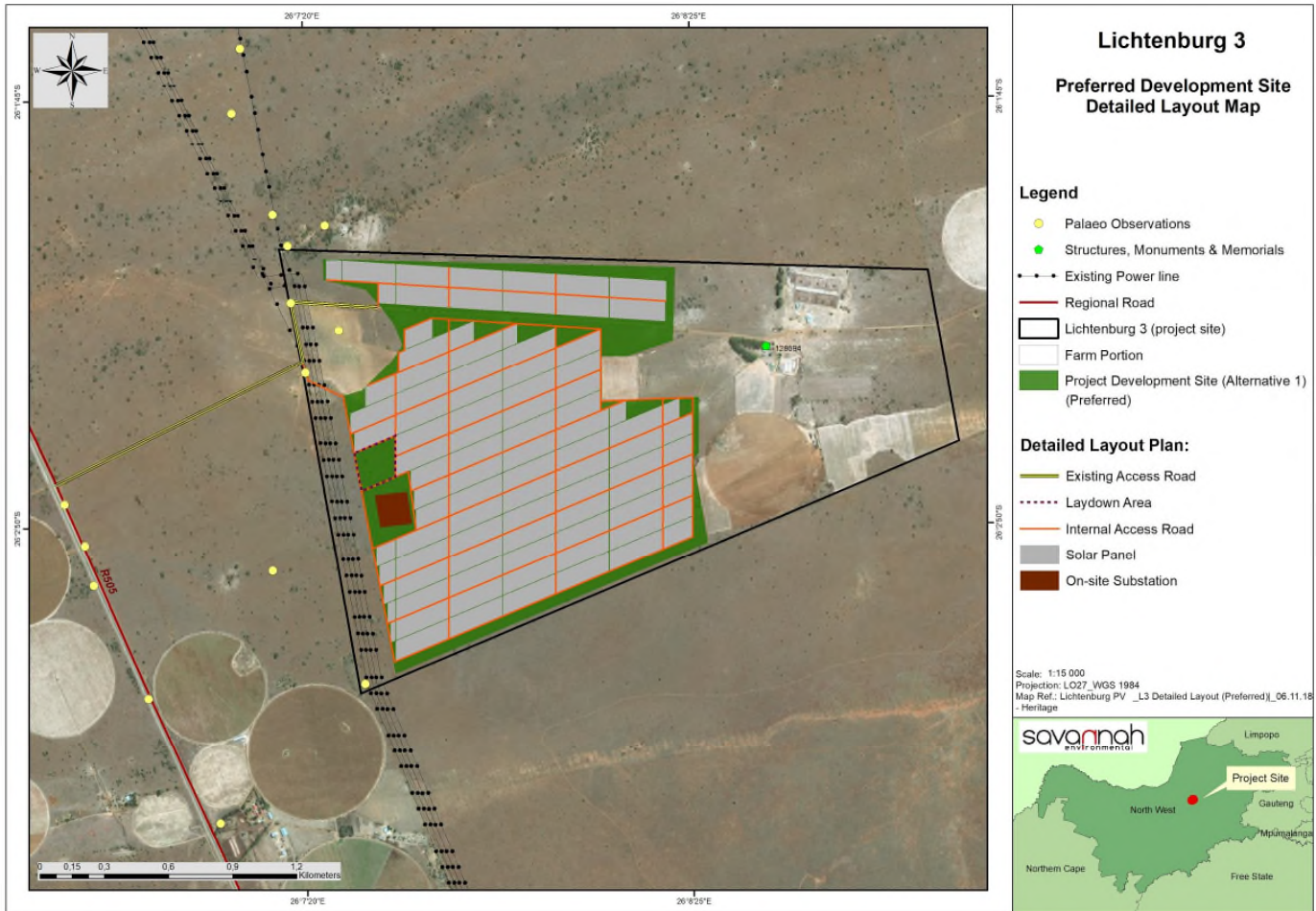
Map 7e: Site Layout Plan indicating the proposed Alternative 3 (preferred) for the overhead powerline.



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Map 7f: Site Layout Plan indicating the proposed preferred Alternatives for the proposed development



Map 7g: Detailed layouts of the preferred site overlain with the heritage findings for L3 provided by Savannah Environmental



5.4 Cumulative Impacts

As per Map 4 and Table 6, ten Heritage Impact Assessments have been conducted within a 30km inclusion zone of the proposed development area according to SAHRIS. Of these, 5 are for proposed solar parks or solar facilities, and one is for a proposed 88kv powerline.

In addition, the landscape surrounding Lichtenburg has not been identified as having any special tangible or intangible heritage significance. Therefore it is unlikely that the proposed development will result in unacceptable risk, unacceptable loss, wholesale changes to the sense of place or unacceptable increase in impact.

Table 5: Development projects within 30km of the proposed development area

Heritage Impact Assessments				
Nid	Report Type	Author/s	Date	Title
6237	AIA	Johnny Van Schalkwyk, Robert de Jong, S Smith	01/08/1995	Reconnaissance of Remaining Cultural Resources in the Bakerville Diamond Fields
8330	AIA	Francois P Coetzee	01/03/2008	Cultural Heritage Survey of the PPC Slurry Operation, near Zeerust, North West Province
8455	HIA	Udo Kusel	25/07/2008	Cultural Heritage Resources Impact Assessment of Portion 151 of Lichtenburg Town and Townlands 27 IP (Lichtenburg Extension 10) North West Province
8531	HIA	Johnny Van Schalkwyk	01/11/2008	Heritage Impact Report for the Proposed 88 kV Power Line from Watershed Substation, Lichtenburg, to the Mmabatho Substation, North West Gauteng Province
50047	HIA	M Hutten	01/05/2012	Heritage Impact Assessment for the Proposed Lichtenburg Solar Park North of Lichtenburg, North West Province
50048	PIA	Bruce Rubidge	14/07/2012	Palaeontological Assessment - Lichtenburg Solar Park
110338	HIA	Julius CC Pistorius	01/06/2011	A PHASE I HERITAGE IMPACT ASSESSMENT (HIA) STUDY FOR THE PROPOSED MAFIKENG CEMENT PROJECT NEAR ITSOSENG IN THE NORTH-WEST PROVINCE OF SOUTH AFRICA
123075	HIA	Jaco van der Walt	12/11/2013	Archaeological Impact Assessment Report - Watershed Solar Facility
138895	AIA	Jaco van der Walt, John E Almond	14/10/2013	Archaeological Impact Assessment for the Proposed Hibernia Solar Project near the town of Lichtenburg in the North West Province of South Africa & Paleontological Report: Recommended Exemption From Further Palaeontological Studies: Proposed Hibernia Pvs
389424	HIA	Wouter Fourie	14/06/2016	HIA for the proposed 75MW SOLAR PHOTOVOLTAIC (PV) ENERGY FACILITY – TLISITSENG PV 1 PROJECT

Table 6: Cumulative Impact Table

NATURE: Cumulative Impact to the sense of place due to the development of the PV facility which will intensify industrial development within the area.



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		Overall impact of the proposed project considered in isolation		Cumulative impact of the project and other projects in the area
MAGNITUDE	L (4)	Low	L (4)	Low
DURATION	M (3)	Medium-term	H (4)	Long-term
EXTENT	L (1)	Low	L (1)	Low
PROBABILITY	L (2)	Improbable	H (3)	Probable
SIGNIFICANCE	L	$(4+3+1) \times 2 = 16$	L	$(4+4+1) \times 3 = 27$
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: No impacts are anticipated and as such, no mitigation is required				

Considering the assessment of cumulative impacts on heritage resources, as per Table 6 and 7 above, the development of Lichtenburg 3 and the other solar energy facilities in the area is considered to be acceptable as no cumulative impacts of a high significance are expected to occur.

6. RESULTS OF PUBLIC CONSULTATION

The public consultation process will be undertaken by the EAP during the EIA.

7. CONCLUSION

The following findings have been made:

- During the survey an old farm house was identified on the remaining extent of Portion 02 of Farm Zamenkomst No 04. However, the farm house falls outside of the proposed development footprint and will not be impacted. This farmhouse has low local heritage significance in terms of its architectural qualities and as such, has been graded IIIC.
- No other archaeological resources were identified in the project area.
- No graves or burial grounds were identified in the project area. However, as graves are subterranean in nature and might not have been identified during the initial site visit and survey.



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- Based on the experience of the palaeontologist and the lack of any previously recorded fossils from the area, it is extremely unlikely that any fossils would be preserved in the stromatolites or overlying soils of the Quaternary.
- The anticipated visual impacts range from **moderate** to **low** significance. Anticipated visual impacts on sensitive visual receptors in close proximity to the proposed facility are not considered to be fatal flaws for the proposed SEF.

8. RECOMMENDATIONS

As such, there is no archaeological objection to the proposed Lichtenburg 3 development.

There is no preferred alternative on heritage grounds alone and as such, the Preferred Alternatives as mapped in Map 7f are preferred.

It is recommended that:

- Although the farm house falls outside of the proposed development footprint, any impacts to the old farm house structure are to be avoided. As this structure has limited architectural heritage significance, no specific mitigation recommendations are provided. Any impacts to this structure will require the approval of the North West Provincial Heritage Resources Authority.

It should be noted that, although there were no other archaeological or heritage resources identified during the project survey; some archaeological material, including artefacts and graves can be buried underground and as such, may not have been identified during the initial survey and site visits. In the case where the proposed development activities bring these materials to the surface, work must cease and SAHRA must be contacted immediately to determine a way forward.

Where sensitive visual receptors are likely to be affected (i.e. residents of homesteads and settlements in close proximity), it is recommended that the developer enter into negotiations regarding the potential screening of visual impacts at the receptor site. This may entail the planting of vegetation, trees or the construction of screens. Ultimately, visual screening is most effective when placed at the receptor itself.



9. REFERENCES

Lavin, Tomose, de Bruin et al. (September 2018). ARCHAEOLOGICAL SPECIALIST STUDY: In terms of Section 38(8) of the NHRA for a Development of the Lichtenburg 1, 2 and 3 PV Solar Energy Facility and associated infrastructure on a site near Lichtenburg, North West Province (Unpublished)

Bamford (September 2018). Palaeontological Impact Assessment for three proposed PV projects near Lichtenburg, Northwest Province. (Unpublished)

Lavin and Wiltshire. (June 2018). Heritage Screening Assessment for the proposed development of the Lichtenburg 2 PV Solar Energy Facility and associated infrastructure on a site near Lichtenburg, North West Province. (Unpublished).

Du Plessis (October 2018). Proposed Lichtenburg 3 Pv Solar Energy Facility, North West Province: Visual Impact Assessment. (Unpublished)



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APPENDICES



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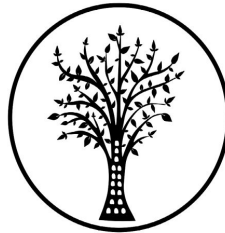
APPENDIX 1: Archaeological Assessment

ARCHAEOLOGICAL SPECIALIST STUDY

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

Development of the Lichtenburg 1, 2 and 3 PV Solar Energy Facility and associated infrastructure on a site near Lichtenburg, North West Province.

Prepared by



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In Association with

Savannah

And

NGT Holdings

September 2018



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THE INDEPENDENT PERSON WHO COMPILED A SPECIALIST REPORT OR UNDERTOOK A SPECIALIST PROCESS

I Jenna Lavin, as the appointed independent specialist hereby declare that I:

- act/ed as the independent specialist in this application;
- regard the information contained in this report as it relates to my specialist input/study to be true and correct, and
- do not have and will not have any financial interest in the undertaking of the activity, other than remuneration for work performed in terms of the NEMA, the Environmental Impact Assessment Regulations, 2010 and any specific environmental management Act;
- have and will not have no vested interest in the proposed activity proceeding;
- have disclosed, to the applicant, EAP and competent authority, any material information that have or may have the potential to influence the decision of the competent authority or the objectivity of any report, plan or document required in terms of the NEMA, the Environmental Impact Assessment Regulations, 2010 and any specific environmental management Act;
- am fully aware of and meet the responsibilities in terms of NEMA, the Environmental Impact Assessment Regulations, 2010 (specifically in terms of regulation 17 of GN No. R. 543) and any specific environmental management Act, and that failure to comply with these requirements may constitute and result in disqualification;
- have ensured that information containing all relevant facts in respect of the specialist input/study was distributed or made available to interested and affected parties and the public and that participation by interested and affected parties was facilitated in such a manner that all interested and affected parties were provided with a reasonable opportunity to participate and to provide comments on the specialist input/study;
- have ensured that the comments of all interested and affected parties on the specialist input/study were considered, recorded and submitted to the competent authority in respect of the application;
- have ensured that the names of all interested and affected parties that participated in terms of the specialist input/study were recorded in the register of interested and affected parties who participated in the public participation process;
- have provided the competent authority with access to all information at my disposal regarding the application, whether such information is favourable to the applicant or not; and
- am aware that a false declaration is an offence in terms of regulation 71 of GN No. R. 543.

Jenna Lavin

Signature of the specialist

CTS Heritage

Name of company

16 August 2018

Date



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EXECUTIVE SUMMARY

ABO Wind Lichtenburg 1 PV (Pty) Ltd propose the development of the Lichtenburg 1 PV Solar Energy Facility on Portion 06 of the Farm Zamenkomst No 04. The proposed solar facility is planned to be bid into the Department of Energy's (DoE's) Renewable Energy (RE) Independent Power Producer (IPP) Procurement Programme (REIPPPP) with the aim of evacuating the generated power into the Eskom national electricity grid and aiding in the diversification and stabilisation of the country's electricity supply.

The Project area comprised of three farms (Figure. 4.1-4.6). The area has been disturbed and transformed by agricultural activities. As such pre-existing agricultural plough fields, grazing areas and farm buildings were identified in the project area. Furthermore, throughout the farming areas several heaps of rocks, that were removed from the agricultural fields were identified (Figure. 4.7).

During the field assessment of the site no archaeological resources, graves or burial grounds were identified in the project area (Figure 5). However, graves are subterranean in nature and might not have been identified during the initial site visit and survey. The only resource of heritage significance that was identified is an old farm house located in the north-eastern corner of the Farm Zamenkomst No 04 Portion 02 (Figure 6.1 – 6.5). The farm house is of low local significance. Apart from the roof that could use a layer of paint the house seems to be in a relatively good condition. The farmhouse was most likely constructed during the 1920's and of Vernacular type. It is currently being occupied.

The following findings have been made:

- During the survey an old farm house was identified on the Farm Zamenkomst No 04 Portion 02. It falls within the proposed project area, and as such could possibly be impacted or damaged by the proposed development activities. This farmhouse has low local heritage significance in terms of its architectural qualities and as such, has been graded III C.
- No other archaeological resources were identified in the project area.
- No graves or burial grounds were identified in the project area. However, as graves are subterranean in nature and might not have been identified during the initial site visit and survey.

As such, there is no archaeological objection to the proposed development. It is recommended that:

- Any impacts to the old farm house structure be avoided. However, as this structure has limited architectural heritage significance, no specific mitigation recommendations are provided. Any impacts to this structure will require the approval of the NW PHRA.

It should be noted that, although there were no other archaeological or heritage resources identified during the project survey; some archaeological material, including artefacts and graves can be buried underground and as such, may not have been identified during the initial survey and site visits. In the case where the proposed development activities bring these materials to the surface, work must cease and SAHRA must be contacted immediately to determine a way forward.



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1. INTRODUCTION

1.1 Background Information on Project

ABO Wind Lichtenburg 1 PV (Pty) Ltd propose the development of the Lichtenburg 1 PV Solar Energy Facility on Portion 06 of the Farm Zamenkomst No 04. The proposed solar facility is planned to be bid into the Department of Energy's (DoE's) Renewable Energy (RE) Independent Power Producer (IPP) Procurement Programme (REIPPPP) with the aim of evacuating the generated power into the Eskom national electricity grid and aiding in the diversification and stabilisation of the country's electricity supply. The project site is located approximately 12km north of Lichtenburg and 5.5km south-west of Bakerville in Ward 16 of the Ditsobotla Local Municipality, of Ngaka Modiri Molema District, North West Province. The area under investigation is approximately 428ha in extent and comprises 1 agricultural property. The project site can be accessed via unsurfaced farm roads, which can be accessed via the R505 regional road.

