HERITAGE IMPACT ASSESSMENT

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

PROPOSED DEVELOPMENT OF THE HOUTHAALBOMEN GRID CONNECTION INFRASTRUCTURE NEAR LICHTENBURG, NORTH WEST PROVINCE

Prepared by Heritage CTS

CTS HERITAGE

For

Savannah Environmental

March 2022

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EXECUTIVE SUMMARY

The Applicant, Houthaalboomen Grid (Pty) Ltd, is proposing the development of grid connection infrastructure in order to enable the evacuation of the generated power from the three (3) onsite facility substations for the Houthaalboomen PV Cluster (i.e., Barleria PV DFFE Ref: 14/12/16/3/3/2/2107, Dicoma PV DFFE Ref: 14/12/16/3/3/2/2108, Setaria PV DFFE Ref: 14/12/16/3/3/2/2106) to the collector substation (Houthaalboomen Collector Substation) to the existing Watershed MTS. This is considered as the grid connection infrastructure for Houthaalboomen PV Cluster and includes a collector substation and a 132kV single or double-circuit power line. The grid connection infrastructure is situated within the Ditsobotla Local Municipality within the Ngaka Modiri Molema District Municipality.

The findings of the archaeology assessment largely correlate with the findings of Van der Walt (2014) and a number of additional heritage resources were identified. The stone age archaeological resources identified were all *ex situ* and are of low heritage significance. These have been graded IIIC in the tables and maps provided and no additional mitigation is recommended for these sites. They have been sufficiently recorded in this report.

A stone structure was identified within the development area. It is likely that this is a burial site (LICBUR10). This site is graded IIIA in the tables and maps provided and a no-development buffer of 10m is recommended around this site. Additionally, a possible burial was identified within the grid connection corridor by Van der Walt (2014). A further 10m no-development buffer zone must also be implemented around this site (SAHRIS Site ID . Furthermore, it is recommended that a management plan is developed to ensure the ongoing conservation of these sites for the duration of the lifespan of the development.

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 loose sands of the Quaternary. No fossils were seen during the site survey and there were no rocky outcrops at all. There is a very small chance that stromatolites of the Malmani Subgroup (Chuniespoort Group, Transvaal Supergroup) may occur below the ground surface and may be disturbed. Therefore, a Fossil Chance Find Protocol should be added to the EMPr or site management plan. If fossils are found by the developer, environmental officer or other designated person, once excavations for foundations, access and infrastructure have commenced then they should be rescued and a palaeontologist called to assess and collect a representative sample.

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.

There is no objection to the proposed development of the Barleria PV facility on heritage grounds on condition that:

- A 10m no-go and no development buffer is implemented around the potential burial sites LICBUR10 and SAHRIS Site ID 51472
- A management plan is developed for the ongoing and long-term management of the burials within the development area.
- The attached Chance Fossil Finds Procedure must be implemented for the duration of the construction phase of the project
- The mitigation measures proposed in the VIA (2021) must be implemented
- Should any buried archaeological resources or burials be uncovered during the course of development activities, work must cease in the vicinity of these finds. The South African Heritage Resources Agency (SAHRA) must be contacted immediately in order to determine an appropriate way forward.
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1. INTRODUCTION

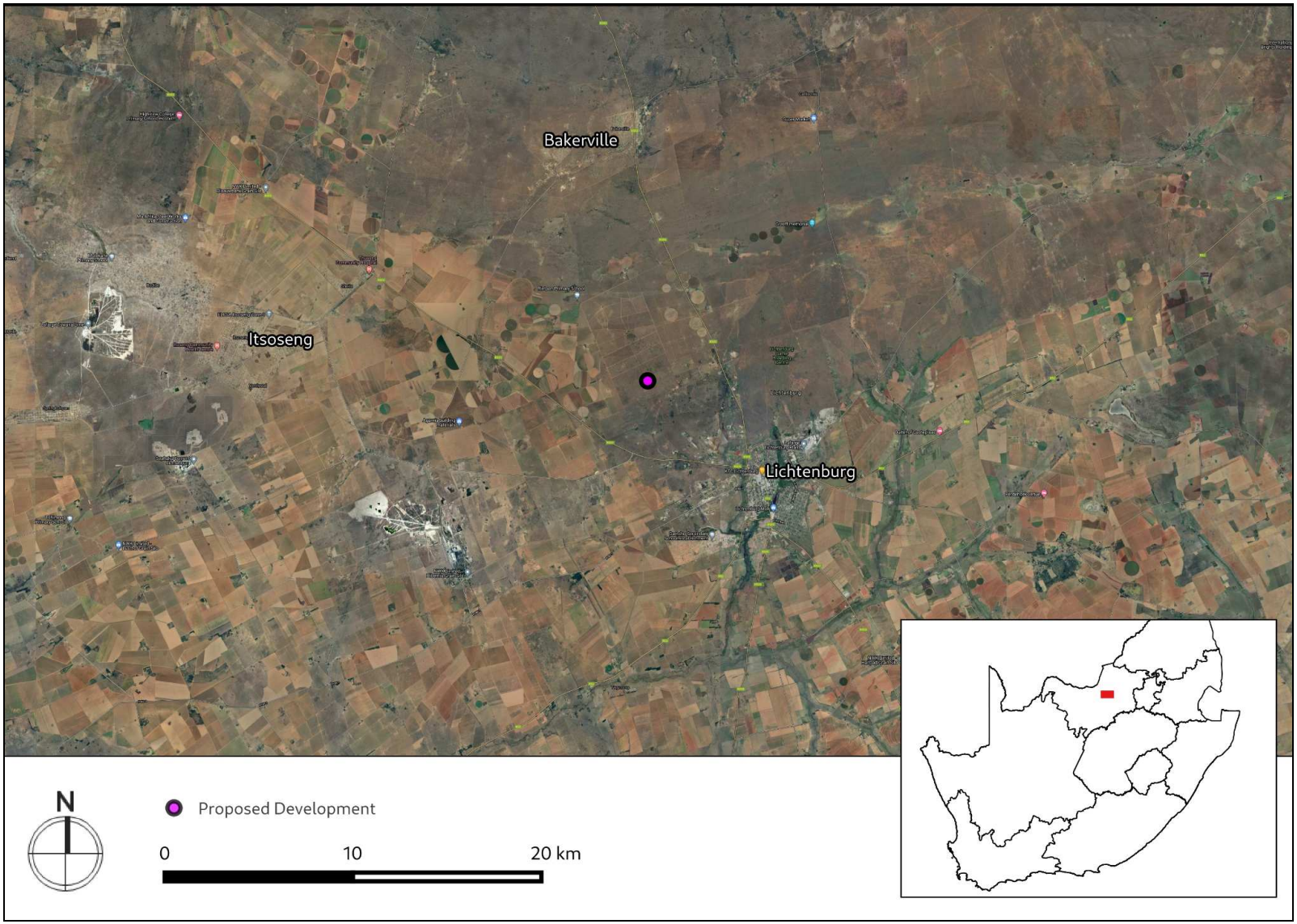
1.1 Background Information on Project

The Applicant, Houthaalboomen Grid (Pty) Ltd, is proposing the development of grid connection infrastructure in order to enable the evacuation of the generated power from the three (3) onsite facility substations for the Houthaalboomen PV Cluster (i.e., Barleria PV DFFE Ref: 14/12/16/3/3/2/2107, Dicoma PV DFFE Ref: 14/12/16/3/3/2/2108, Setaria PV DFFE Ref: 14/12/16/3/3/2/2106) to the collector substation (Houthaalboomen Collector Substation) to the existing Watershed MTS. This is considered as the grid connection infrastructure for Houthaalboomen PV Cluster and includes a collector substation and a 132kV single or double-circuit power line. The grid connection infrastructure is situated within the Ditsobotla Local Municipality within the Ngaka Modiri Molema District Municipality.