Additional Infrastructure required for this development includes:

- Arrays of PV panels (either static or tracking PV systems) with a generation capacity of up to 75MW.
- Mounting structures to support the PV panels.
- On-site inverters to convert the power from Direct Current (DC) to Alternating Current (AC) and a substation to facilitate the connection between the solar energy facility and the Eskom electricity grid.
- A new 132kV power line between the on-site substation and the Eskom grid connection point. Two options are currently being considered for grid connection:
 - Connecting the facility to the existing Watershed Main Transmission Substation (MTS) (this is the preferred option).
 - Connecting the facility (i.e. loop-in-loop-out) to one of the power lines which traverses the property in a north-south direction (this is dependent on line capacity).
- Cabling between the project components (to be laid underground where practical).
- Offices and workshop areas for maintenance and storage.
- Temporary laydown areas.
- Internal access roads and fencing around the development area.

1.2 Description of Property and Affected Environment

The project area falls within the Grassland Biome, which contains a wide variety of grasses typical of arid areas. The project area falls within a heavily disturbed area, as the area has been transformed by agricultural activities and animal grazing. Much of the project area is covered in grass species, contains agricultural fields and grazing areas for cows and sheep.



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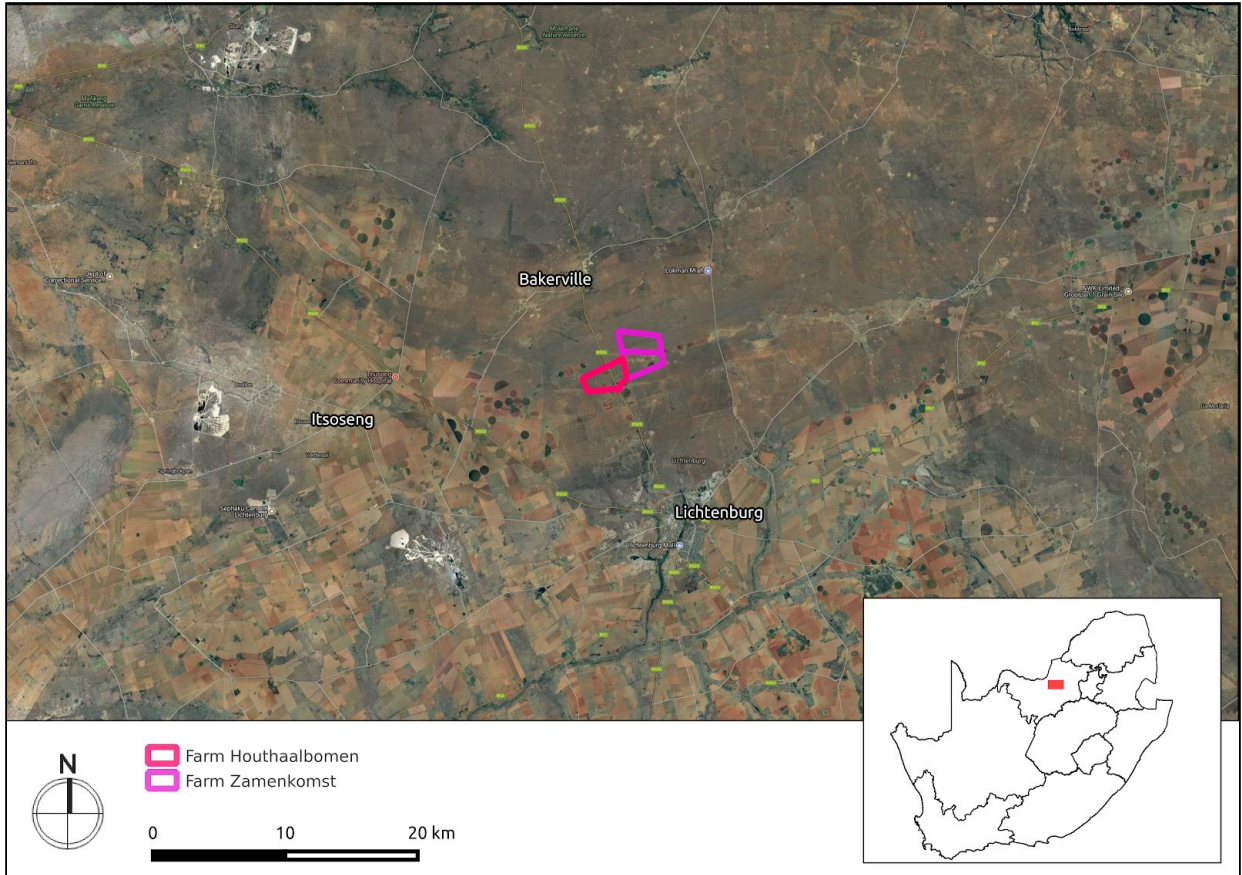


Figure 1.1: Close up satellite image indicating proposed location of development

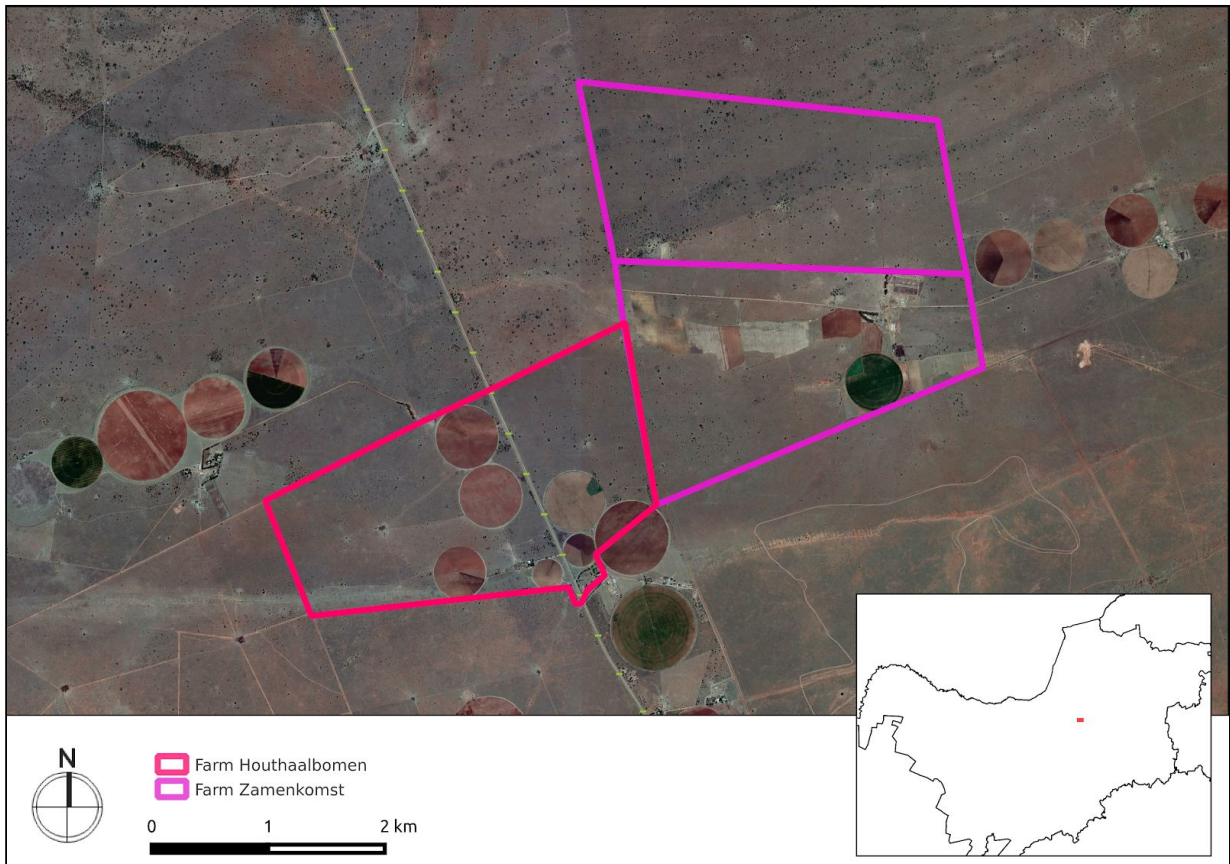


Figure 1.2: Close up satellite image indicating proposed location of development



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

- Miss Cherene de Bruyn (Archaeology and Heritage Consultant – NGT), Miss Nana Msimang (Environmental and Sustainability consultant – NGT) and Mr Mthoko Zulu (Assistant - NGT) conducted a survey of the proposed development sites and the receiving environment on 25 September 2018. The aim of the survey was search for archaeological and other heritage resources (e.g. burial grounds and graves, and historic built environment features (such as an old farmhouses) within the proposed development sites and to determine the potential impacts on these resources by the proposed development.
- The identified resources were assessed to evaluate their heritage significance in terms of the grading system outlined in section 3 of the NHRA (Act 25 of 1999).
- Alternatives and mitigation options were discussed with the Environmental Assessment Practitioner.

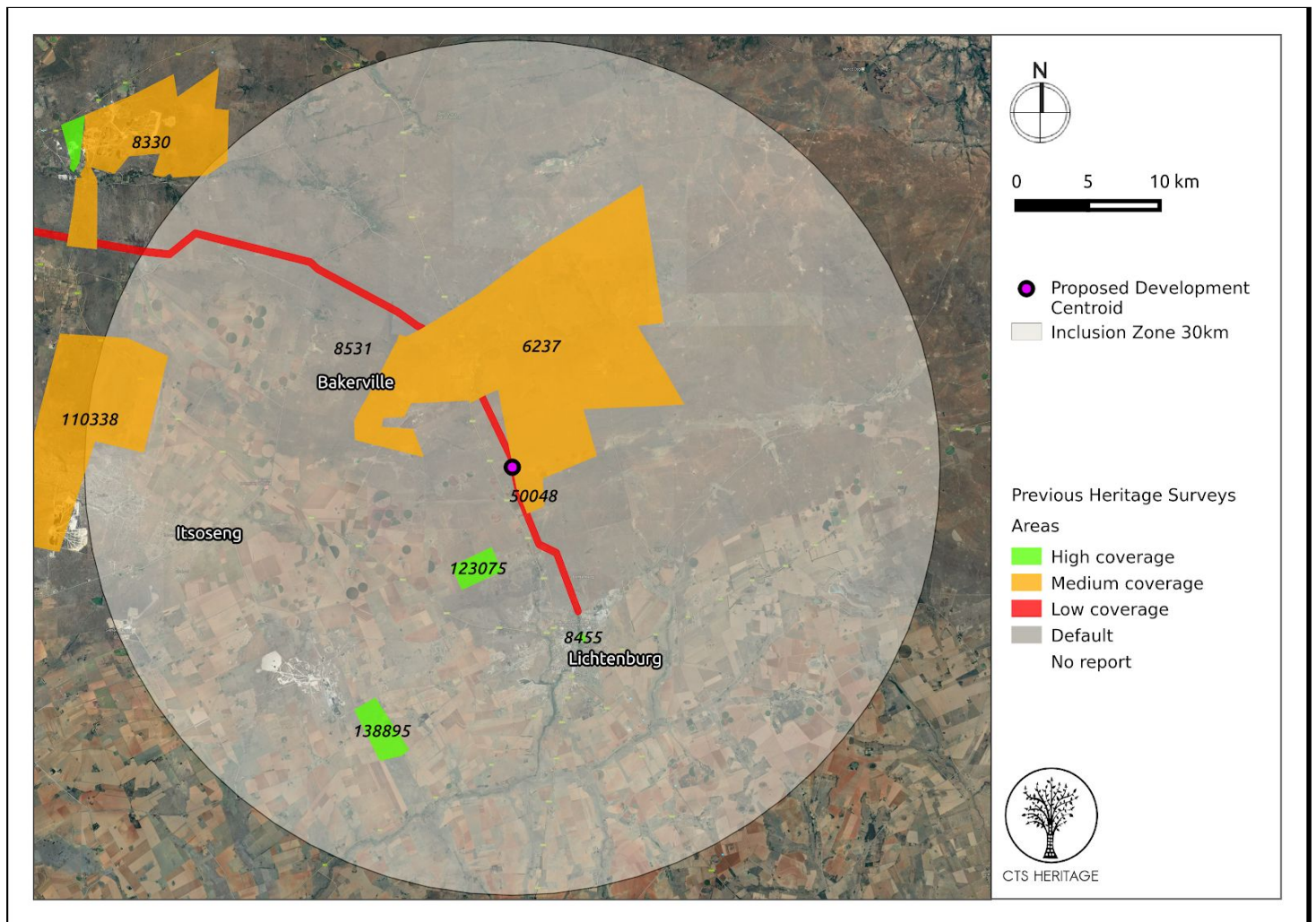


Figure 2: Close up satellite image indicating proposed location of development in relation to heritage studies previously conducted



3. HISTORY AND EVOLUTION OF THE SITE AND CONTEXT

Lichtenburg town was established in 1873 and named “Town of Light”. General Del la Rey was buried in Lichtenburg after a fatal shooting incident at Langlaagte. During the 1800’s, more and more farmers settled in the area. During the Second Boer War, the strategically important town of Lichtenburg was occupied by both Boer and Briton for short spells. In November 1900, a large British force under Col. Robert Baden-Powell was transferred to Lichtenburg and secured the town, and much of the territory with it. In addition, the town is known from Rudyard Kipling’s poem, Lichtenberg, which relays the story of a foreign combatant in the second South African War. In 1926, Lichtenburg experienced a gold rush that lasted approximately 10 years. Lichtenburg district is now mostly a farming area, combining cattle and crop-farming and large areas of former diamond mine diggings are now used as grazing.

According to van Schalkwyk et al (1995, SAHRIS NID 6237) in their report completed for the Bakerville Diamond Fields, “land use in the area goes back to the Early Stone Age, as can be determined by the number of stone artifacts found near the old mining commissioners office. This material seems to be disturbed from its primary context because of the mining activities. It is postulated that similar occurrences will be found in other parts of the diggings, but that this material would have been disturbed out of context.” As a result of the dominant land use in the area, many of the heritage resources identified by van Schalkwyk et al (1995) are associated with past and present agriculture, and consist of farming implements (many of them found together with discarded mining equipment), a few windmills, and dipping-troughs. One such trough, located at Elandsputte on the farm Uitgevonden 355JP, was the site where the first diamond was discovered. This structure is a proclaimed national monument (now Provincial Heritage Site).

Van Schalkwyk et al (1995) identified a number of burial grounds within their surveyed area (Figure 2 and 3). As per Appendix 1, heritage resources known from this area include burial grounds and graves, archaeological artefacts and old structures, often associated with farming activities or diamond mining. It is likely that the proposed development will impact on such heritage resources.

The proposed development is located on geological deposits belonging to the Monte Christo Formation of the Chuniespoort Group. These deposits have a very high sensitivity for impacts to palaeontological resources (Figure 4). The Chuniespoort Group is known to contain a Range of shallow marine to intertidal stromatolites (domes, columns etc) and organic-walled microfossils. In addition, it is within this geological group that fossiliferous Late Cenozoic cave breccias have been identified. Good examples of stromatolites from this Group have been identified within the Cradle of Humankind region. It is possible that the proposed development will impact significant palaeontological heritage resources.

Table 1: Table of known heritage resources within the development footprint (Figure 3a and 3b)

Site ID	Site No	Site Name	Site type	Grading
26804	9/2/235/0008	Historic cattle dip, Elandsputte, Lichtenburg District	Building	Grade II
26803	9/2/235/0005	Nerderduitse Gereformeerde Church, 27 Gerrit Maritz Street, Lichtenburg	Building	Grade II
26788	9/2/238/0015	Water mill, Malmani Eye, Marico District	Building	Grade II



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33370	GY01	Mafikeng Cement 1	Burial Grounds & Graves	Grade IIIa
33372	GY02	Mafikeng Cement 2	Burial Grounds & Graves	Grade IIIa
33817	ZPPCS4	Zeerust 4	Building	
33818	ZPPCS5	Zeerust 5	Burial Grounds & Graves	Grade IIIa
32832	AEPC 3	Steenkoolspruit farm, Ogies Emalahleni Mpumalanga Province (mapped incorrectly on SAHRIS)	Burial Grounds & Graves	Grade IIIa
51468	WSF 01	Watershed Solar Facility 01	Artefacts	Grade IIIc
51470	WSF 02	Watershed Solar Facility 02	Artefacts	Grade IIIc
51472	WSF 03	Watershed Solar Facility 03	Burial Grounds & Graves	Grade IIIa
44979	HIB01	Hibernia 01	Burial Grounds & Graves	Grade IIIa
33373	GY03	Mafikeng Cement 3	Burial Grounds & Graves	Grade IIIa
83780	MALA015	eMalahleni 015	Burial Grounds & Graves	Grade IIIa

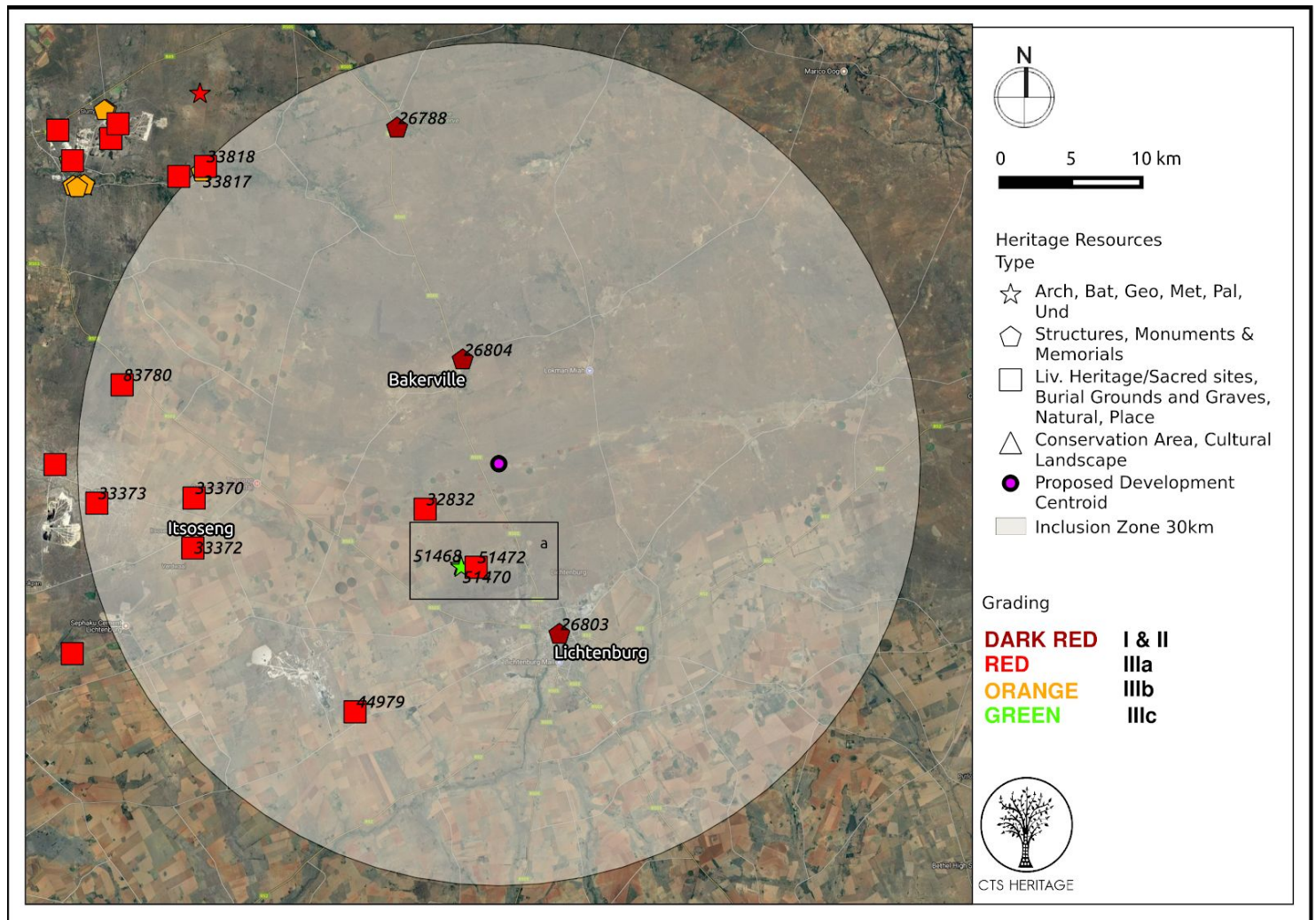


Figure 3. Heritage Resources Map. Heritage Resources previously identified in and near the study area, with SAHRIS Site IDs indicated



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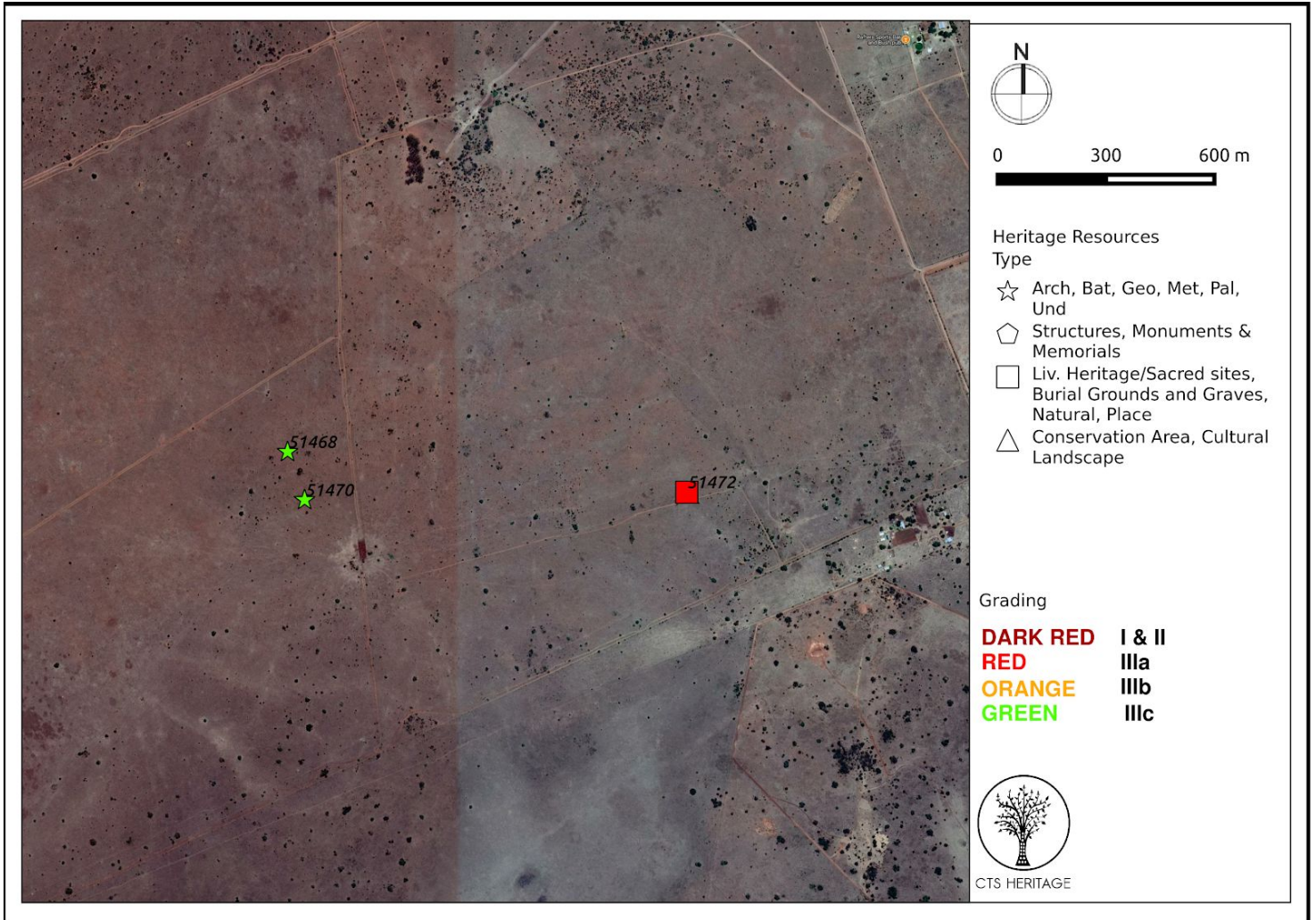


Figure 3a. Heritage Resources Map. Heritage Resources previously identified in and near the study area, with SahrIs Site IDs indicated

4. IDENTIFICATION OF HERITAGE RESOURCES

4.1 Field Assessment

The background information search yielded information about the archaeology and history of the North West Province, and particularly the Lichtenburg region. The physical survey focused on the areas proposed for the Lichtenburg 1 PV Solar Energy Facility on Portion 02 and Portion 06 of the Farm Zamenkomst No 04 as well as on Portion 23 of the Farm Houthaalbomen No 31 in Ditsobotla Local Municipality, of the Ngaka Modiri Molema District.

The Project area comprised of three farms (Figure. 4.1-4.6). The area has been disturbed and transformed by agricultural activities. As such pre-existing agricultural plough fields, grazing areas and farm buildings were identified in the project area. Furthermore, throughout the farming areas several heaps of rocks, that were removed from the agricultural fields were identified (Figure. 4.7).



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Figure 4.1: Contextual Images from Farm Zamenkomst No 04 Portion 02



Figure 4.2: Contextual Images from Farm Zamenkomst No 04 Portion 02



Figure 4.3: Farming infrastructure and workers houses identified on the Farm Zamenkomst No 04 Portion 02



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Figure 4.4: General view of the Farm Zamenkomst No 04 Portion 06



Figure 4.5: General view of the Farm Zamenkomst No 04 Portion 06



Figure 4.6: Farming infrastructure including a reservoir and wind pump as well as cattle enclosures identified on the Farm Zamenkomst No 04 Portion 06



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Figure 4.7: General view of the Farm Houthaalbomen No 31 Portion 23



Figure 4.8: General view of the Farm Houthaalbomen No 31 Portion 23



Figure 4.9: Sheep on the Farm Houthaalbomen No 31 Portion 23



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Figure 4.10: Heaps of rock removed from the agricultural fields on the Farm Houthaalbomen No 31 Portion 23

4.2 Archaeological Resources identified

During the field assessment of the site no archaeological resources, graves or burial grounds were identified in the project area (Figure 5). However, graves are subterranean in nature and might not have been identified during the initial site visit and survey.

The only resource of heritage significance that was identified is an old Farm House located in the north-eastern corner of the Farm Zamenkomst No 04 Portion 02 (Figure 6.1 – 6.5). The farm house is of low local significance. Apart from the roof that could use a layer of paint the house seems to be in a relatively good condition. The farmhouse was most likely constructed during the 1920's and of Vernacular type. It is currently being occupied.

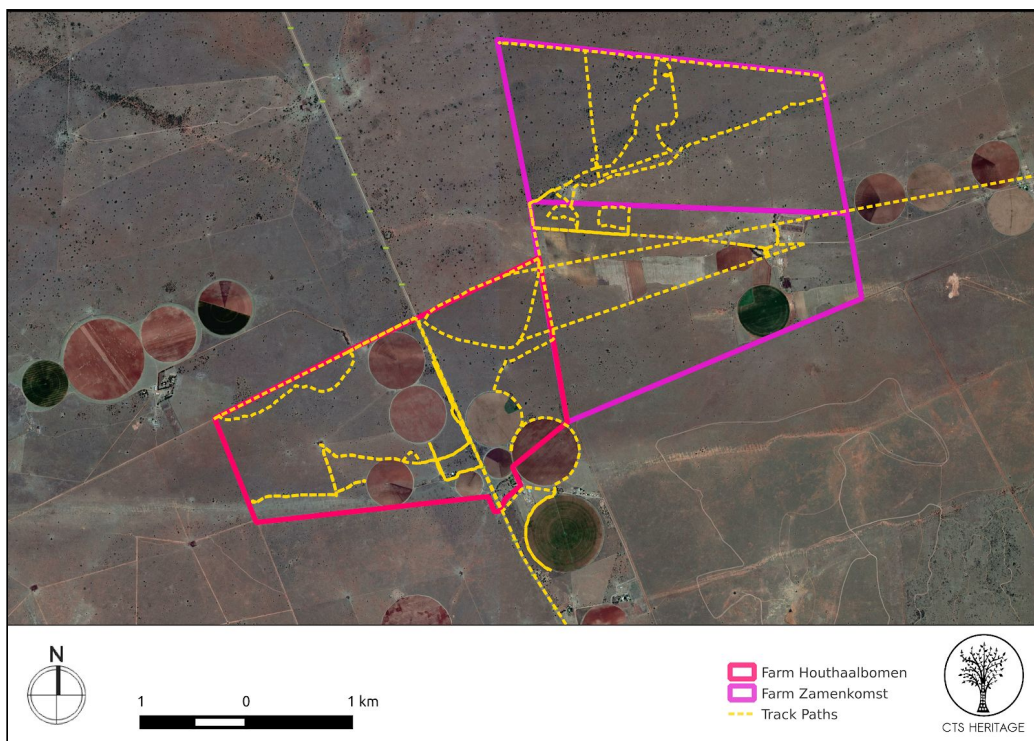


Figure 5: Overall track paths of foot survey

Table 2: Resources identified during the field assessment

SAHRIS ID	Site No.	Name	Description	Latitude	Longitude	Grading ¹³
128694	ZKT1	Zamenkomst	1920's farm house structure	26° 2'22.91"S	26° 8'37.83"E	Grade IIIc

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4.3 Selected photographic record



Figure 6.1: General view of the Farm House and associated farm buildings, as well as the small fence surrounding the property.



Figure 6.2 Western Corner of the farm house and 6.3 Eastern Corner of the farm house



Figure 6.4 Southern Corner of the farm house and 6.5 Northern Corner of the farm house

5. ASSESSMENT OF THE IMPACT OF THE DEVELOPMENT

5.1 Assessment of impact to Archaeological Resources

The farm house is of low local significance and has local heritage value. The old farm house falls within the proposed project area. A fence is currently constructed around the site which is acting as barrier protecting it from unnecessary impacts. It is recommended that any impacts to this structure be avoided. However, as this structure has limited architectural heritage significance, no specific mitigation recommendations are provided.

It is important to note that, although none were identified within our field assessment, in such rural, agricultural contexts unmarked, or lightly marked, burials may exist within the development footprint and care must be taken to avoid impacts to these hidden remains.

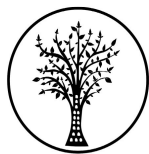
5.2 Proposed development alternatives

No development alternatives have yet been provided by the EAP.

6. CONCLUSION

The following findings have been made:

- During the survey an old farm house was identified on the Farm Zamenkomst No 04 Portion 02. It falls within the proposed project area, and as such could possibly be impacted or damaged by the proposed development activities. This farmhouse has low local heritage significance in terms of its architectural qualities and as such, has been graded IIIC.
- No other archaeological resources were identified in the project area.
- No graves or burial grounds were identified in the project area. However, as graves are subterranean in nature and might not have been identified during the initial site visit and survey.