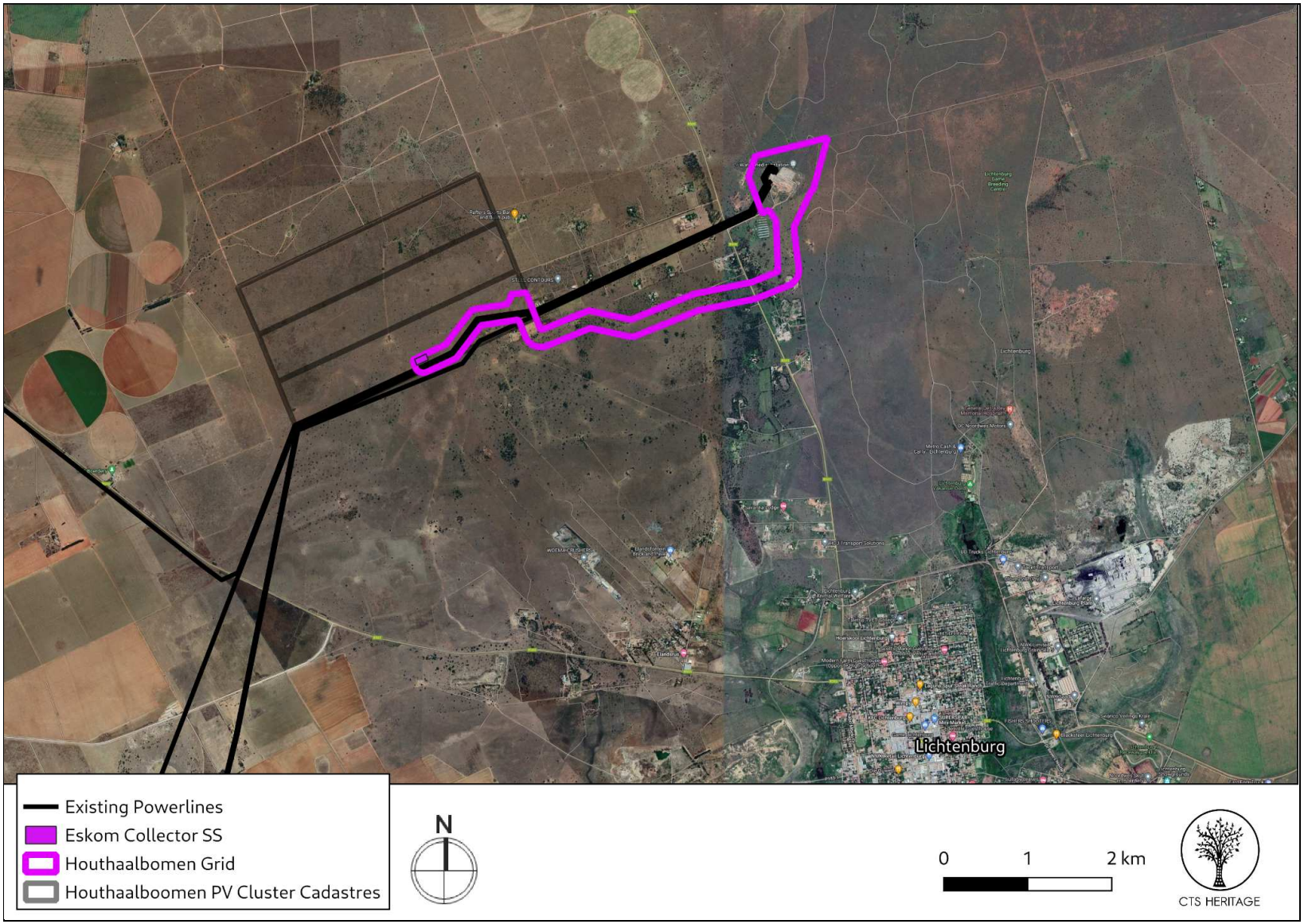
The grid connection infrastructure will be located on the following properties:

- Portion 1 of the Farm Houthaalboomen 31
- Portion 0 of Farm Talene 25
- Portion 39 of Farm Elandsfontein 34-
- Portion 93 of Farm Elandsfontein 34
- Portion 41 of Farm Elandsfontein 34
- Portion 0 of Farm Priem 30
- Portion 25 of Farm Houthaalboomen 31
- Portion 1 of Farm Lichtenburg Town and Townlands, No 27

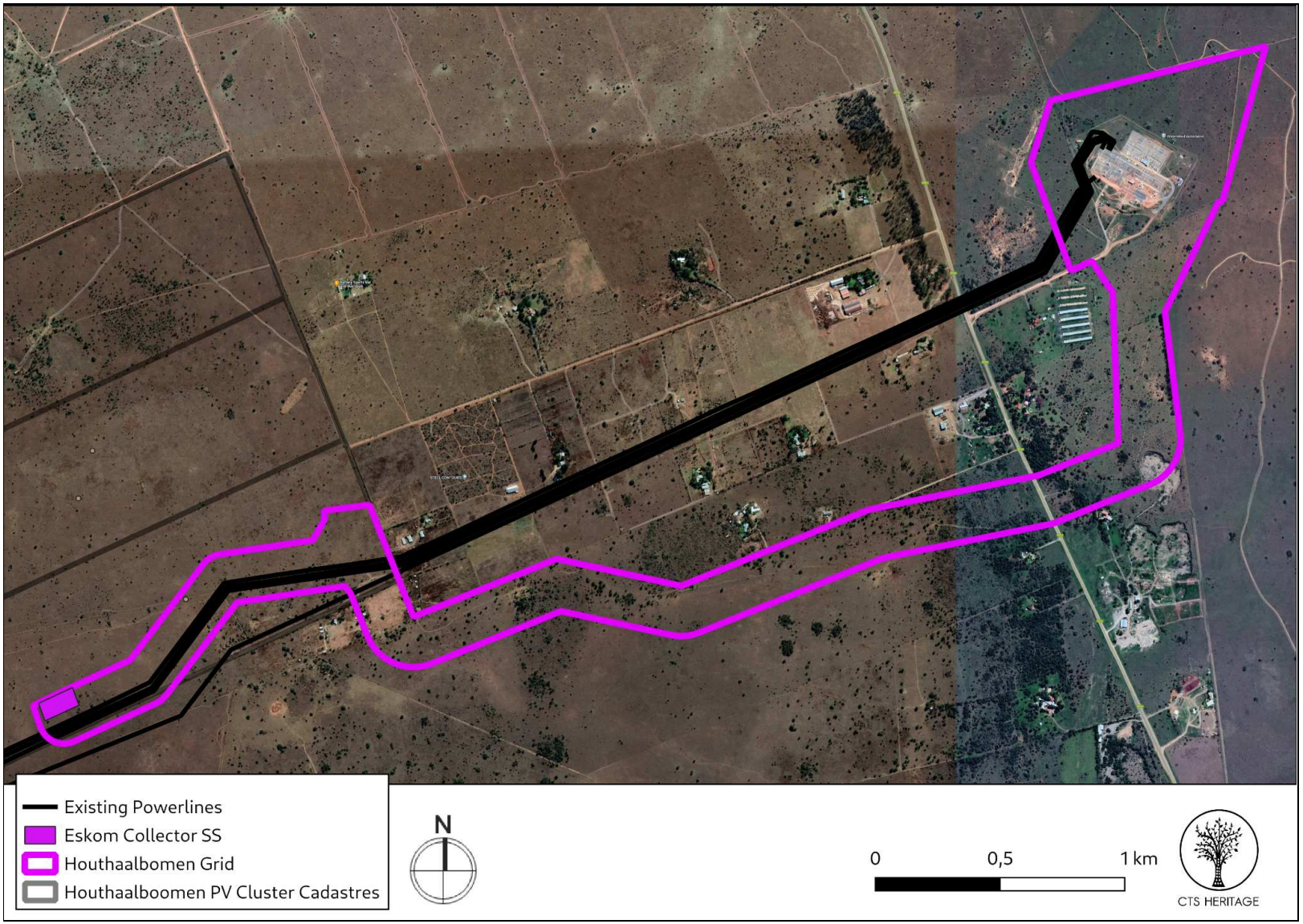
The grid connection infrastructure is located within a 6km long and 200m wide grid connection corridor



Map 1a: The proposed project area



Map 1b: The proposed development area



Map 1c: The proposed development area

1.2 Description of Property and Affected Environment

The landscape falls within the semi-arid southern African Grassland Biome, and the vegetation across the project area is characterized largely by grassland (dense in several portions) and shrubland that is evident on undulating plains with chert bedrock outcropping in multiple locations (see Mucina et al., 2006), which served as a source of raw-material for Pleistocene and Holocene occupants of the area. Nodules were also used as demarcation/protection within potential grave structures documented within the project area (see below).

The topography of the project area is generally flat, with extensive disturbance in the form of clearing for crop farming and bioturbation in the form of rodent activity in the upper 0.5-2m of sandy topsoil. Indeed, much of the area has been affected by historical farming related activities, with prominent evidence in the form of extensive mounds of chert nodules that were recently cleared from the land surface by farmers and accumulated in strategic locations within different grazing camps (Figure 5). The surface sediments are generally bioturbated sandy soils, which appear to be aeolian in terms of original deposition, with inclusions of primary nodules of chert (5-30cm in maximum diameter) deriving from the local bedrock.

The general land use in the footprint is predominantly stock farming, with evidence of smaller antelope (Bushbuck, Steenbok and Duiker) as well as bushpig in addition to burrowing rodents (molerats, hares and meerkats) within the project footprint.

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 conducted a survey of archaeological resources likely to be disturbed by the proposed development. The site visit took place on 17 July 2021.
- A palaeontologist conducted a survey of a palaeontological resources likely to be disturbed by the proposed development. The site visits took place on 21 September 2021.
- 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.