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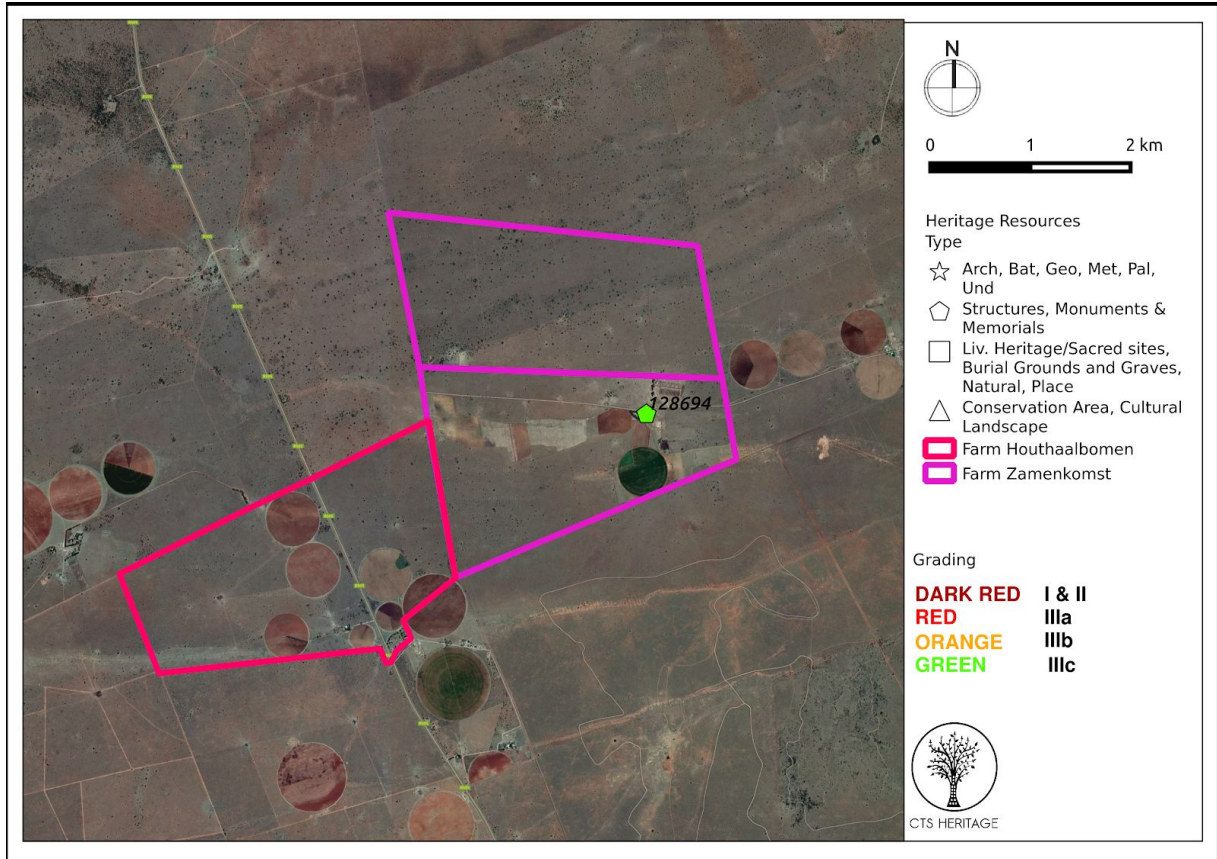


Figure 7.1: Map of heritage resources identified during the field assessment relative to the proposed development

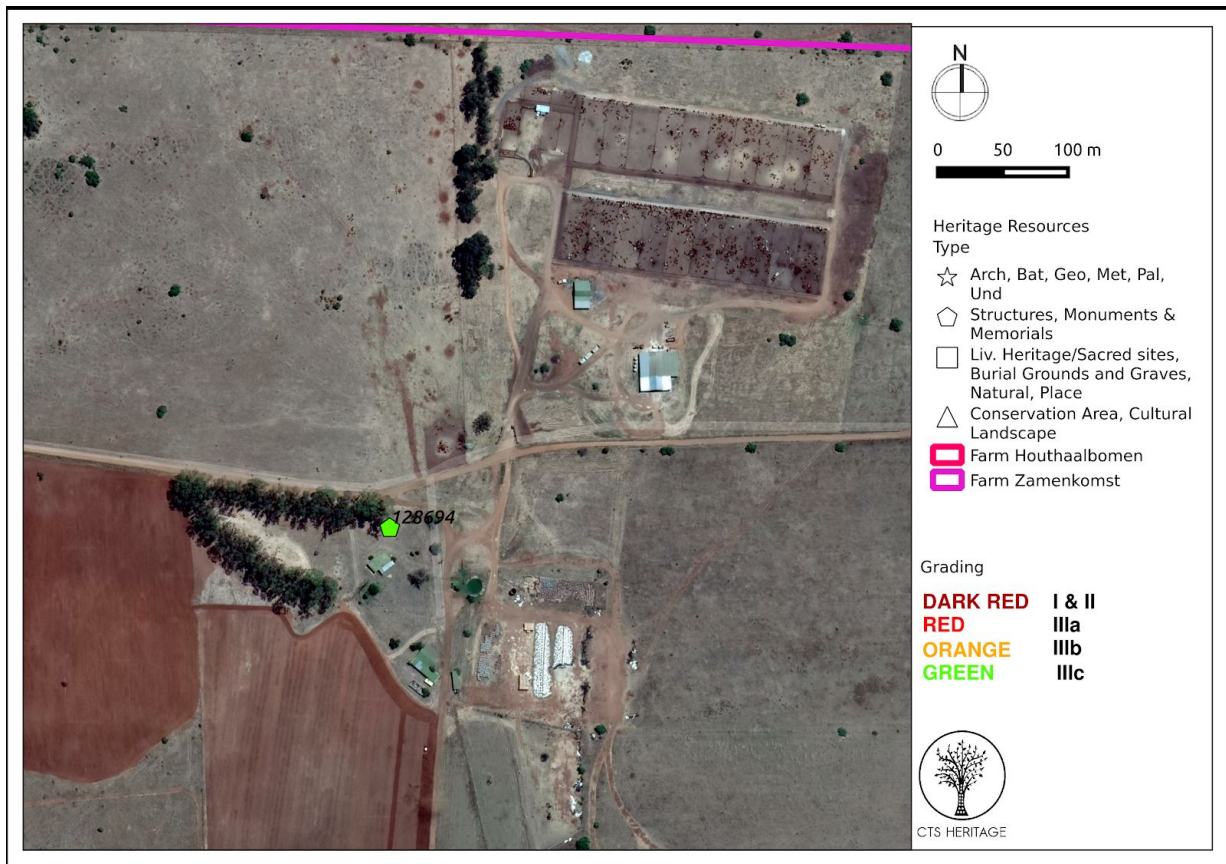


Figure 7.2: Map of heritage resources identified during the field assessment relative to the proposed development



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7. RECOMMENDATIONS

As such, there is no archaeological objection to the proposed development. It is recommended that:

- Any impacts to the old farm house structure be avoided. However, as this structure has limited architectural heritage significance, no specific mitigation recommendations are provided. Any impacts to this structure will require the approval of the NW PHRA.

It should be noted that, although there were no other archaeological or heritage resources identified during the project survey; some archaeological material, including artefacts and graves can be buried underground and as such, may not have been identified during the initial survey and site visits. In the case where the proposed development activities bring these materials to the surface, work must cease and SAHRA must be contacted immediately to determine a way forward.



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8. REFERENCES

Impact Assessment References				
Nid	Report Type	Author/s	Date	Title
6237	AIA	Johnny Van Schalkwyk, Robert de Jong, S Smith	01/08/1995	Reconnaissance of Remaining Cultural Resources in the Bakerville Diamond Fields
8330	AIA	Francois P Coetzee	01/03/2008	Cultural Heritage Survey of the PPC Slurry Operation, near Zeerust, North West Province
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50047	HIA	M Hutten	01/05/2012	Heritage Impact Assessment for the Proposed Lichtenburg Solar Park North of Lichtenburg, North West Province
50048	PIA	Bruce Rubidge	14/07/2012	Palaeontological Assessment - Lichtenburg Solar Park
110338	HIA	Julius CC Pistorius	01/06/2011	A PHASE I HERITAGE IMPACT ASSESSMENT (HIA) STUDY FOR THE PROPOSED MAFIKENG CEMENT PROJECT NEAR ITSOSENG IN THE NORTH-WEST PROVINCE OF SOUTH AFRICA
123075	HIA	Jaco van der Walt	12/11/2013	Archaeological Impact Assessment Report - Watershed Solar Facility
138895	AIA	Jaco van der Walt, John E Almond	14/10/2013	Archaeological Impact Assessment for the Proposed Hibernia Solar Project near the town of Lichtenburg in the North West Province of South Africa & Paleontological Report: Recommended Exemption From Further Palaeontological Studies: Proposed Hibernia Pv S



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APPENDIX 2: Palaeontological Assessment

**Palaeontological Impact Assessment for three proposed
PV projects near Lichtenburg,
Northwest Province**

Phase 2 / Site Visit Report

For

CTS Heritage

29 September 2018

Prof Marion Bamford

Palaeobotanist

P Bag 652, WITS 2050

Johannesburg, South Africa

Marion.bamford@wits.ac.za

Expertise of Specialist

The Palaeontologist Consultant is: Prof Marion Bamford
Qualifications: PhD (Wits Univ, 1990); FRSSAf, ASSAf
Experience: 30 years research; 22 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

A handwritten signature in blue ink, appearing to read 'M Bamford', with a horizontal line underneath it.

Signature:

Executive Summary

A palaeontological Impact Assessment was requested for the establishment of Photovoltaic facilities (PV) on three farms between Bakerville and Lichtenburg with a powerline to the substation in Lichtenburg, in the Northwest Province. The affected farms and municipal properties are Zamenkomst No 04, Houthaalbomen No 31, Lichtenburg Town and Townlands No. 27. To comply with 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 desktop Palaeontological Impact Assessment (PIA) was completed for the proposed development.

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 Malmani Subgroup where only dolomites and stromatolites occur or in the overlying soils of the Quaternary. It is the opinion of the palaeontologist that proposed project to construct three PV facilities on the Farms Zamenkomst No 04, Houthaalbomen No 31, Lichtenburg Town and Townlands No. 27 can proceed.

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Background

A Palaeontological Impact Assessment was requested for the establishment of Photovoltaic facilities (PV) on three farms between Bakerville and Lichtenburg with a powerline to the substation in Lichtenburg, in the Northwest Province. The affected farms and municipal properties are:

- » Portion 06 of the Farm Zamenkomst No 04
- » Portion 23 of the Farm Houthaalbomen No 31
- » Remaining Extent of Portion 02 of Farm Zamenkomst No 04
- » Portion 10 of the Farm Lichtenburg Town and Townlands No. 27
- » Remaining Extent of Portion 01 of the Farm Lichtenburg Town and Townlands No. 27

To comply with 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 phase 2 or site visit Palaeontological Impact Assessment (PIA) was completed on 5-8 September 2018 for the proposed PV development and associated infrastructure.

Table 1: Specialist report requirements in terms of Appendix 6 of the EIA Regulations (2014)

A specialist report prepared in terms of the Environmental Impact Regulations of 2014 must contain:	Relevant section in report
Details of the specialist who prepared the report	Appendix A
The expertise of that person to compile a specialist report including a curriculum vitae	Appendix A
A declaration that the person is independent in a form as may be specified by the competent authority	Page 1
An indication of the scope of, and the purpose for which, the report was prepared	Section 1
The date and season of the site investigation and the relevance of the season to the outcome of the assessment	N/A
A description of the methodology adopted in preparing the report or carrying out the specialised process	Section 2

The specific identified sensitivity of the site related to the activity and its associated structures and infrastructure	Section ii
An identification of any areas to be avoided, including buffers	N/A
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;	N/A
A description of any assumptions made and any uncertainties or gaps in knowledge;	Section 5
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 4
Any mitigation measures for inclusion in the EMPr	N/A
Any conditions for inclusion in the environmental authorisation	N/A
Any monitoring requirements for inclusion in the EMPr or environmental authorisation	N/A
A reasoned opinion as to whether the proposed activity or portions thereof should be authorised	N/A
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	N/A
A description of any consultation process that was undertaken during the course of carrying out the study	N/A
A summary and copies if any comments that were received during any consultation process	N/A
Any other information requested by the competent authority.	N/A



Figure 1: Google Earth map of the proposed site for the PV facility. The farms are outlined in green, red and purple. Map supplied by CTS Heritage.

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 (*applicable to this assessment*);
3. Where appropriate, collection of unique or rare fossils with the necessary permits for storage and curation at an appropriate facility (*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 (*applicable to this assessment*).

Table 2: Explanation of symbols for the geological map and approximate ages (Erikssen et al., 2006. Johnson et al., 2006; McCarthy et al., 2006; Robb et al., 2006; van der Westhuizen et al., 2006). SG = Supergroup; Fm = Formation.

Symbol	Group/Formation	Lithology	Approximate Age
Q	Quaternary	Alluvium, sand, calcrete	Neogene, ca 25 Ma to present
T-Qk	Kalahari Group	Sand, limestone	
Jd	Jurassic dykes	Dolerite dykes, intrusive	Jurassic, approx. 180 Ma
C-Pd	Dwyka Group, Karoo Supergroup	Tillite, sandstone, mudstones, shales	Upper Carboniferous
Vdi	Diabase	diabase	
Vt	Timeball Hill Fm and Rooihogte Fm, Pretoria Group, Ventersdorp SG	Quartzite	< 2420 Ma
Vm	Malmani Subgroup, Chuniespoort Group, Transvaal Supergroup	Dolomite, chert	Ca 2750 – 2650 Ma
Vbr	Black Reef Fm,	Quartzite, conglomerate, shale, basalt	Ca 2650 – 2640 Ma
Val	Allanridge Fm, Ventersdorp Supergroup	Andesite	>2700 Ma

The sites for the PV facility lie on rocks of the Malmani Subgroup, Chuniespoort Group (Figure 2). The Malmani Subgroup is up to 2000m thick and comprises five formations distinguished by the amount of chert, stromatolite morphology, intercalated shales and erosion surfaces (Erikssen et al., 2006). The basal Oaktree Fm overlies the Black Reef Formation, and is made up of carbonaceous shales, stromatolitic dolomites and locally developed quartzites. Above this is the Monte Christo Formation comprising erosive breccia, overlain by stromatolitic and oolitic platformal dolomites. Next is the Lyttleton Formation of shales quartzites and stromatolitic dolomites. The Eccles Formation comprises a series of erosional breccias and the overlying Frisco Formation is made up mostly of stromatolitic dolomites.

The other rocks in the region would not be affected by this development and will not be discussed further.

Palaeontological context

The palaeontological sensitivity of the area under consideration is presented in Figure 3. The site for development is in the Malmani Group which contains a number of stromatolitic dolomites. These were formed in warm shallow sea and are the accumulation of layer upon layer of minerals deposited by blue-green algae (also known as cyanobacteria) and rarely some filamentous algae. Minerals deposited by the algae include calcium carbonate, calcium sulphate and magnesium carbonate. Very rarely are the algal cells preserved in the stromatolites and these are microscopic. Stromatolites are essentially trace fossils and these ones are 2750 to 2650 million years old and very abundant.

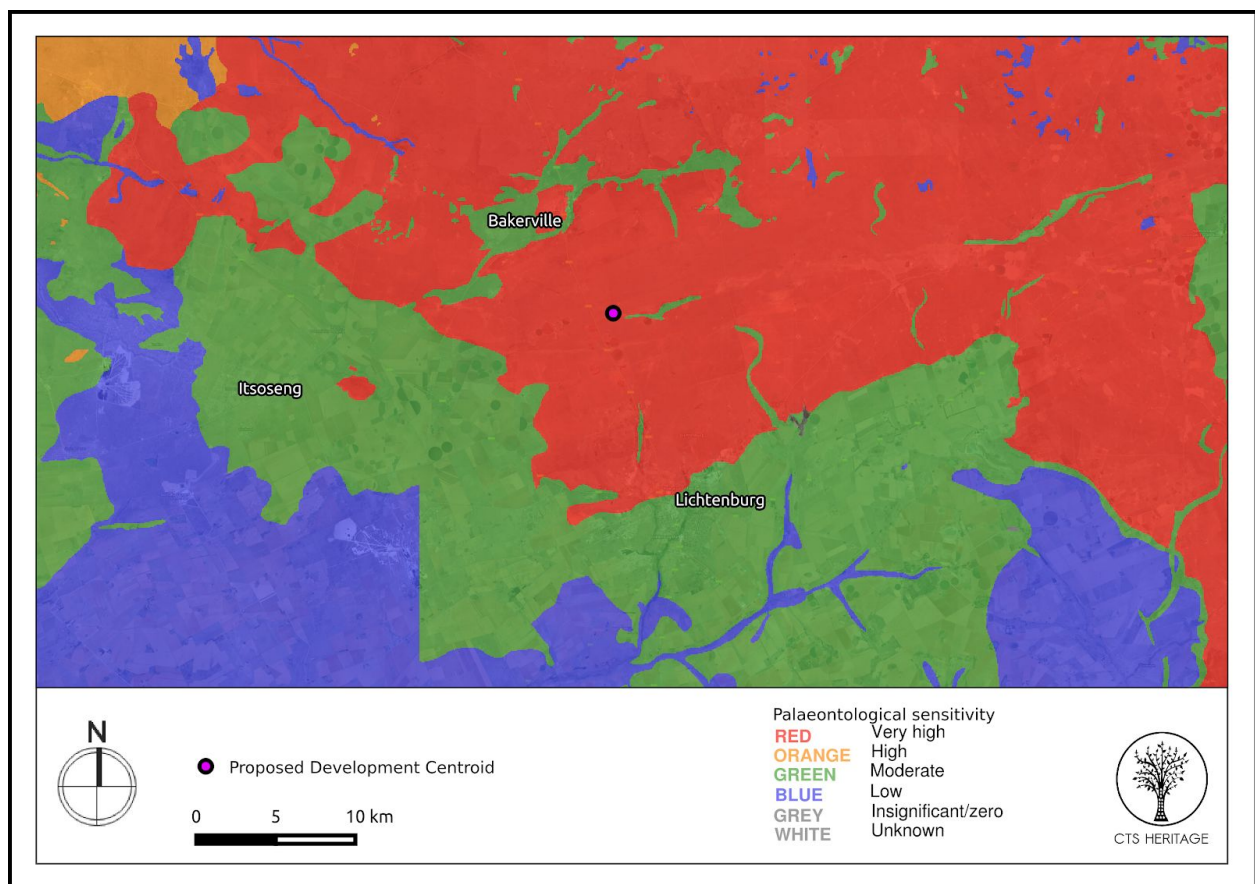


Figure 3: SAHRIS palaeosensitivity maps for the site for the proposed PV facility with the northern and southern sections in separate maps. Farms affected shown within the yellow rectangles. Colours indicate the following degrees of sensitivity: red = very highly sensitive; orange/yellow = high; green = moderate; blue = low; grey = insignificant/zero.

From the SAHRIS map above the area is indicated as highly sensitive (red) so a site visit was conducted on 5-8 September 2018 and the observations are presented here. The area has been disturbed from previous agricultural activities and roadworks.

Table 3: GPS readings for the sites visited on the three farms and along the road between the farms and Lichtenburg to Townlands with observations and some photographs provided below.

Stop	Latitude Longitude	Location and Observation
1	S26° 01.329' E26° 07.098'	Farm Zamenkomst – starting point; some weathered rock, most likely dolomite or dolostone; no fossils (Figure 4)
2	S26° 01.520' E26° 07.144'	Zamenkomst – area of broken rocks mostly dolomite; some stromatolites broken up (Figure 5).
3	S26° 01.619' E26° 07.161'	Zamenkomst – some dolomite; no fossils
4	S26° 01.783' E26° 07.136'	Zamenkomst – large patch of exposed rock
5	S26° 02.042' E26° 07.250'	Zamenkomst – boulders; no fossils
6	S26° 02.121' E26° 07.291'	Zamenkomst – patch of weathered rock
7	S26° 02.070 E26° 07.396'	Zamenkomst – few weathered rocks; breccia not in situ (Figure 6).
8	S26° 02.266' E26° 07.299'	Zamenkomst entrance – no in situ rocks
9	S26° 02.444' E26° 07.339'	Zamenkomst – section portion entrance; no rocks
10	S26° 02.336' E26° 07.433'	Zamenkomst – some weathered rocks
11	S26° 03.234' E26° 07.501'	Zamenkomst – no exposed rocks
12	S26° 02.888' E26° 02.253'	Farm Houthaalbomen entrance – no exposed rocks
13	S26° 09.933' E26° 06.179'	Houthaalbomen – pile of rocks that have been collected and placed here (Figure 7)
14	S26° 02.945' E26° 07.244'	Houthaalbomen – pile of rocks
15	S26° 02.957' E26° 06.251'	Houthaalbomen – rock fragments, some possibly stromatolitic
16	S26° 03.586' E26° 07.093'	Houthaalbomen – other entrance to farm; no rocks

17	S26° 02.774' E26° 06.661'	Houthaalbomen – some rocky outcrops; no fossils
18	S26° 02.879' E26° 06.718'	Houthaalbomen – no rocks
19	S26° 02.981' E26° 06.742'	Houthaalbomen – pile of collected rocks
20	S26° 01.316' E26° 07.154'	Zamenkomst - Stromatolites, loose sample taken
21	S26° 01.316' E26° 07.159'	Zamenkomst – stromatolites, loose sample taken
22	S26° 03.269' E26° 06.893'	Houthaalbomen – loose boulders; no fossils
23	S26° 01.329' E26° 07.098'	Roadside from farm to Lichtenburg Townlands – no rocks
24	S26° 04.053' E26° 07.528'	Roadside– some rocks only
25	S26° 04.913' E26° 07.368'	Roadside – no rocks (Figure 8)
26	S26° 05.596' E26° 03.161'	Roadside – no rocks



Figure 4: Zamenkomst Farm – typical mixture of dolomite (central grey rock) and other rocks (chert, quartzite)



Figure 5: Zamenkomst – stromatolites in the dolomite, circular domes formed by the excretion of minerals by the ancient algal colonies.



Figure 6: Zamenkomst – breccia block that has been moved



Figure 7: Houthalbomen farm – pile of rocks.



Figure 8 – roadside as commonly seen with no exposures of rocks.

Impact assessment

An assessment of the potential impacts to possible palaeontological resources considers the criteria encapsulated in Table 3:

Table 3a: 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 3b: Impact Assessment

PART B: Assessment		
SEVERITY/NATURE	H	-
	M	-
	L	Loose sands do not preserve plant fossils; stromatolites are common trace fossils and not considered palaeontologically important in this age deposit. They outcrop sporadically. The impact would be very unlikely.
	L+	-

	M+	-
	H+	-
DURATION	L	-
	M	-
	H	Where manifest, the impact will be permanent.
SPATIAL SCALE	L	Since only the possible fossils within the area would be microscopic blue-green algae in some stromatolites, the spatial scale will be localised within the site boundary.
	M	-
	H	-
PROBABILITY	H	-
	M	-
	L	It is extremely unlikely that any fossils would be found in the stromatolites which are themselves common trace fossils.

Based on the nature of the project, surface activities may impact upon the fossil heritage if preserved in the development footprint. The geological structures suggest that the rocks are much too old to contain fossils other than blue-green algae. Taking account of the defined criteria, the potential impact to fossil heritage resources is negligible to extremely low.

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 dolomites, sandstones, shales and sands are typical for the country and do not contain fossil plant, insect, invertebrate and vertebrate material. The sands of the Quaternary period would not preserve fossils and the dolomites and stromatolites of the Malmani Subgroup do not contain any visible fossils of any palaeontological interest. The site visit has confirmed these findings and there will be no impact on the fossil heritage.

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 stromatolites or overlying soils of the Quaternary. It is the opinion of the palaeontologist that proposed project to construct three PV facilities on the Farms Zamenkomst No 04, Houthaalbomen No 31, Lichtenburg Town and Townlands No. 27 can proceed.

References

Johnson, M.R., van Vuuren, C.J., Visser, J.N.J., Cole, D.I., Wickens, H.deV., Christie, A.D.M., Roberts, D.L., Brandl, G., 2006. Sedimentary rocks of the Karoo Supergroup. In: Johnson, M.R., Anhaeusser, C.R. and Thomas, R.J., (Eds). The Geology of South Africa. Geological Society of South Africa, Johannesburg / Council for Geoscience, Pretoria. Pp 461 – 499.

McCarthy, T.S., 2006. The Witwatersrand Supergroup. In: Johnson, M.R., Anhaeusser, C.R. and Thomas, R.J., (Eds). The Geology of South Africa. Geological Society of South Africa, Johannesburg / Council for Geoscience, Pretoria. Pp 155-186.

Plumstead, E.P., 1969. Three thousand million years of plant life in Africa. Geological Society of southern Africa, Annexure to Volume LXXII. 72pp + 25 plates.

Robb, L.J., Brandl, G., Anhaeusser, C.R., Poujol, M., 2006. Archaean Granitoid Intrusions. In: Johnson, M.R., Anhaeusser, C.R. and Thomas, R.J., (Eds). The Geology of South Africa. Geological Society of South Africa, Johannesburg / Council for Geoscience, Pretoria. Pp 57-94.

Van der Westhuizen, W.A., de Bruijn, H., Meintjes, P.G., 2006. The Ventersdorp Supergroup. In: Johnson, M.R., Anhaeusser, C.R. and Thomas, R.J., (Eds). The Geology of South Africa. Geological Society of South Africa, Johannesburg / Council for Geoscience, Pretoria. pp 187-208.

Curriculum vitae (short) - Marion Bamford PhD June 2018

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-
Telephone : +27 11 717 6690
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	6	1
Masters	8	1
PhD	10	2
Postdoctoral fellows	9	3

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 –
Cretaceous Research: 2014 -

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

xi) Research Output

Publications by M K Bamford up to June 2018 peer-reviewed journals or scholarly books: over 120 articles published; 5 submitted/in press; 8 book chapters.

Scopus h index = 26; Google scholar h index = 28;

Conferences: numerous presentations at local and international conferences.

xii) NRF Rating

NRF Rating: B-2 (2016-2020)

NRF Rating: B-3 (2010-2015)

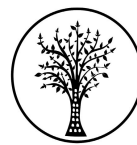
NRF Rating: B-3 (2005-2009)

NRF Rating: C-2 (1999-2004)



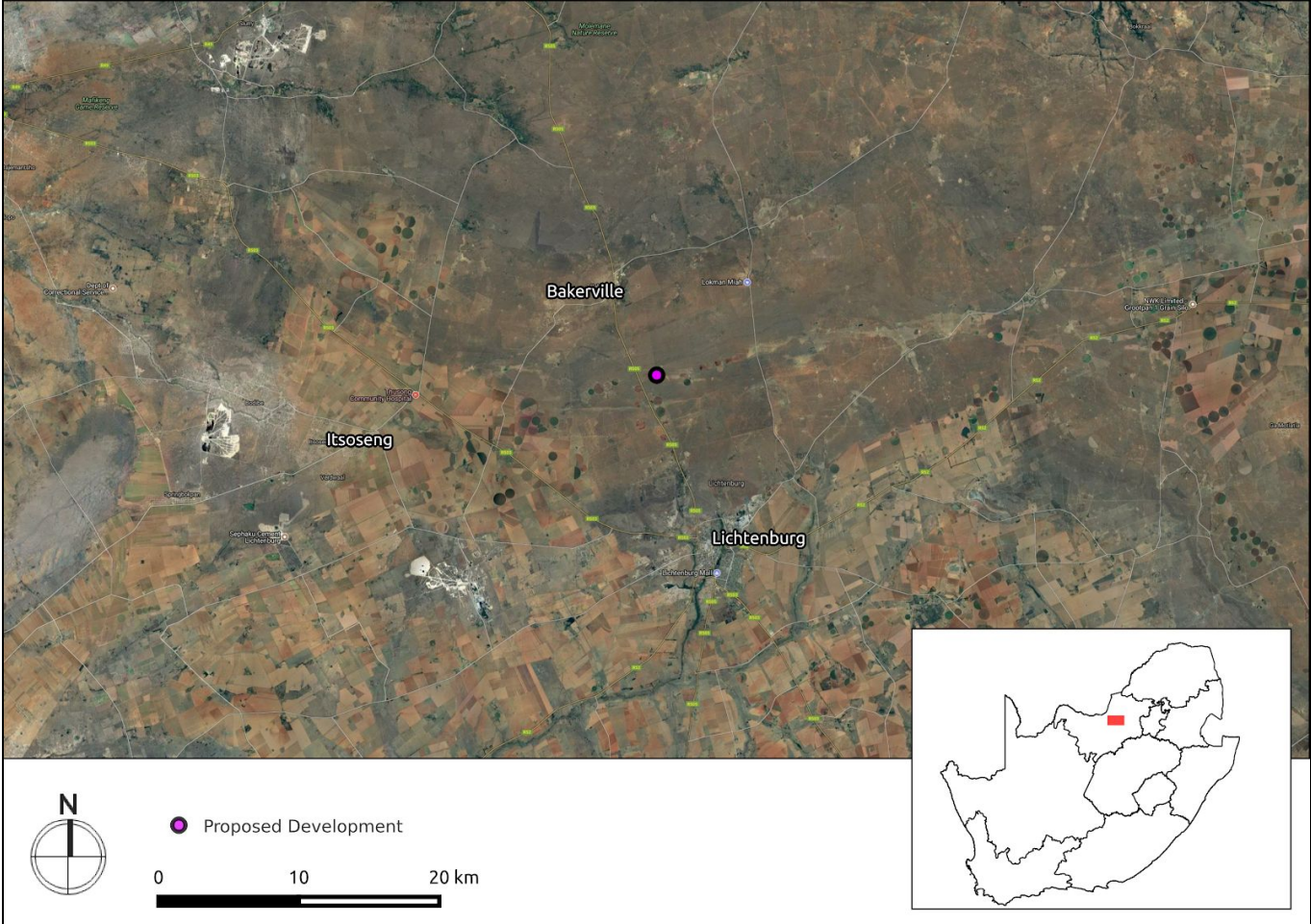
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APPENDIX 3: Heritage Screening Assessment



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HERITAGE SCREENER

CTS Reference Number:	CTS18_104	 <p data-bbox="801 1251 2024 1283">Figure 1a. Satellite map indicating the location of the proposed development in the North West Province</p>
SAHRIS Case ID		
Client:	Savannah Environmental	
Date:	1 June 2018	
Title:	Development of the Lichtenburg 3 PV Solar Energy Facility and associated infrastructure on a site near Lichtenburg, North West Province.	
Recommendation by CTS Heritage Specialists:	<p>RECOMMENDATION: Based on the available information for the proposed development area, it is likely that the proposed development will impact in significant heritage resources in the form of archaeology and palaeontology. As such, it is recommended that a full HIA that satisfies section 38(3) of the NHRA be conducted that assesses impacts to archaeological and palaeontological heritage including a field assessment.</p>	



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1. Proposed Development Summary

ABO Wind Lichtenburg 3 PV (Pty) Ltd propose the development of the Lichtenburg 3 PV Solar Energy Facility on Portion 02 of the Farm Zamenkomst No 04. The proposed solar facility is planned to be bid into the Department of Energy's (DoE's) Renewable Energy (RE) Independent Power Producer (IPP) Procurement Programme (REIPPPP) with the aim of evacuating the generated power into the Eskom national electricity grid and aiding in the diversification and stabilisation of the country's electricity supply. The project site is located approximately 10km north of Lichtenburg and 7km south-west of Bakerville in Ward 16 of the Ditsobotla Local Municipality, of Ngaka Modiri Molema District, North West Province. The area under investigation is approximately 429ha in extent and comprises 1 agricultural property. The project site can be accessed via unsurfaced farm roads, which can be accessed via the R505 regional road.

2. Application References

Name of relevant heritage authority(s)	South African Heritage Resources Agency
Name of decision making authority(s)	DEDECT

3. Property Information

Latitude / Longitude	-26.046555693239245, 26.15479993505096
Erf number / Farm number	Portion 02 of Farm Zamenkomst No 04
Local Municipality	Ditsobotla Local Municipality
District Municipality	Ngaka Modiri Molema District
Previous Magisterial District	Lichtenburg
Province	North West Province
Current Use	Agriculture
Current Zoning	Agriculture
Total Extent	4385km sq.

4. Nature of the Proposed Development

Total Surface Area	429ha
Depth of excavation (m)	Approximately 3m
Height of development (m)	Approximately 3m
Expected years of operation before decommission	NA

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5. Category of Development

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.	X
2. Construction of a bridge or similar structure exceeding 50m in length.	
3. Any development or activity that will change the character of a site-	
a) exceeding 5 000m ² in extent	X
b) involving three or more existing erven or subdivisions thereof	
c) involving three or more erven or divisions thereof which have been consolidated within the past five years	
4. Rezoning of a site exceeding 10 000m ²	
5. Other (state):	

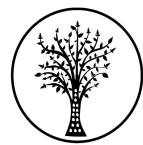
6. Additional Infrastructure Required for this Development

Arrays of PV panels (either static or tracking PV systems) with a generation capacity of up to 75MW.
Mounting structures to support the PV panels.
On-site inverters to convert the power from Direct Current (DC) to Alternating Current (AC) and a substation to facilitate the connection between the solar energy facility and the Eskom electricity grid.
A new 132kV power line between the on-site substation and the Eskom grid connection point. Two options are currently being considered for grid connection:
- Connecting the facility to the existing Watershed Main Transmission Substation (MTS) (this is the preferred option).
- Connecting the facility (i.e. loop-in-loop-out) to one of the power lines which traverses the property in a north-south direction (this is dependent on line capacity).
Cabling between the project components (to be laid underground where practical).
Offices and workshop areas for maintenance and storage.
Temporary laydown areas.
Internal access roads and fencing around the development area.