2.4 Constraints & Limitations

The following constraints and limitations were experienced:

Access was acquired to assess the eastern portion of the connection route area (Figure 5). However, when this portion was being assessed large numbers of cattle with calves were present on the property, with several bulls amongst them. When the cattle showed aggressive behaviour towards the consultants, this portion was

abandoned. This section was subsequently reviewed from the neighbouring property and from the far eastern portion which was accessible from a separate property (Figure 5: see track). The latter portion of the project area is considered to have limited to no potential for *in situ* Stone Age archaeological remains.

2.5 Savannah Impact Assessment Methodology

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

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

- The degree to which the impact can be mitigated.

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

S = (E + D + M) x P

S = Significance weighting

E = Extent

D = Duration

M = Magnitude

P = Probability

The significance weightings for each potential impact are as follows:

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

3. HISTORY AND EVOLUTION OF THE SITE AND CONTEXT

3.1 Previous Heritage Impact Assessments

The area associated with the Houthaalbomen PV Facilities to which this grid connects was thoroughly assessed for impacts to heritage resources in an Archaeological Impact Assessment conducted by Van der Walt (2014, SAHRIS NID 123075). This report is referred to below in order to determine the likely heritage sensitivity of the area proposed for the development of the grid connection.

The PV development and proposed grid connection is located within an area that has already approved PV facilities within a belt of approved renewable energy facilities. In terms of impacts to heritage resources, it is preferred that this kind of infrastructure development is concentrated in one location and is not sprawled across an otherwise culturally significant landscape. The construction of the proposed development is therefore unlikely to result in unacceptable risk or loss, nor will the proposed development result in a complete change to the sense of place of the area or result in an unacceptable increase in impact. Furthermore, Van der Walt (2014) notes that "Visual impacts to scenic routes and sense of place are not assessed to be high from a heritage perspective."

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 (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.

An archaeological field assessment was conducted for the Lichtenburg PV facilities located immediately adjacent to this proposed development (CTS Heritage, 2018). The field assessment noted that the area assessed had been disturbed and transformed by agricultural activities in a similar way to the area proposed for this development. Pre-existing agricultural plough fields, grazing areas and farm buildings were identified in the development area. Furthermore, throughout the farming areas several heaps of rocks that were removed from the agricultural fields were identified. During the field assessment of the site *no archaeological resources, graves or burial grounds were identified* in the project area assessed in CTS Heritage's report (2018).

The exact area proposed for development was previously assessed by Van der Walt (2014, SAHRIS NID 123075). Van der Walt (2014) notes that "The site lies on a featureless flat plain. The entire development footprint was extensively utilised for crop farming and ploughing through the years resulted in a lateral and downward migration of artefacts making it virtually impossible to identify knapping or manufacture sites and site extent of artefact concentrations. In some areas borrowing animals brought MSA artefacts to the surface where the sand cover is more than a meter and a half thick and the possibility of finding subsurface material cannot be excluded. Most of the Stone Age archaeology in the study area consists of low densities of scattered (and possibly mixed) MSA and LSA artefacts. These find spots are documented as "occurrences" and are of low significance but more substantial and higher density scatters of MSA material do occur, and were recorded as "sites"." The archaeological sites are described as "Medium density scatters of tools. Blades, flakes, cores. MSA mainly of chert." and are graded IIIC i.e. low local significance. Van der Walt (2014) also identified a single unmarked grave (approximately 27 years old) and farm labour housing dating to the 1990's. He further notes that "Cultural landscape elements were noted in the northern portion of the study area consisting of the mentioned farm labourer dwelling together with a windmill, stone walled cattle kraal and a recently constructed kraal." (Van der Walt, 2014).

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 10km inclusion zone (see Heritage Screening Assessment)

Site ID	Site no	Full Site Name	Site Type	Grading
130171	2626AA/ Solar/ Farm Zamenkomst 04/ Site 1	Old farm house	Structures, Structures	Grade IIIc
128694	ZKT1	Zamenkomst 1	Building	Grade IIIc
26803	9/2/235/0005	Nederduitse Gereformeerde Church, 27 Gerrit Maritz Street, Lichtenburg	Building	Grade II
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**
128308	Grave of Vic Hamman	Grave of Vic Hamman	Burial Grounds & Graves	
138616	FHDN-001	FARM HOUTHAALDOORNS 2	Palaeontological	
138617	FHDN-002	FARM HOUTHAALDOORNS 2	Palaeontological	
138618	FHDN-003	FARM HOUTHAALDOORNS 2	Palaeontological	
138619	FHDN-004	FARM HOUTHAALDOORNS 2	Palaeontological	
138620	FHDN-005	FARM HOUTHAALDOORNS 2	Palaeontological	
138621	FHDN-006	FARM HOUTHAALDOORNS 2	Palaeontological	
138624	FHDN-009	FARM HOUTHAALDOORNS 2	Palaeontological	
138625	FHDN-010	FARM HOUTHAALDOORNS 2	Palaeontological	
138626	FHDN-011	FARM HOUTHAALDOORNS 2	Palaeontological	
138627	FHDN-012	FARM HOUTHAALDOORNS 2	Palaeontological	
138628	FHDN-013	FARM HOUTHAALDOORNS 2	Burial Grounds & Graves	Grade IIIa
137491	Gereformeerde kerk	Gereformeerde kerk Lichtenburg	Monuments & Memorials	

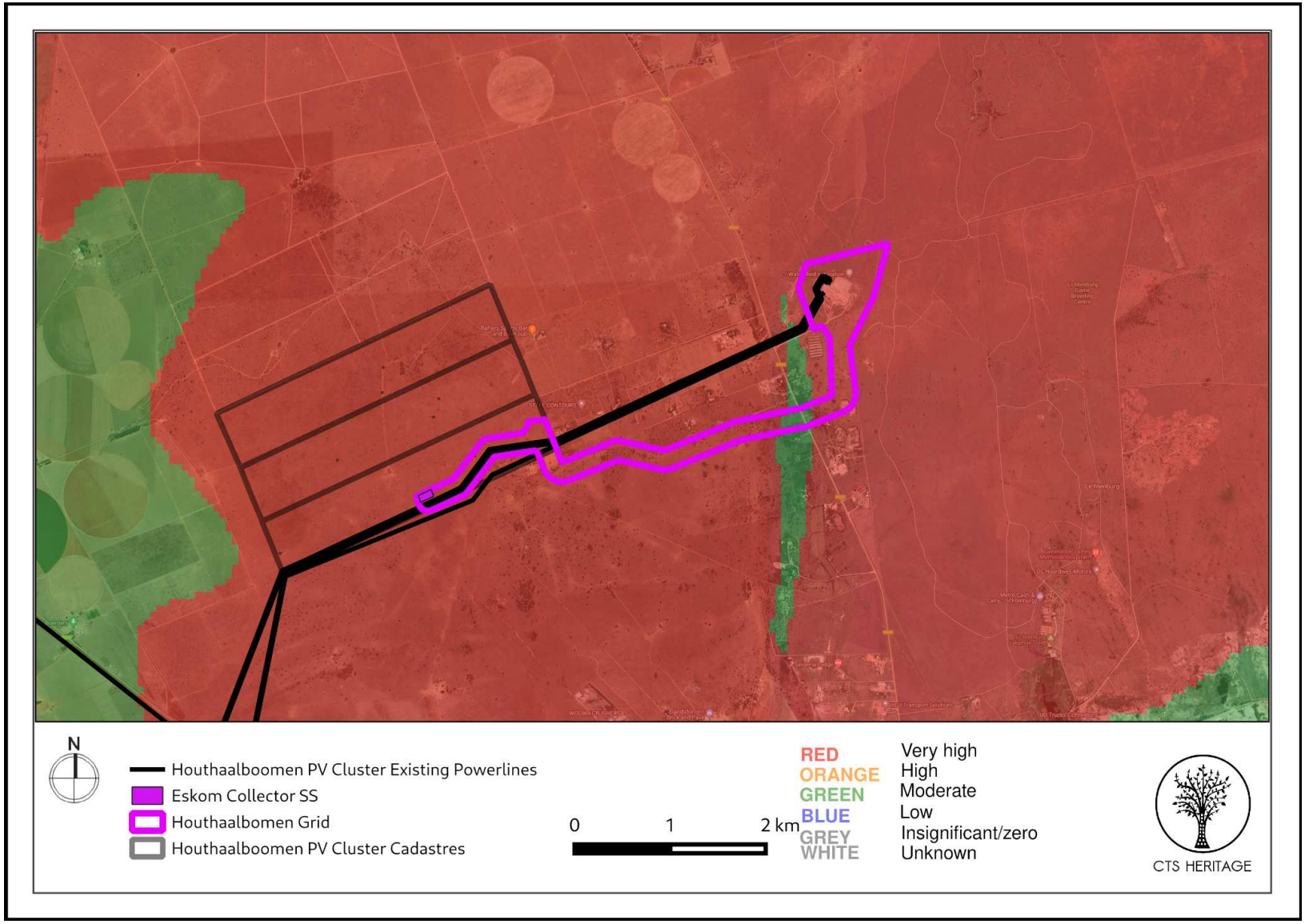
3.2 Geology and geomorphology, climate, vegetation