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

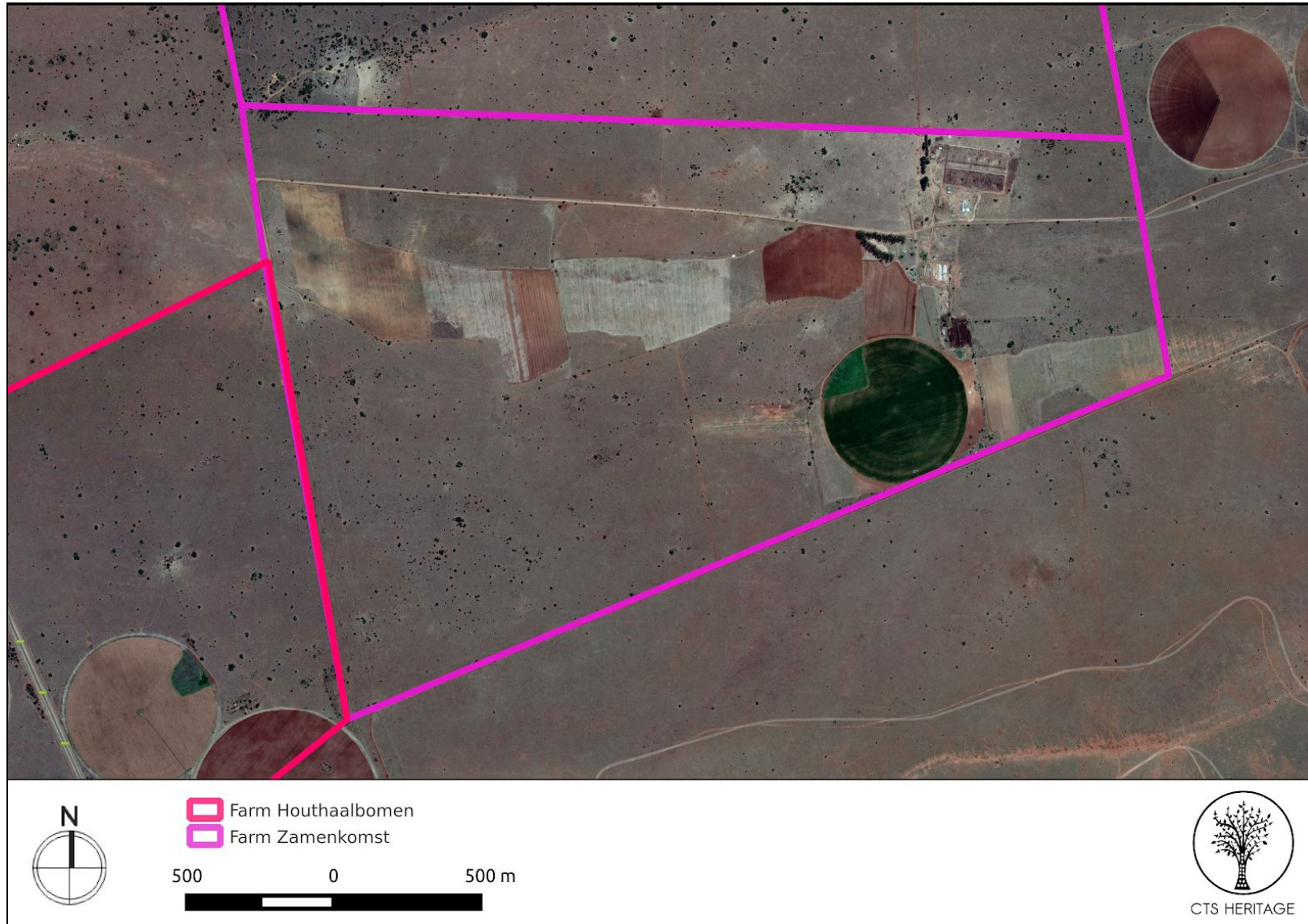
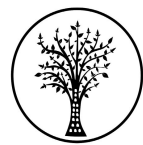


Figure 1b. Close up Map. Close up satellite image (2017) indicating the proposed development area.



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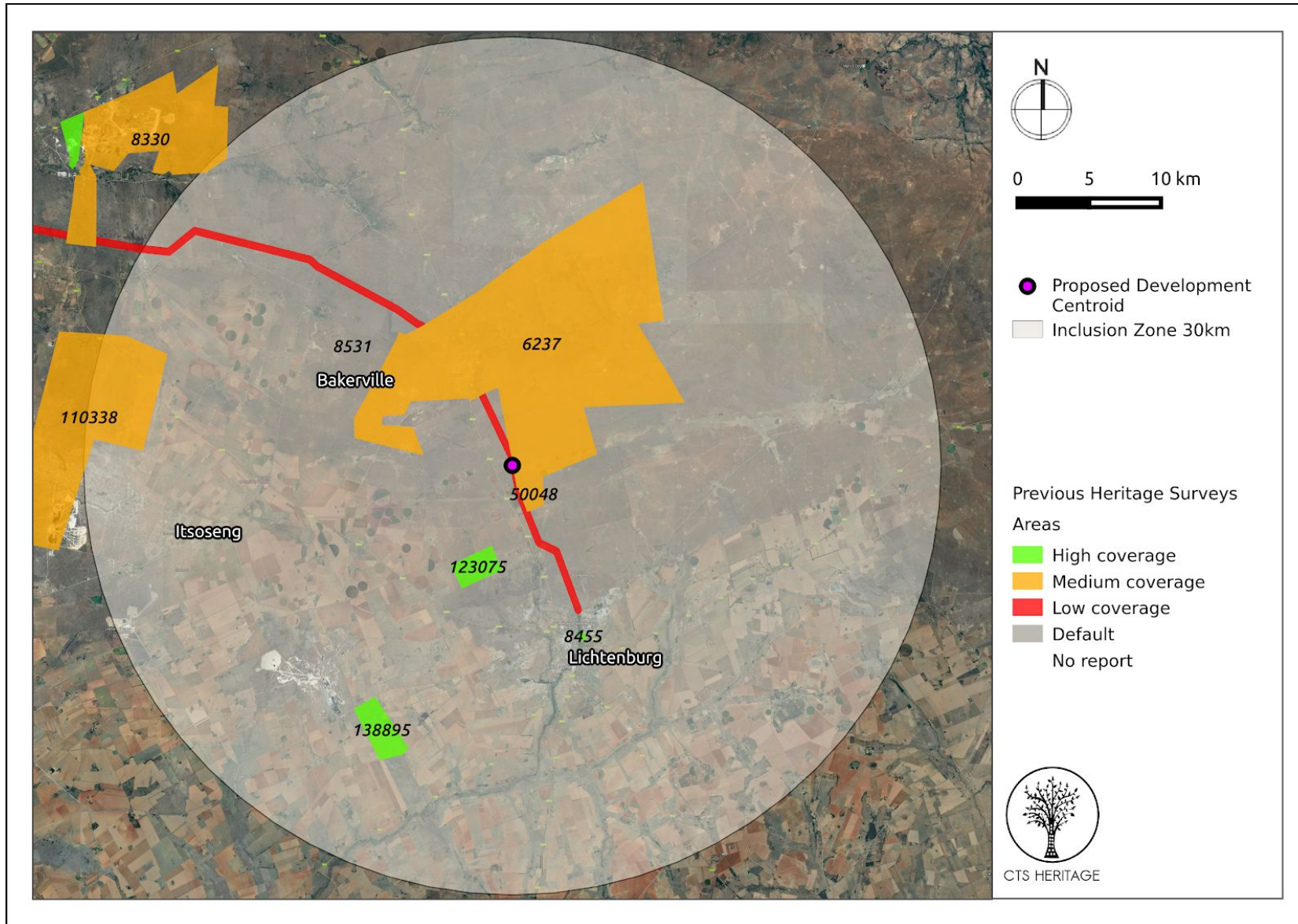
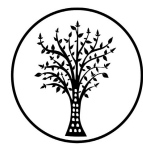


Figure 2. Heritage Reports map. Previous Heritage Impact Assessments surrounding the proposed development area within 30kms, with SAHRIS NIDs indicated (please see Appendix 2 for full reference list).



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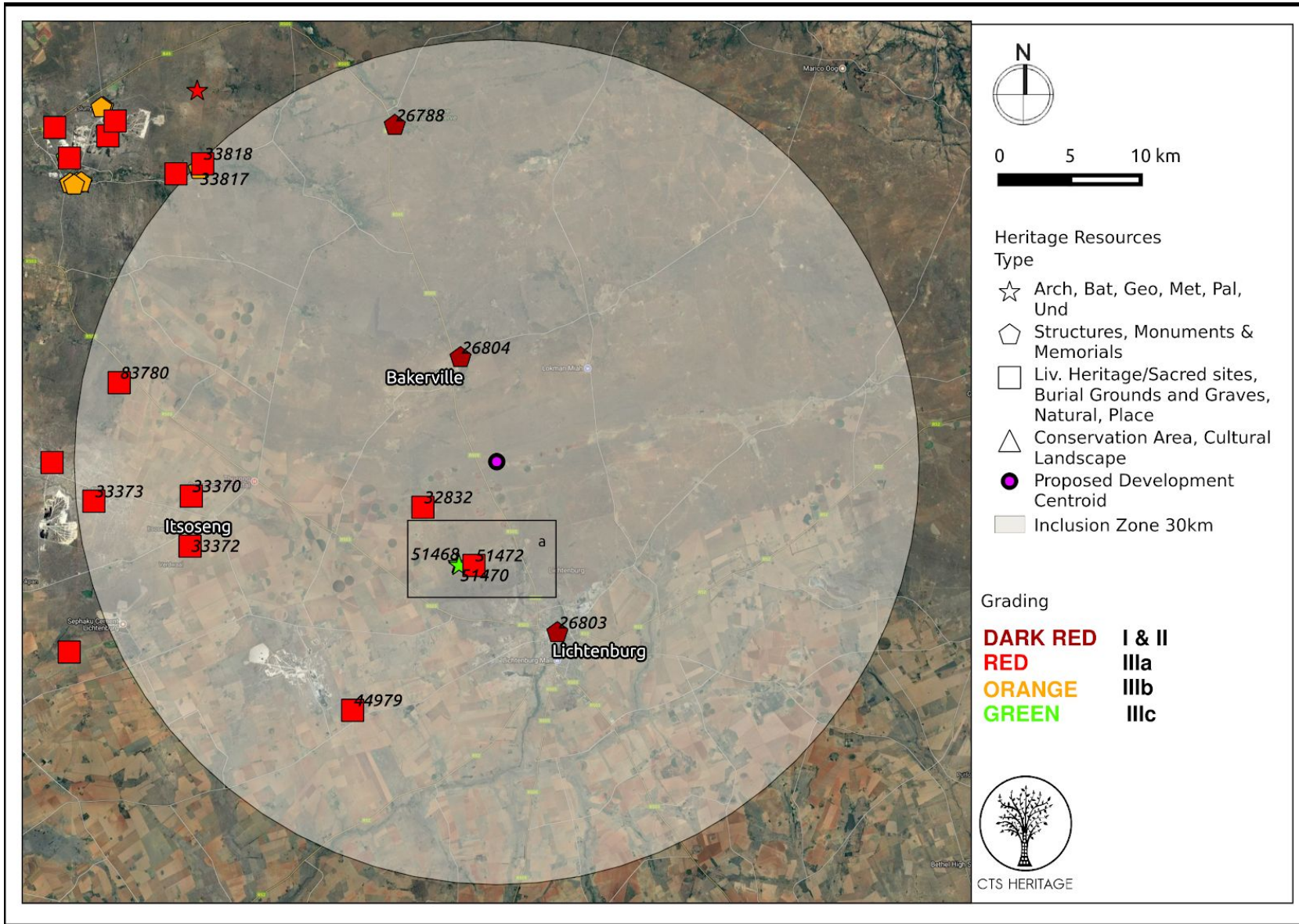


Figure 3. Heritage Resources Map. Heritage resources previously identified in and near the study area, with SAHRIS Site IDs indicated (see Figure 3a for insets). See Appendix 4 for full description of heritage resource types.

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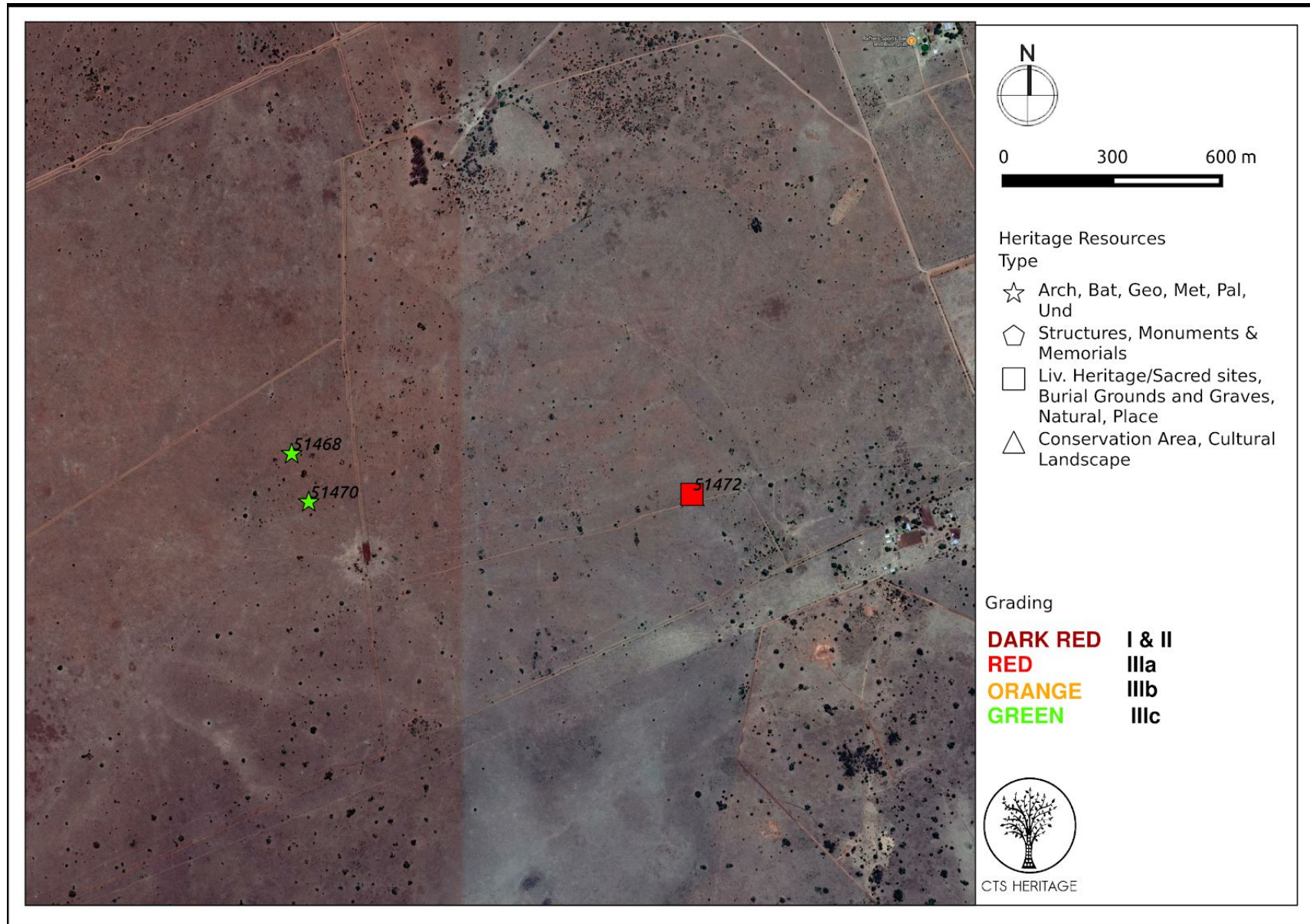
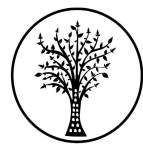


Figure 3a. Heritage Resources Map. Inset Map.