The Late Archaean to early Proterozoic Transvaal Supergroup is preserved in three structural basins on the Kaapvaal Craton (Eriksson et al., 2006). In South Africa are the Transvaal and Griqualand West Basins, and the Kanye Basin is in southern Botswana. The Griqualand West Basin is divided into the Ghaap Plateau sub-basin and the Prieska sub-basin. Sediments in the lower parts of the basins are very similar but they differ somewhat higher up the sequences. Several tectonic events have greatly deformed the south western portion of the Griqualand West Basin between the two sub-basins

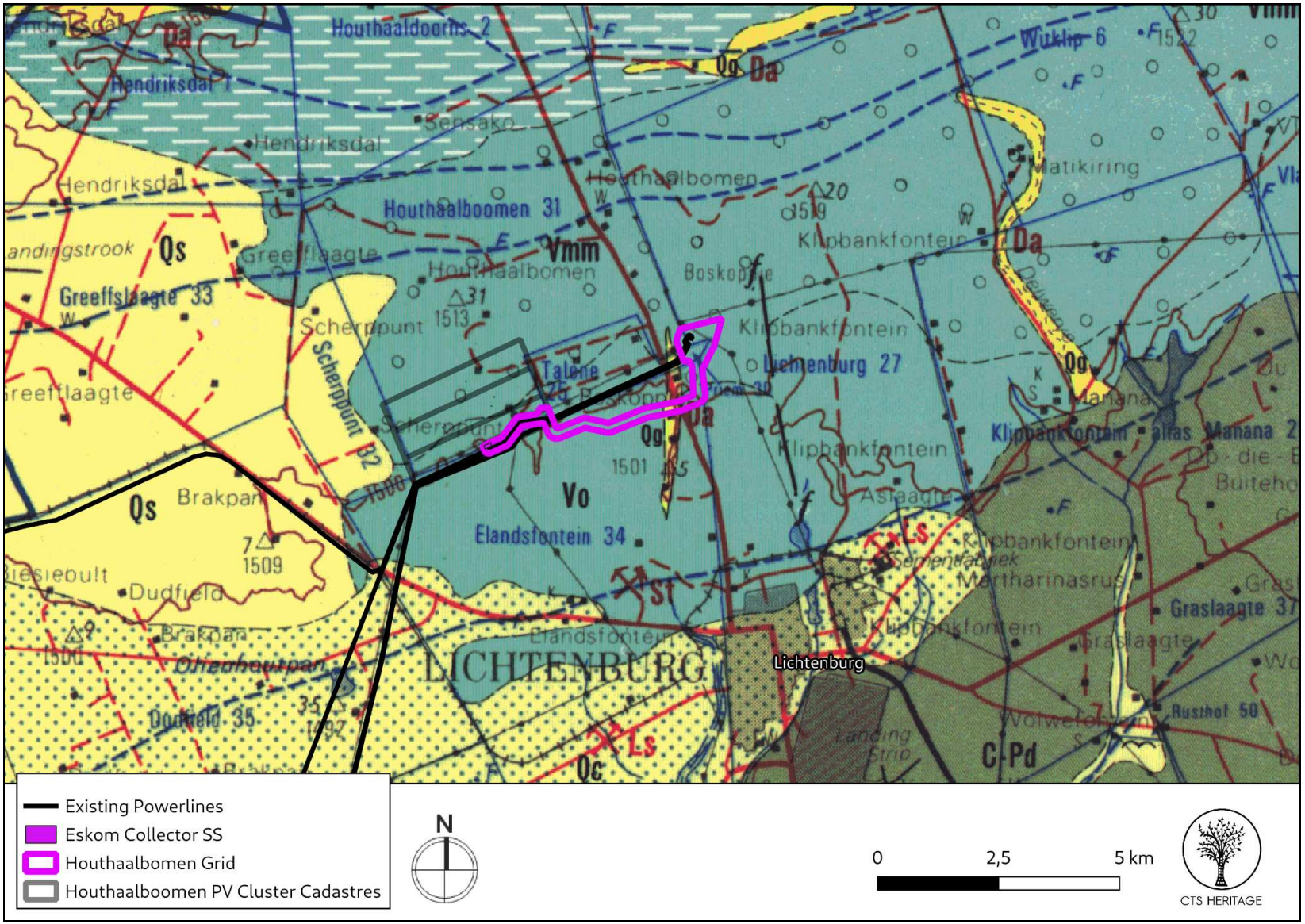
The Transvaal Supergroup comprises one of the world's earliest carbonate platform successions (Beukes, 1987; Eriksson et al., 2006; Zeh et al., 2020). In some areas there are well preserved stromatolites that are evidence of the photosynthetic activity of blue green bacteria and green algae. These microbes formed colonies in warm, shallow seas.

In the Transvaal Basin the Transvaal Supergroup is divided into two Groups, the lower Chuniespoort Group and the upper Pretoria Group (with ten formations; Eriksson et al., 2006). The Chuniespoort Group is divided into the basal Malmani Subgroup that comprises dolomites and limestones and is divided into five formations based on chert content, stromatolitic morphology, intercalated shales and erosion surfaces. The top of the Chuniespoort Group has the Penge Formation and the Duitschland Formation.

The Malmani Subgroup is up to 2000m thick and has been divided into five formations based on the composition of cherts, stromatolites, limestones and shales. At the base, overlying the Black Reef Formation, is the Oaktree Formation that represents a transition from siliciclastic sedimentation to platform carbonates (Eriksson et al., 2006). It is composed of carbonaceous shales, stromatolitic dolomites and locally developed quartzites. Next is the Monte Christo Formation that has an erosive breccia base and continues with stromatolitic and oolitic platformal dolomites. Above that is the Lyttleton Formation that is composed of shales, quartzites and stromatolitic dolomites. The overlying Eccles Formation includes a series of cherty dolomites and erosion breccias that locally contain gold deposits. This mineralisation has been attributed to hydrothermal remobilisation of fluids by the Bushveld complex (Eriksson et al., 2006). The topmost formation is the Frisco Formation that is composed mainly of stromatolitic dolomites but these become more shale rich towards the top of the sequence because of the deepening depositional environment.



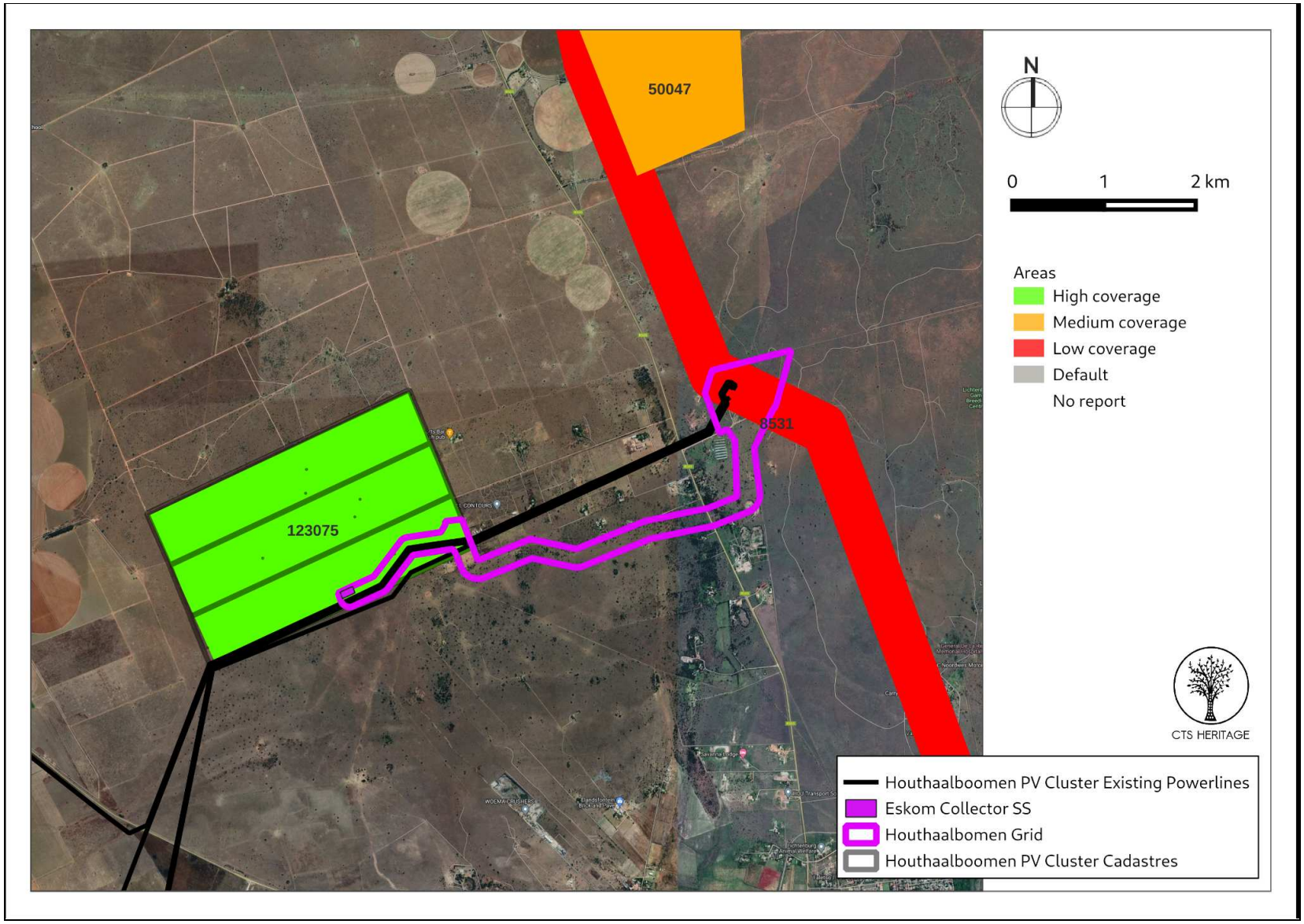
Map 2: Palaeontological sensitivity of the proposed development area