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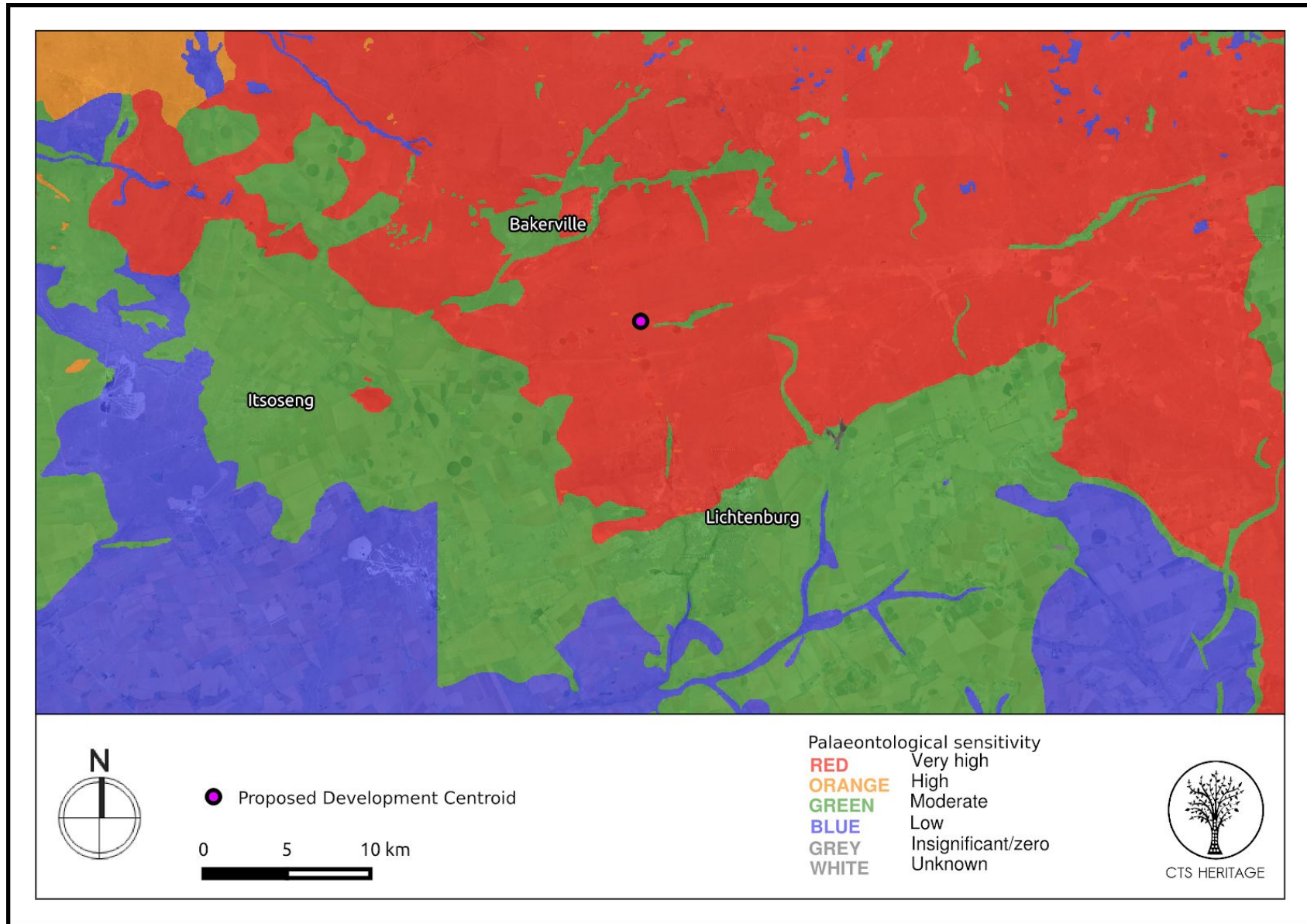


Figure 4. Palaeosensitivity Map, indicating very high fossil sensitivity underlying the study area.

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8. Heritage statement and character of the area

INTRODUCTION

ABO Wind Lichtenburg 3 PV (Pty) Ltd propose the development of the Lichtenburg 3 PV Solar Energy Facility on Portion 02 of the Farm Zamenkomst No 04. The proposed solar facility is planned to be bid into the Department of Energy's (DoE's) Renewable Energy (RE) Independent Power Producer (IPP) Procurement Programme (REIPPPP) with the aim of evacuating the generated power into the Eskom national electricity grid and aiding in the diversification and stabilisation of the country's electricity supply. The project site is located approximately 10km north of Lichtenburg and 7km south-west of Bakerville in Ward 16 of the Ditsobotla Local Municipality, of Ngaka Modiri Molema District, North West Province. The area under investigation is approximately 429ha in extent and comprises 1 agricultural property. The project site can be accessed via unsurfaced farm roads, which can be accessed via the R505 regional road.

Photovoltaic (PV) technology is proposed for the generation of electricity. The solar energy facility will have a contracted capacity of up to 75MW, and will make use of either Fixed-tilt, Single-Axis Tracking, or Double-Axis Tracking PV technology. This site is one of three proposed to be part of the Lichtenburg Solar Energy Project. The PV structures / modules will occupy an area approximately 200ha in extent, while supporting infrastructure such as internal access roads (18ha), auxiliary buildings (1ha), and an onsite substation (1ha) will occupy the remaining extent. During construction a temporary laydown area approximately 5ha in extent will be required. The project will comprise approximately 300 000 solar panels which once installed will stand 3.5m above ground level. The solar panels will have a maximum of approximately 60 centralised inverter stations at a height of approximately 3m, and approximately 840 string inverters mounted at a minimum height of approximately 300mm above ground.

Centralised Inverters: Mega Volt (MV) distribution transformers will be located internal to centralised inverter stations at a height of approximately 3m. String Inverters will be equipped with approximately 14MV transformers of approximately 5.4 Mega Volt Amp (MVA) containerised with switchgear and at a height of approximately 3m. The main transformer capacity varies according to detailed design and client requirement, however it is anticipated that 1 x 80MVA transformation capacity to be typical, and generally stepping up from 22kV or 33kV to 132kV for evacuation into the Eskom electricity grid.

A 132kV on-site substation is required, and will occupy an area approximately 100m x 100m in extent. In addition, on-site power lines approximately 6km in length with a capacity of 132kV will be constructed. The on-site power lines will be constructed within a power line corridor 300m in width (i.e. 150m on either side of the centreline). A single power line is required to connect the solar energy facility to Eskom's national electricity grid. The power line will have a capacity of 132kV, be approximately 24m in height, will be developed in a power line servitude of 31m – 36m in width (i.e. 15.5m – 18m either side of centre line), and will make use of monopole or lattice tower structures.

HERITAGE RESOURCES

Lichtenburg town was established in 1873 and named "Town of Light". General Del la Rey was buried in Lichtenburg after a fatal shooting incident at Langlaagte. During the 1800's, more and more farmers settled in the area. During the Second Boer War, the strategically important town of Lichtenburg was occupied by both Boer and Briton for short spells. In November 1900, a large British force under Col. Robert Baden-Powell was transferred to Lichtenburg and secured the town, and much of the territory with it. In addition, the town is known from Rudyard Kipling's poem, Lichtenberg, which relays the story of a foreign combatant in the second South African War. In 1926, Lichtenburg experienced a gold rush that lasted approximately 10 years. Lichtenburg district is now mostly a farming area, combining cattle and crop-farming and large areas of former diamond mine diggings are now used as grazing.

According to van Schalkwyk et al (1995, SAHRIS NID 6237) in their report completed for the Bakerville Diamond Fields, "land use in the area goes back to the Early Stone Age, as can be determined by the number of stone artifacts found near the old mining commissioners office. This material seems to be disturbed from its primary context because of the mining activities. It is postulated that similar occurrences will be found in other parts of the diggings, but that this material would have been disturbed out of context." As a result of the

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dominant land use in the area, many of the heritage resources identified by van Schalkwyk et al (1995) are associated with past and present agriculture consist of farming implements (many of them found together with discarded mining equipment), a few windmills, and dipping-troughs. One such trough, located at Elandsputte on the farm Uitgevonden 355JP, was the site where the first diamond was discovered. This structure is a proclaimed national monument (now Provincial Heritage Site).

Van Schalkwyk et al (1995) identified a number of burial grounds within their surveyed area (Figure 2 and 3). As per Appendix 1, heritage resources known from this area include burial grounds and graves, archaeological artefacts and old structures, often associated with farming activities or diamond mining. It is likely that the proposed development will impact on such heritage resources.

The proposed development is located on geological deposits belonging to the Monte Christo Formation of the Chuniespoort Group. These deposits have a very high sensitivity for impacts to palaeontological resources (Figure 4). The Chuniespoort Group is known to contain a Range of shallow marine to intertidal stromatolites (domes, columns *etc*) and organic-walled microfossils. In addition, it is within this geological group that fossiliferous Late Cenozoic cave breccias have been identified. Good examples of stromatolites from this Group have been identified within the Cradle of Humankind region. It is possible that the proposed development will impact significant palaeontological heritage resources.

RECOMMENDATION

Based on the available information for the proposed development area, it is likely that the proposed development will impact in significant heritage resources in the form of archaeology and palaeontology. As such, it is recommended that a full HIA that satisfies section 38(3) of the NHRA be conducted that assesses impacts to archaeological and palaeontological heritage including a field assessment.

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APPENDIX 1

List of heritage resources within the 30km Inclusion Zone

Site ID	Site no	Full Site Name	Site Type	Grading	Declaration
26804	9/2/235/0008	Historic cattle dip, Elandsputte, Lichtenburg District	Building	Grade II	Provincial Heritage Site
26803	9/2/235/0005	Nerderduitse Gereformeerde Church, 27 Gerrit Maritz Street, Lichtenburg	Building	Grade II	Provincial Heritage Site
26788	9/2/238/0015	Water mill, Malmani Eye, Marico District	Building	Grade II	Provincial Heritage Site
33370	GY01	Mafikeng Cement 1	Burial Grounds & Graves	Grade IIIa	
33372	GY02	Mafikeng Cement 2	Burial Grounds & Graves	Grade IIIa	
33817	ZPPCS4	Zeerust 4	Building		
33818	ZPPCS5	Zeerust 5	Burial Grounds & Graves	Grade IIIa	
32832	AEPC 3	Steenkoolspruit farm, Ogies Emalahleni Mpumalanga Province	Burial Grounds & Graves	Grade IIIa	
51468	WSF 01	Watershed Solar Facility 01	Artefacts	Grade IIIc	
51470	WSF 02	Watershed Solar Facility 02	Artefacts	Grade IIIc	
51472	WSF 03	Watershed Solar Facility 03	Burial Grounds & Graves	Grade IIIa	
44979	HIB01	Hibernia 01	Burial Grounds & Graves	Grade IIIa	
33373	GY03	Mafikeng Cement 3	Burial Grounds & Graves	Grade IIIa	
83780	MALA015	eMalahleni 015	Burial Grounds & Graves	Grade IIIa	

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APPENDIX 2

Reference List within 30km Inclusion Zone

Heritage Impact Assessments				
Nid	Report Type	Author/s	Date	Title
6237	AIA	Johnny Van Schalkwyk, Robert de Jong, S Smith	01/08/1995	Reconnaissance of Remaining Cultural Resources in the Bakerville Diamond Fields
8330	AIA	Francois P Coetzee	01/03/2008	Cultural Heritage Survey of the PPC Slurry Operation, near Zeerust, North West Province
8455	HIA	Udo Kusel	25/07/2008	Cultural Heritage Resources Impact Assessment of Portion 151 of Lichtenburg Town and Townlands 27 IP (Lichtenburg Extension 10) North West Province
8531	HIA	Johnny Van Schalkwyk	01/11/2008	Heritage Impact Report for the Proposed 88 kV Power Line from Watershed Substation, Lichtenburg, to the Mmabatho Substation, North West Gauteng Province
50047	HIA	M Hutten	01/05/2012	Heritage Impact Assessment for the Proposed Lichtenburg Solar Park North of Lichtenburg, North West Province
50048	PIA	Bruce Rubidge	14/07/2012	Palaeontological Assessment - Lichtenburg Solar Park
110338	HIA	Julius CC Pistorius	01/06/2011	A PHASE I HERITAGE IMPACT ASSESSMENT (HIA) STUDY FOR THE PROPOSED MAFIKENG CEMENT PROJECT NEAR ITSOTSENG IN THE NORTH-WEST PROVINCE OF SOUTH AFRICA
123075	HIA	Jaco van der Walt	12/11/2013	Archaeological Impact Assessment Report
138895	AIA	Jaco van der Walt, John E Almond	14/10/2013	Archaeological Impact Assessment for the Proposed Hibernia Solar Project near the town of Lichtenburg in the North West Province of South Africa & Paleontological Report: Recommended Exemption From Further Palaeontological Studies: Proposed Hibernia Pv S

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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
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
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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Methodology

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

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

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

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

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

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

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

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

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

DETERMINATION OF THE PALAEOLOGICAL SENSITIVITY

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

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

DETERMINATION OF THE COVERAGE RATING ASCRIBED TO A REPORT POLYGON

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

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Low coverage will be used for:

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

Medium coverage will be used for

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

High coverage will be used for

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

RECOMMENDATION GUIDE

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

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

This recommendation is made when:

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

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

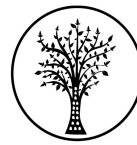
This recommendation is made in instances in which there are already some studies undertaken in the area and/or in the adjacent area for the proposed development. Further studies in a limited HIA may include:

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

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

Note:

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

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APPENDIX 4: Specialist CVs and Declaration of Independence

CURRICULUM VITAE

Jenna Lavin

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E-mail address: jenna.lavin@gmail.com

ID number: 8512050014089

Address: 7 Carey Street, Woodstock, cape Town

EDUCATION:

Tertiary

- 2014 M.Phil in Conservation of the Built Environment (University of Cape Town)
- Not completed as of 2017
- 2011 Continued Professional Development Course in Urban Conservation
Management (University of Cape Town) Part I and Part II
- 2010 M.Sc. with Distinction in Archaeology (University of Cape Town)
Title: *Palaeoecology of the KBS member of the Koobi Fora Formation: Implications for
Pleistocene Hominin Behaviour.*
- 2007 B.Sc. Honours in Archaeology (University of Cape Town)
Title: *The Lost Tribes of the Peninsula: An Investigation into the historical distribution of
Chacma baboons (*Papio ursinus*) at the Cape Peninsula, South Africa.*
Koobi Fora Field School, Rutgers University (U.S.A.)/ National Museums of Kenya
- 2006 B.Sc. Archaeology (University of Cape Town)
B.Sc. Environmental and Geographic Science (University of Cape Town)

Secondary

- 1999-2003 Rustenburg High School for Girls
Firsts in English, Afrikaans, Mathematics HG, Biology HG, History HG, Entrepreneurship.

EMPLOYMENT HISTORY:

PROFESSIONAL DEVELOPMENT

Environmental and Heritage Management:

- **Director: Heritage for CTS heritage and member of OpenHeritage NPC.**

July 2016 to present

I am a member of the senior management of the company. I am responsible for project management and quality control on all of our heritage-related projects. I provide specialist heritage expertise when required and assist with the drafting of management plans, impact assessments and other specialist reports. I liaise with clients, authorities and other specialists to ensure the highest quality product from CTS Heritage. I manage the budgets and financial compliance for all our projects and for the business in general. In addition, I manage a specialist team of two archaeologists. We have recently been involved in developing the online map for the National Resistance and Liberation Heritage Route with DAC.

Through OpenHeritage, I have been intimately involved with the development, and successful implementation of, of a digital heritage objects management system for the National Museum in Kenya as well as Tristan da Cunha.

- **Assistant Director for Policy, Research and Planning at Heritage Western Cape (HWC).**

August 2014 to June 2016

As a member of the management structure of HWC, I was responsible for the drafting of new heritage related policy, the grading and declaration of Provincial Heritage Sites, the development of Conservation Management Plans, facilitating the development of inventories of heritage resources through local authorities as well as managing the development of the Western Cape's Heritage Information Management System (HIMS). I was also responsible for managing the project to nominate the Modern Human Origins proposed World Heritage Site.

I performed the role of Acting Deputy Director for HWC from April to December 2015, including financial management responsibilities, problem solving and the training of new staff.

- **Heritage Officer for Palaeontology and for the Mpumalanga Province at the South African Heritage Resources Agency (SAHRA).**

January 2013 to June 2014

Responsibilities include managing palaeontological permit applications in terms of Section 35 of the NHRA and development applications in terms of Section 38 of the NHRA. Projects included the development of a National Palaeotechnic Report identifying significant palaeontological deposits throughout SA, as well as developing professional relationships between SAHRA and the Palaeontological Society of South Africa (PSSA) and the Geological Society of South Africa (GSSA). During this time, I was part of the team that developed the digitised National Palaeontological Sensitivity Map, the first of its kind in the world.

- **Heritage Officer for Archaeology, Palaeontology and Meteorites at Heritage Western Cape (HWC).**

September 2010 to December 2012

HWC is a Public Entity that forms part of the Heritage Resource Management Component of the Provincial Governments' Department of Cultural Affairs and Sport (DCAS). Projects included the declaration of Pinnacle Point and the West Coast Fossil Park as Provincial Heritage Sites (PHSs), the management of the development of the Baboon Point PHS Conservation Management Plan as well as an educational outreach program as part of the DCAS MOD Centre Project.

- **Heritage Officer for the Archaeology, Palaeontology and Meteorites Unit of the South African Heritage Resources Agency (SAHRA) as part of a three month contract.**

January 2010 to March 2010

- **Environmental Control Officer, Amathemba Environmental Management Consulting**

Part time: 2007 to 2009

Field Work Experience:

- 2008-2009 Field Assistant, Dr. D. Braun, Elandsfontein Excavation Locality, University of Cape Town (UCT)
Field Assistant, Dr. D. Braun, Koobi Fora Research Project (Kenya), Rutgers University, New Jersey
- 2006 Field Assistant, Damiana Ravasi (PhD), Zoology Department, University of Cape Town.
- 2005 Research Assistant, Dr. Becky Ackerman, Archaeology Department, University of Cape Town
- 2004 Field Assistant, Prestwich Place Excavation Locality, Archaeology Contracts Office, UCT

Teaching Positions:

- 2017 Guest Lecturer, South African Heritage Legislation, George Washington University Heritage Management Field School
- 2016 Guest Lecturer, South African Heritage Legislation, Archaeology Honours Course, University of Cape Town
- 2015 Guest Lecturer, South African Heritage Legislation, Archaeology Honours Course, University of Cape Town
- 2014 Guest Lecturer, South African Heritage Legislation, Archaeology Honours Course, University of Cape Town
- 2013 Guest Lecturer, South African Heritage Legislation, Archaeology Honours Course, University of Cape Town
- 2010 Teaching Assistant, Langebaanweg Field School, Arizona State University
- 2009 Demonstrator, Archaeology in Practice, University of Cape Town (AGE3013H)
Demonstrator, Introduction to Geography, Earth and Environmental Science, University of Cape Town (GEO1009F)
Teaching Assistant, Koobi Fora Field School (Kenya), Rutgers University, New Jersey
Lecturer, Introduction to Geography, Earth and Environmental Science: Supplementary Course, University of Cape Town (EGS1004S)
- 2008 Demonstrator, Elandsfontein Honours Field School, University of Cape Town (AGE4000W)
Demonstrator, Introduction to Geography, Earth and Environmental Science, University of Cape Town (ERT1000F)
Demonstrator, Elandsfontein Honours Field School, University of Cape Town (AGE4000W)
Teaching Assistant, Koobi Fora Field School (Kenya), Rutgers University, New Jersey

Conferences and Papers

- 2017 ASAPA, Pretoria, RSA: *“Using Heritage Data to Guide Responsible Development: Tools to ensure high quality recording of heritage sites”*
ICAHM, Bagomoyo, Tanzania: *“OpenHeritage: Development and implementation of national heritage management systems - Lessons from South Africa, Namibia and Kenya”*
- 2016 ICAHM, Salalah, Oman: *“Straight to the (Baboon) Point: A look at the Conservation of Archaeological Landscapes in South Africa using Baboon Point as a Case Study”*
- 2015 Leakey Foundation, Sonoma County, San Francisco, USA: *““Straight to the (Baboon) Point: A look at the Conservation of Archaeological Landscapes in South Africa using Baboon Point as a Case Study”*
- 2012 PSSA, Johannesburg, RSA: *“SAHRIS Palaeosensitivity Map - Methodology and Implementation”*

Other

In 2013 I was asked to join the panel of judges for the Ministerial awards for Heritage in the Western Cape. From 2013 to July 2014, I was a member of the Heritage Western Cape Archaeology, Palaeontology and Meteorites Committee and I currently sit on the Heritage Western Cape Inventories, Gradings and Interpretations Committee.

In November 2013, I was awarded a bursary from the Department of Arts and Culture to complete a Masters in Philosophy in Conservation of the Built Environment through the UCT Faculty of Engineering and the Built Environment in 2014 and 2015. I was in the process of finalising this degree in 2017, however the arrival of my son has temporarily halted my progress.

I am a paid up member of the Association for Southern African Professional Archaeologists (ASAPA), the Association of Professional Heritage Practitioners (APHP) and I have been a member of the Executive Council of APHP since 2014.

In June 2017, I was selected as Chair of APHP. I am a member of the Palaeontological Society of South Africa (PSSA) and ICOMOS South Africa, for which I am Vice-President of the Board. I am also a member of the International Committee for Archaeological Heritage Management (ICAHM), a committee of UNESCO.

I am an active participant in a not-for-profit company called OpenHeritage which is dedicated to opening access to heritage resources through digital innovation. To this end, we have been involved in a number of projects including Wikipedia Training with Africa Centre, the development and implementation of a Collections Management System for the National Museums of Kenya and the development of a digital Inventory of the Vernacular Architecture of the Eastern Cape.

Referees

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Janette Deacon

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082 491 5067

Laura Robinson

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083 463 4765

Andrew Hall

waitabout191@gmail.com

(Currently based in Oman)

Wendy Black

wblack@iziko.org.za

021 481 3883

PROJECT	PROJECT DESCRIPTION	DURATION
SKA Scoping Project	Provision of Heritage Specialist Assessment Services for SKA Scoping Phase	09/2015 - 09/2016
National Liberation & Khoisan Heritage Routes	Development of online mapping interface to promote national liberation and Khoisan heritage routes	02/2017 - present
Western Cape Coastal Access Strategy	Heritage statements describing changing utilisation of Western Cape coast through time	01/2016 - 02/2017
Robben Island PV Facility	Heritage survey, Heritage Impact Assessment, monitoring, mapping, report writing	01/2016 - 02/2017
Stawelklip Rock Art Conservation Management Plan	Site documentation, stakeholder consultation, CMP compilation, development of signage	10/2015 - 01/2016
Phillipskop Rock Art Conservation Management Plan	Site documentation, stakeholder consultation, CMP compilation, development of signage	04/2016 - 08/2016
Cape Winelands Heritage Inventory	Data processing, heritage management and mapping services	08/2016 - 09/2017

CTS Heritage Impact Assessments

HIA Title	Date Completed
HIA: Brakke Kuyl Sand Mine	05/12/2016
HIA: Gouritz Abalone Farm	28/10/2016
HIA: Malmesbury Granite Quarry	28/11/2016
HIA: Expansion of Jacobsbaai Abalone Farm	26/08/2016
HIA: Mutsho Power Project near Makhado	02/02/2017
HIA: Vanrhynsdorp Prospecting	06/03/2017
HIA: Spitskop Power Lines	02/03/2007
Desktop HIA Namakwa Prospecting	21/06/2017
HIA: San Miguel Citrus	26/04/2017
HIA : Ash River Hydro	In process
HIA: 22kv Powerlines Eastern Cape	22/08/2017
HIA: Langa Telecommunications Mast	18/08/2017
HIA: Ouwerv HF Radar Wave Monitoring Antennae	In process



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CURRICULUM VITAE



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EDUCATION:

- M.Sc., Archeology - University of Cape Town (2011)
- B.Sc. (Honours), Archeology - University of Cape Town (2005)
- B.Sc., Archeology and Environmental & Geographical Sciences - University of Cape Town (2004)
- A+ and MCSE - New Horizons, Bloemfontein (1999)
- Matric (Distinction) - St Andrew's School, Bloemfontein (1997)

EMPLOYMENT HISTORY:

December 2013 - present : Cedar Tower Services (Pty) Ltd, Cape Town, South Africa

Position : Owner/Director

April 2015 – present : OpenHeritage, Cape Town, South Africa

Position : Founder

Responsibilities :



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- Director of OpenHeritage, a non-profit organisation tasked with rolling out free open source heritage management systems to developing nations

December 2013 - present : Mothers2Mothers - AgeWell Global LLC, (pilot) through Cedar Tower Services Cape Town, South Africa

March 2015 - present : IT Services Consultant to m2m

Responsibilities :

- Currently providing ongoing project support

December 2013 – December 2014 : AgeWell Global LLC Developer

Responsibilities :

- Drupal development of handheld recording system on smartphones and tablets for health data in the older persons sector

November 2011 – November 2013 : South African Heritage Resources

Agency (SAHRA) Cape Town, South Africa

Position : Project Manager & Developer: SAHRIS (The South African Heritage Resource Information System)

Responsibilities :

Design and implement South Africa's first national heritage management system. In summary this involves:

- Planning and selection of a suitable platform to develop SAHRIS
- Planning, selection, installation and setup of dedicated servers using Ubuntu Server OS
- Development of SAHRIS on the Drupal Platform
- Setup of a Geoserver to interface with Drupal
- Live Disaster Recovery Setup
- Installation and setup of mass storage devices (NAS Servers) across multiple data centres
- Setup of replication and backup
- Regular planning and assessment meetings with key stakeholders to outline future system improvements
- Training users, especially of SAHRA and the nine Provincial Heritage Resources Authorities,



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and museums

- Creation of training videos and help documentation
- Implementation of the website theme designed by an outside graphic design company
- Data Migration of Sites, Objects, Media Content, Profiles, Reports
- Designing, planning and overseeing SAHRA's Digitisation
- Promotion of SAHRIS and production of peer reviewed articles

November 2008 - June 2010 : Heritage Western Cape Position : Senior Heritage Officer:
Archaeology Responsibilities :

- Identify, protect and manage archaeological resources in the Western Cape
- Assess development applications, write policies, nominate sites for Provincial Heritage Site (grade 2) status
- Maintain and update GIS reporting database with SAHRA

Project Involvement: November 2008 – March 2009

- Designed, wrote and implemented database tracking system for applications and issuing of coded Records of Decision
- Implemented and maintained GIS system for archaeological sites, reports and provincial heritage sites
- Worked closely with SAHRA in bringing the GIS Reporting Project to its first release in November 2009
- Ran a workshop in July 2009 to allow all the practitioners in the province to see the demonstration of the database and the updated requirements of the system in terms of the minimum standards
- Involved monthly reporting and quarterly reporting to management as per government policies

December 2007 – September 2011 (and intermittently prior) : Archaeological Consultant,
Independent

IT Contractor & Research Assistant Project Involvement :

African Climate & Development Initiative (ACDI), UCT, Cape Town, 2011

- Design of database system for the ACDI audit of projects, departments, people and research units engaged in climate change related research at UCT
- Pooled various GIS data repositories to initiate discussion around the impacts of CC on the



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Cederberg Municipality and prepared the GIS groundwork for a demonstration presentation in May 2011

- Collaborated with the MAPA project to setup the structure for an online solution to hosting the UCT projects audit
- Was also involved in the Southern African Regional Universities Association (SARUA) meeting in March 2011 and presented a Google Earth mapping layer linked to the audit database to provide a possible solution to their collaboration framework. Involved in setup and maintenance of WordPress website for the ACDI and UCT steering committee for the Enterprise Content Management (ECM) project

eastern Cederberg Rock Art Group (eCRAG), Western Cape, 2008

- Archaeological surveys for rock art and other archaeological sites from Wupperthal in the north to Op die Berg in the south of the Cederberg
- Contributed to three Conservation Management Plans handed to each owner for completed properties
- Current number of sites documented: 464
- Created and managed the photographic, digital report and GIS archive

Just Fruit and Veg, Killarney Gardens (July 2008-January 2009, November 2010-February 2011) Spar Ordering System:

- Designed and implemented database system to run the Packing Sheets, Production Totals and automatic exports of the Spar Group's orders to JFV Pastel Accounting system
- The system also imports weekly price updates from their unique pricing system

JFV Pricing System:

- Overhauled an Excel based pricing system which calculated suggested selling prices based on margins and cost inputs
- The new system tracks costs and selling price changes per product and is able to export the new prices across multiple price structures directly in Pastel
- Various choices can be manipulated to derive a new selling price and the database has been coded to prevent accidental errors which cropped up in the Excel based system that relied on macros

HIMAP – Historical Mapping Project, Cape Town, June 2009 – December 2009



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- Digitally mapped the historical layers of the 18th century of Cape Town from various historical maps in a project with Dr Antonia Malan
- Combined archival data with the shape files so that various interpretative layers could easily be generated

ACO Prestwich Place, Cape Town, April 2008 – August 2008

- Design and implementation of database system for the Prestwich Place burials
- This includes a GIS mapping of the data and a 3d modelling tool for point cloud data using VRML

Iziko Museums, Cape Town, December 2007 – March 2008

- Design of interactive multimedia exhibit displayed in the rock art collection comprising a selection from the Bleek & Lloyd Archive and the Warmhoek rock art trail in Clanwilliam

Masters (& partly Honours) Project at UCT, Cape Town, 2005, 2008-2011

- Design of database system for the SARU archaeological records
- This involved the digitisation of 10 000 slides and the organisation of all the digital photographs taken since 2001
- All the site records were physically scanned and typed up, mapped on GIS and linked relationally to my system
- Archive generated over 250 gigabytes of data

Genex, Cape Town, July 2007 – October 2007

- Project managed the migration of the accounting systems from Accpac for Windows to Fincon Accounting
- Ran the Accounting department on a short term basis as caretaker before taking on another project at Ellies in Maputo, Mozambique

Millennium Foods, Killarney Gardens, June 2007 Ordering System:

- Designed and implemented networked database system to capture EDI orders from Checkers and to automate standing orders from their other customers
- The system also exports these orders directly into Pastel Accounting and runs their packing and production reports



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Ellies Electronics, Cape Town, February - May 2006

- Project managed the migration of the accounting systems from Accpac (DOS version) to Fincon Accounting
- Setup and installed Windows NT server and email server

Kardex and Tracking Systems, Bloemfontein, November 1999 - February 2000

- Designed two database systems to track stock in a multi-company environment, produce dispatch labels and to automate tripsheets

January - July 2007 : Archaeological Contractor Responsibilities :

- Contract work undertaken for the Archaeological Contracts Office at UCT & Cape Archaeological Survey.
- Cape Nature Archaeological Survey Project from July 2007 – December 2007.

January 2006 – November 2007 : Fincon Position : IT Consultant Responsibilities :

- Training, installation and Accountancy services
- Main clients: Ellies Cape Town, Ellies Maputo, IT Outlook, Genex, Toshiba Central

1998 – 2002 :

- Spent two full years as well as two short term periods working and travelling in Europe and the UK

REFERENCES:

Professor John Parkington, Supervisor at UCT 079 872 4807

Raymond Berkmann, Ellies Electronics, Cape Town 021 532 2225

Dr Janette Deacon, APM Committee, HWC, Cape Town 082 491 5067

Mamakomoreng Nkhasi EO, Corporate Affairs, SAHRA 021 462 4502

Dr Mitchell Besser, Mothers2Mothers, Cape Town 021 466 9160



APPENDIX 5: Visual Impact Assessment

(Refer to Appendix H of the Lichtenburg 3 EIA Report (2019) for the Visual Impact Assessment)