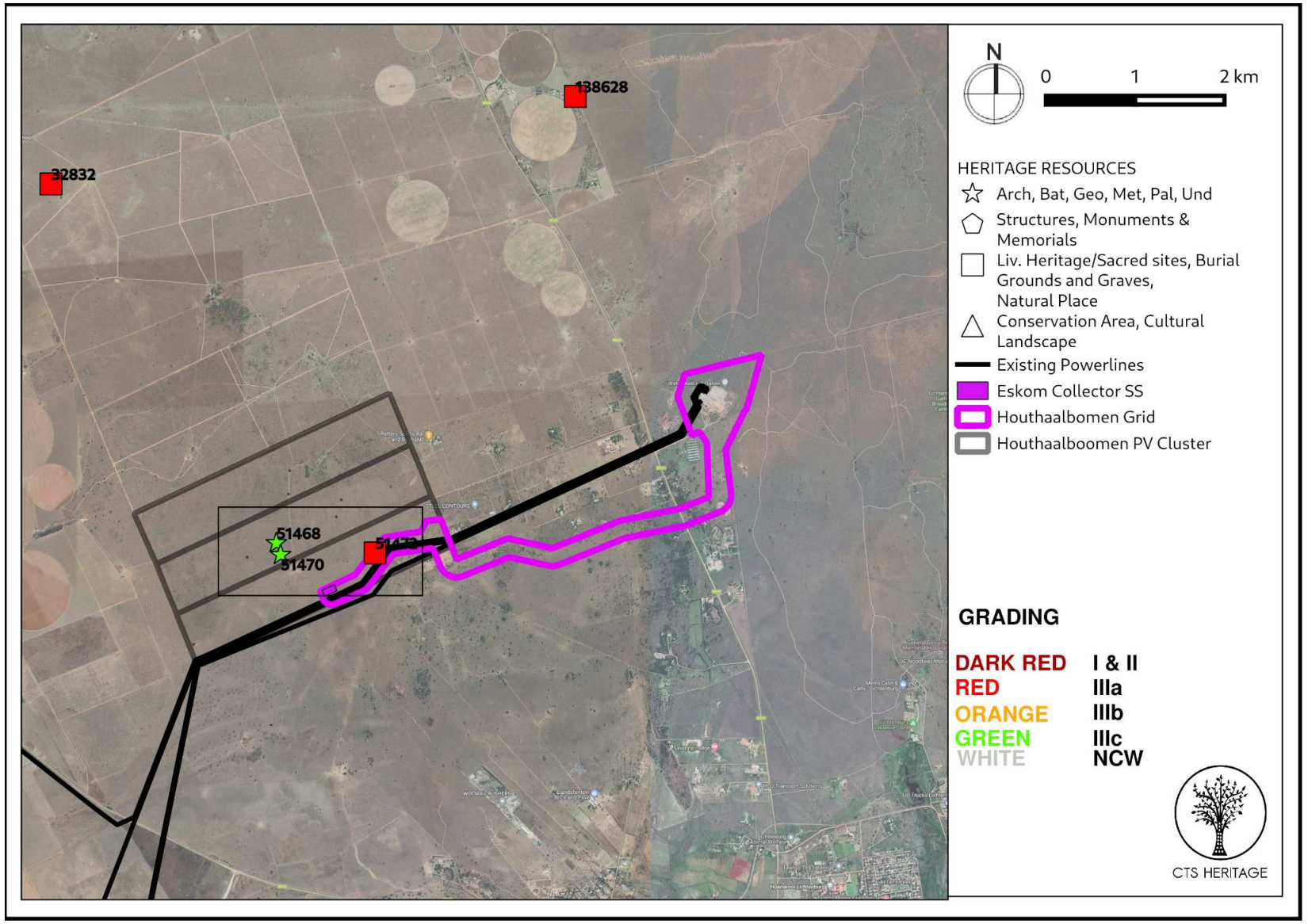
Map 3: Geology underlying the proposed project area extracted from the Council of Geoscience Map (1:250 000) 2626 West Rand

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.

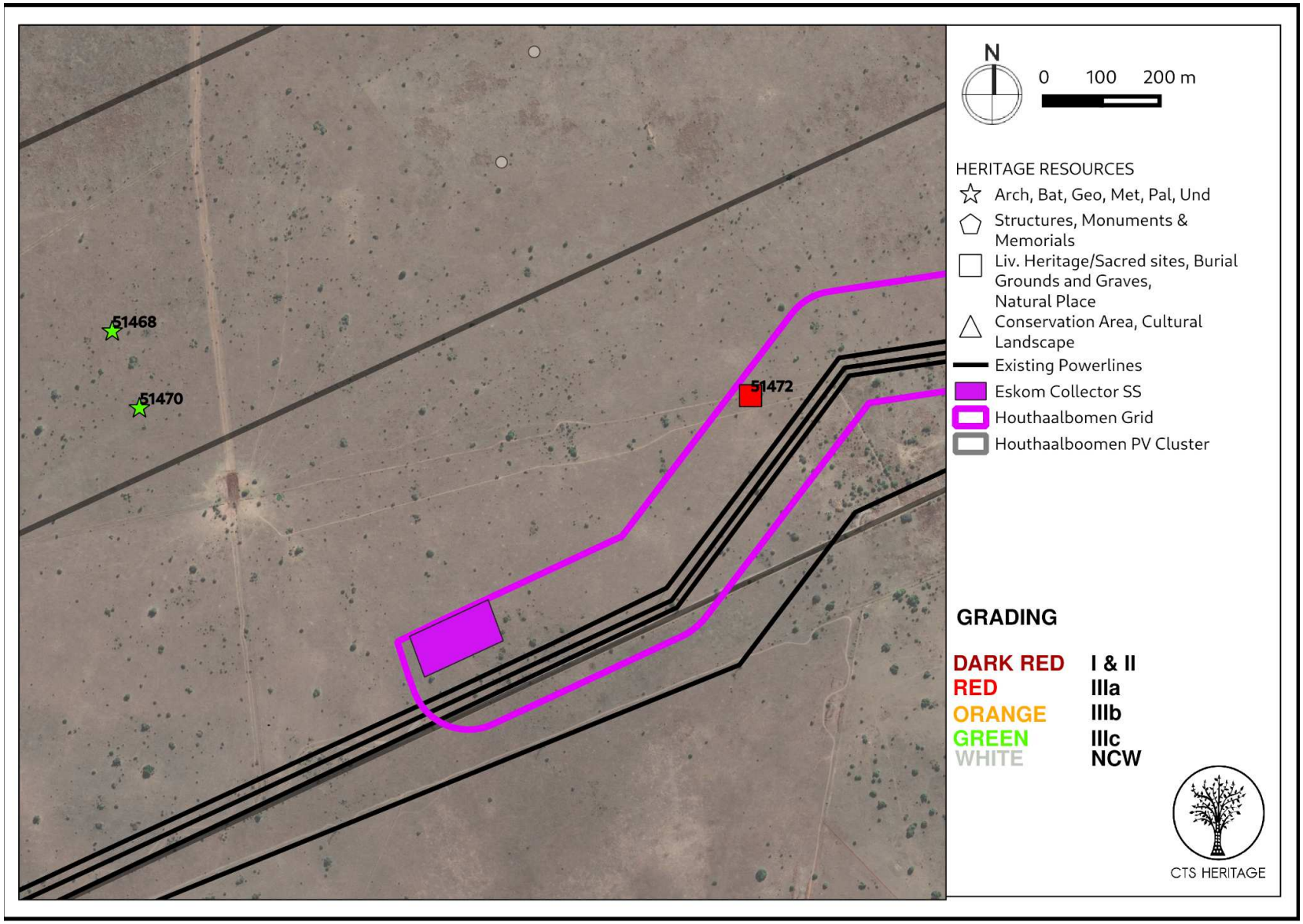
Symbol	Group/Formation	Lithology	Approximate Age
Qs	Quaternary	Alluvium, sand, calcrete	Neogene, ca 2.5 Ma to present
Qg			Neogene, ca 2.5 Ma to present
C-Pd	Dwyka Group	Diamictites, tillites, mudstones, shales,	Early Permian, Middle Ecca, ca 280-270 Ma
Vml	Littleton Fm, Malmani Subgroup, Chuniespoort Group, Transvaal SG	Dark chert-poor dolomite	Ca 2585 – 2480 Ma
Vmm	Monte Christo Fm, Malmani Subgroup, Chuniespoort Group, Transvaal SG	Chert-rich dolomite; circles = oolitic	Ca 2585 – 2480 Ma
Vmo	Oaktree Fm, Malmani Subgroup, Chuniespoort Group, Transvaal SG	Dark chert-free dolomite	Ca 2585 – 2480 Ma
Vbr	Black Reef Fm, Transvaal SG	Quartzite, conglomerate, shale	<2618 Ma



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



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



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

4. IDENTIFICATION OF HERITAGE RESOURCES

4.1 Summary of findings of Specialist Reports

Archaeology (Appendix 1)

Stone Age Archaeology

Field assessment suggests that the area was occupied or traversed intermittently by Stone Age groups potentially through periods in both the Middle Stone Age (MSA – 300ka:~40ka) and the Later Stone Age (LSA: 40ka: ~2ka), although artefacts that could be clearly linked with chrono-cultural periods were scarce, which is likely a function of the proximity to primary sources of raw-material. The abundance of high-quality chert rocks in the project area was likely the resource that attracted groups there and resulted in them leaving behavioural traces in the form of stone artefacts.

Indeed the majority of the stone artefacts identified look to be the result of expedient 'testing' of rocks for quality, and the so-called products in many of the scatters were likely transported away. In this sense no evidence of substantial densities of finds or occupational debris were identified, and the stone artefacts present are evidenced to have been produced by mobile groups moving through the area. The raw-materials exploited for stone artefact manufacture were exclusively local cherts. The presence of primary and secondary sources of chert in association with stone artefacts are suggestive of the landscape resources that probably drew Stone Age groups to the region over an extended expanse of human evolutionary history.

Stone Structures

The structures with spatial layouts of potential graves are ranked in terms of sensitivity below in Table 2. None have headstones or inscriptions, however due to their layout and orientation, it is likely that these structures represent burials.

The other structures (see table) are less typical for human graves and have a range of sizes and orientations. These structures were recorded due to their proximity to abandoned building remains and other human-made structures, and are considered to be potentially sensitive due to their spatial association to historical human occupation and activity, rather than their morphology and orientation. In terms of material form, the latter cannot definitively be identified as graves.

Palaeontology (Appendix 2)

The palaeontological sensitivity of the area under consideration is presented in Figure 3, with the Monte Christo and Oaktree Formations of the Malmani Subgroup indicated as very highly sensitive (red) because of the potential of finding trace fossils, in particular stromatolites.

Stromatolites are the trace fossils that were formed by colonies of green algae and blue-green algae (Cyanobacteria) that grew in warm, shallow marine settings. These algae were responsible for releasing oxygen via the photosynthetic process where atmospheric carbon dioxide and water, using energy from the sun, are converted into carbon chains and compounds that are the building blocks of all living organisms. The released carbon dioxide initially was taken up by the abundant reducing minerals to form oxides, e.g. iron oxide. Eventually free oxygen was released into the atmosphere and some was converted into ozone by the bombardment of cosmic rays. The ozone is critical for the filtering out of harmful ultraviolet rays.

Stromatolites are the layers upon layers of inorganic materials that were deposited during photosynthesis, namely calcium carbonate, magnesium carbonate, calcium sulphate and magnesium sulphate. These layers can be in the form of flat layers, domes or columns depending on the environment where they grew (Beukes, 1987). Some environments did not form stromatolites, just layers of limestone that later was converted to dolomite. The algae that formed the stromatolites are very rarely preserved, and they are microscopic so they can only be seen from thin sections studies under a petrographic microscope.

Visual Impacts (Appendix 5)

According to the VIA (2021) completed for this project, "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 PV facility on the regional visual quality, and by implication, on the sense of place, is difficult to quantify, but is generally expected to be of **low** significance. This is due to the relatively low viewer incidence within close proximity to the proposed development site."

4.2 Heritage Resources identified

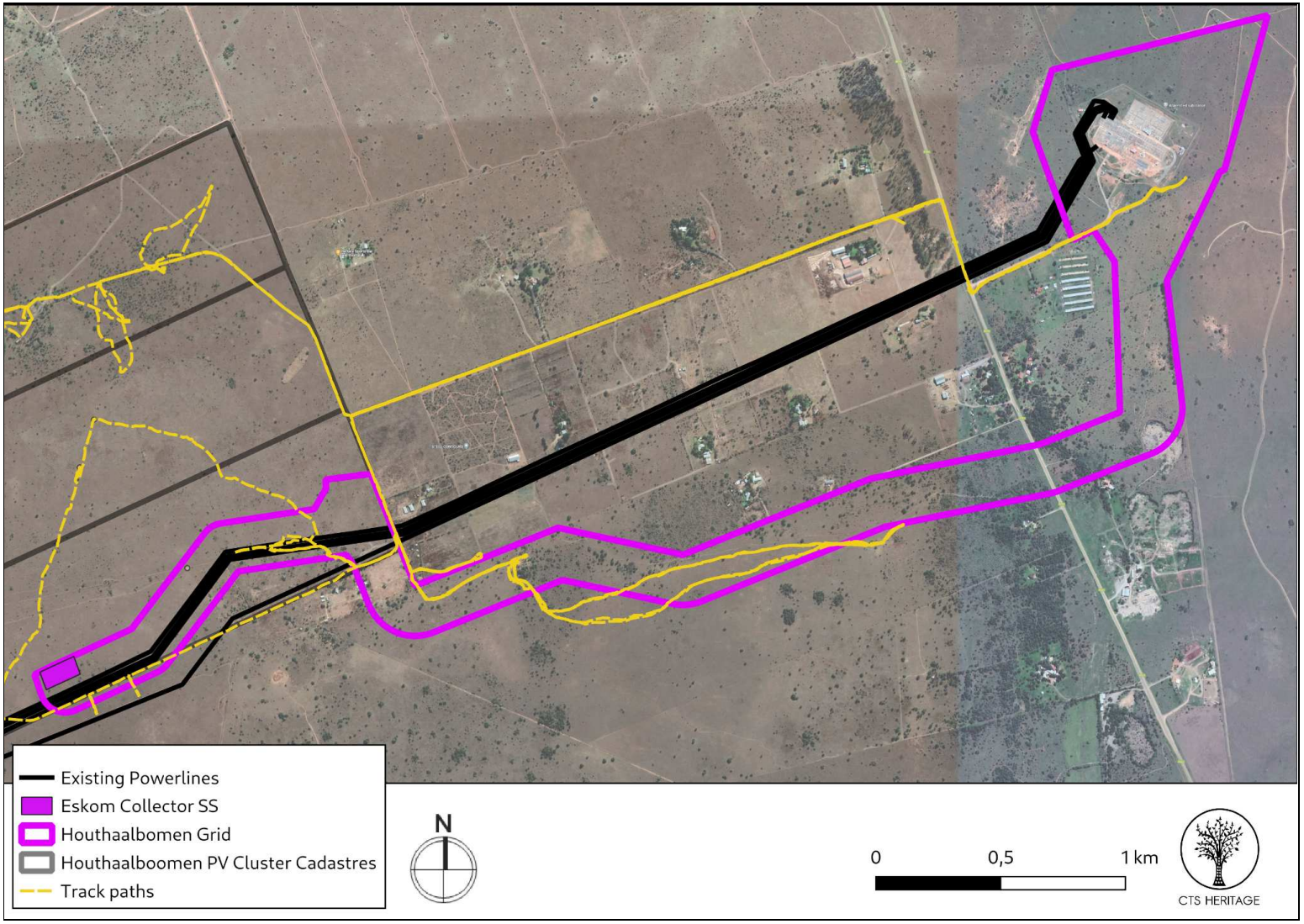
Table 3: Heritage resources identified within or near the grid connection development area

Site No.	Site Name	Description	Co-ordinates		Grading	Mitigation
LCTB 016	**LICBUR10**	**Stone structure - likely burial**	**26,109238**	**-26,105839**	**IIIA**	**10m no-development buffer**
LCTB 015	LIC13	Sparse stone artefact scatter	26,109219	-26,107903	IIIC	None required
LCTB 029	LI15	Cores with ephemeral removals	26,108559	-26,103651	IIIC	None required

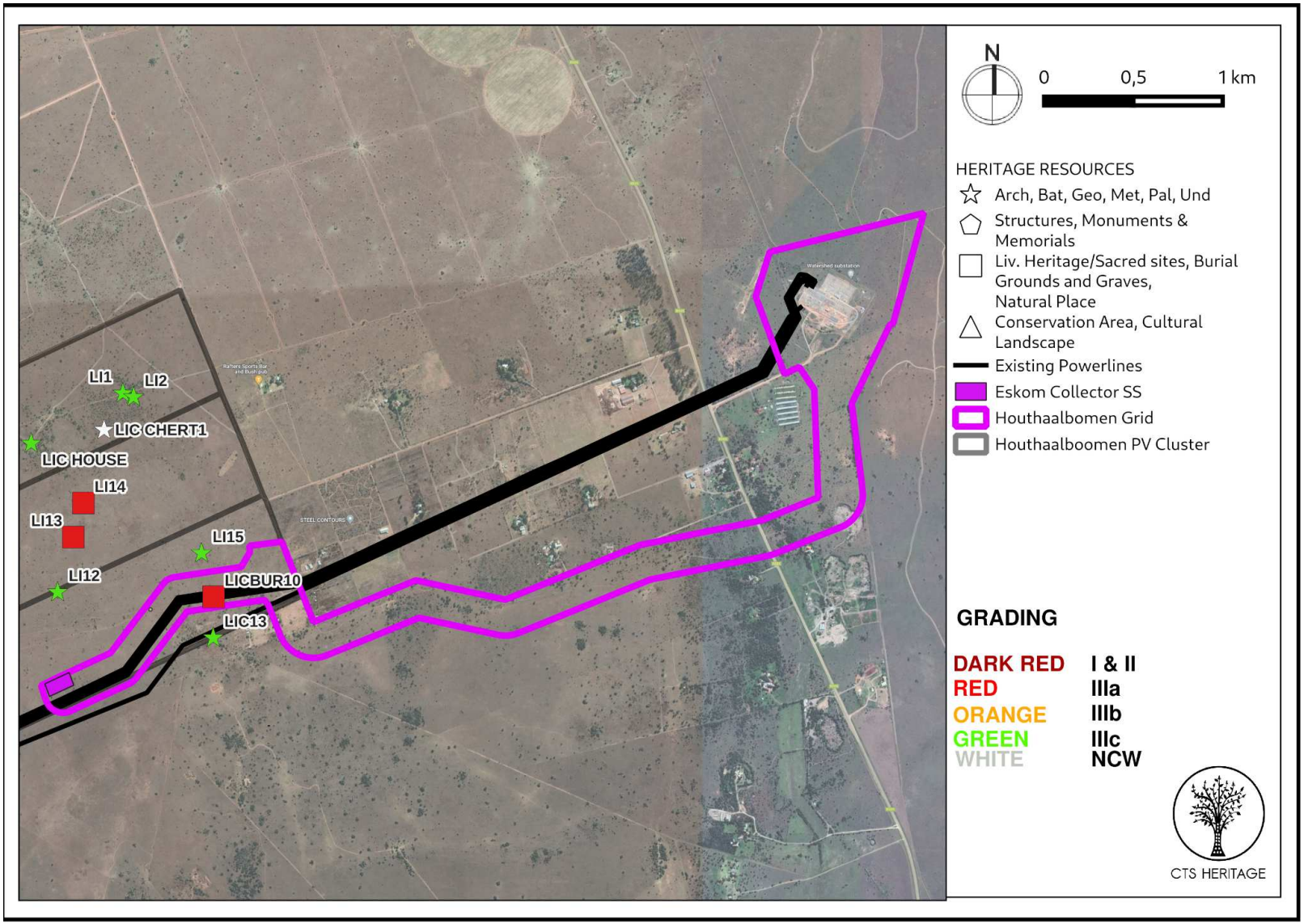
Palaeontology (Appendix 2)

No palaeontological resources of significance were identified within the development area.

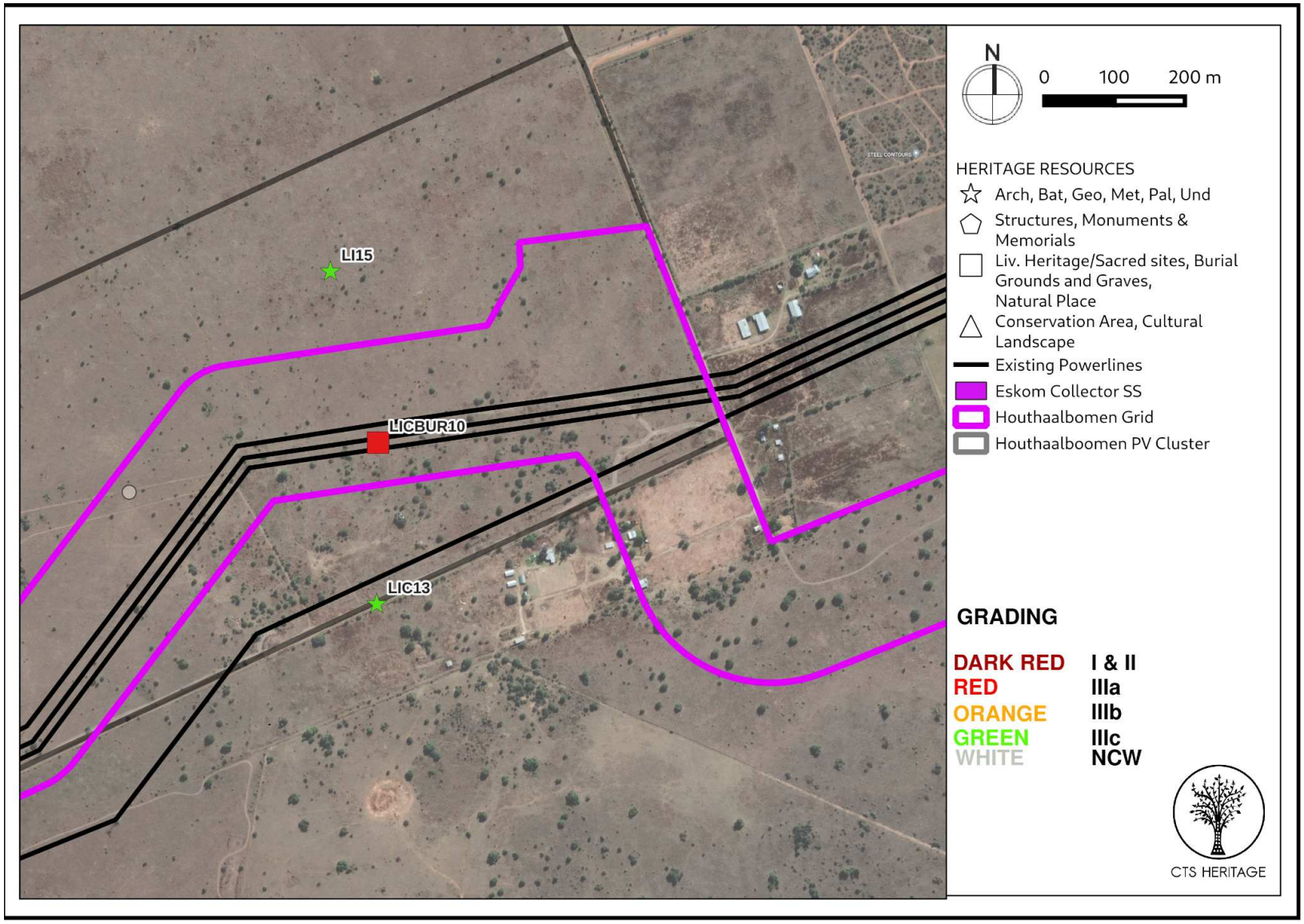
4.3 Mapping and spatialisation of heritage resources



Map 6: Track paths of the archaeological specialists field assessment



Map 6: Heritage Resources in the vicinity of the proposed development area from the field assessment



Map 6: Heritage Resources in the vicinity of the proposed development area from the field assessment

5. ASSESSMENT OF THE IMPACT OF THE DEVELOPMENT

5.1 Assessment of impact to Heritage Resources

Archaeology

All Stone Age finds identified in the field assessment were documented in *ex-situ* contexts, which is further supported by the extensive evidence for rock clearing, and the palimpsests of artefacts documented in several places. The potential for finding a dateable *in-situ* archaeological horizon based on current surface observations appears to be low. The documented Stone Age archaeology is therefore classified as scientifically LOW-SIGNIFICANCE, or Grade IIIC.

As such, it is unlikely that the proposed development will negatively impact on significant stone age archaeological heritage. However, it is possible that significant *in situ* deposits may exist beneath the ground surface. A recommended protocol for such a scenario is included in the recommendations below.

A number of stone structures were identified within the study area. Some of these structures are likely to represent human burial (LICBUR10) and as such, these structures are conservatively graded IIIA (high local significance). It is recommended that a 10m no-development buffer zone around each structure or set of structures is implemented. Additionally, a possible burial was identified within the grid connection corridor by Van der Walt (2014). A further 10m no-development buffer zone must also be implemented around this site (SAHRIS Site ID 51472).

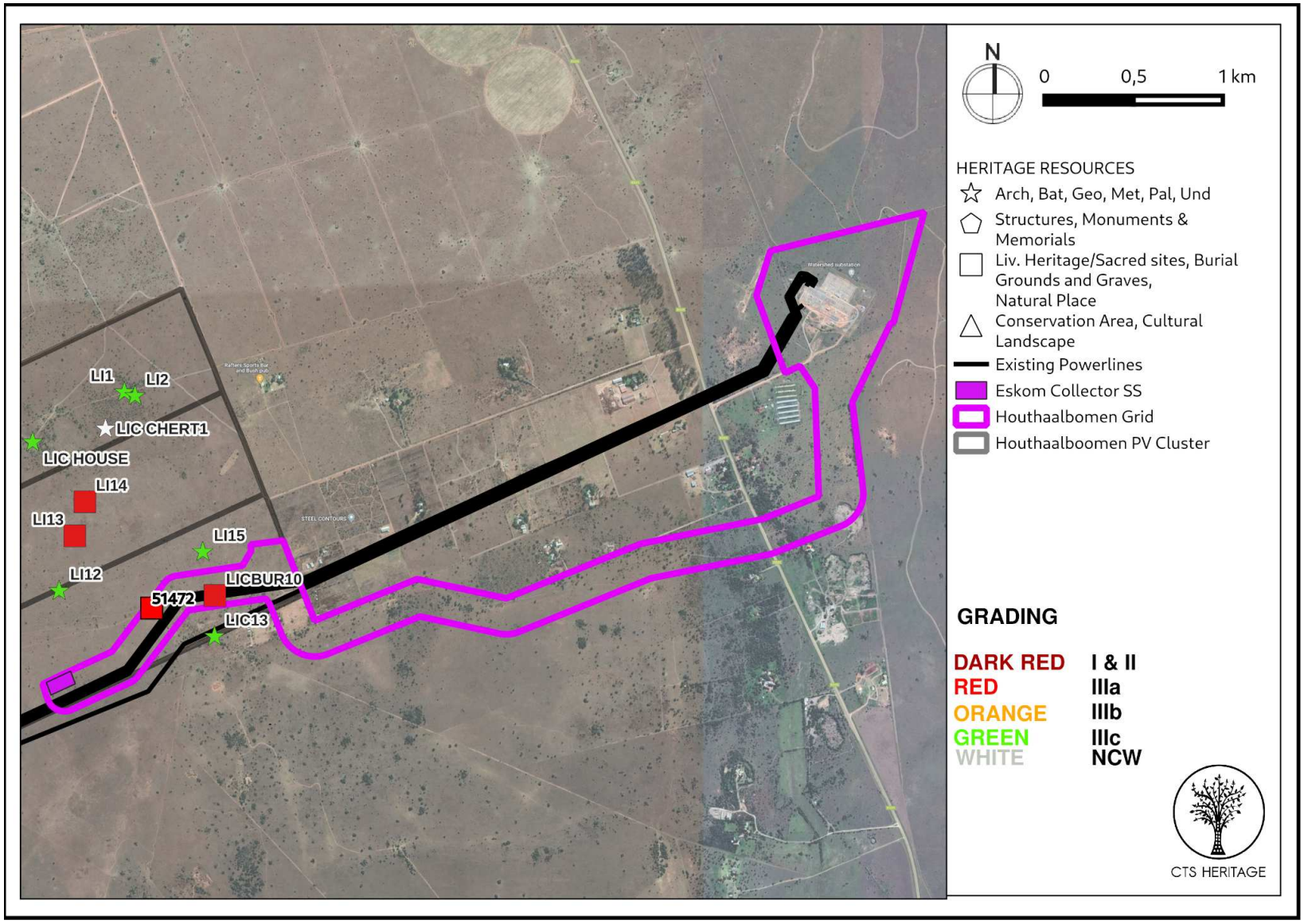
Not all the stone structures identified are likely human burials. Some of these less typical stone structures should be avoided where possible, and construction in the vicinity should proceed with caution. If human remains are exposed during construction, activities should cease immediately and the on-duty Environmental Control Officer should protect these (in the primary exposed context). A recommended protocol for such a scenario is included in the recommendations below

Palaeontology

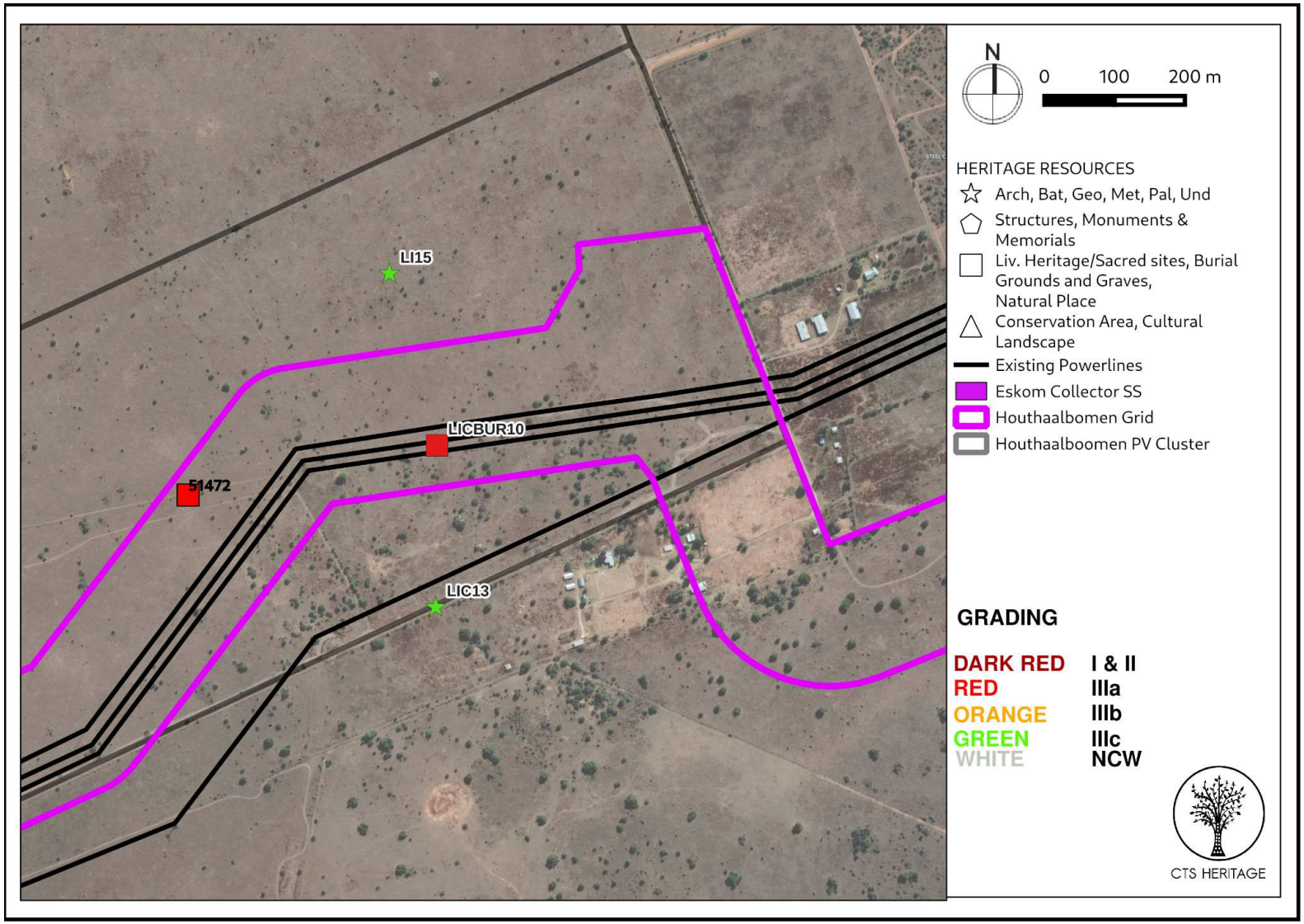
Based on the nature of the project, surface activities may impact upon the fossil heritage if preserved in the development footprint. The geological structures suggest that the rocks are the correct age and type to contain trace fossils, namely stromatolites in the Malmani Subgroup. Furthermore, the material to be excavated is loose sand and this does not preserve fossils. Since there is an extremely small chance that trace fossils, stromatolites, from the Malmani Subgroup may occur below ground and may be disturbed a Fossil Chance Find Protocol has been added to this report. Taking account of the defined criteria, the potential impact to fossil heritage resources is extremely low.

Table 4: Impacts to heritage resources

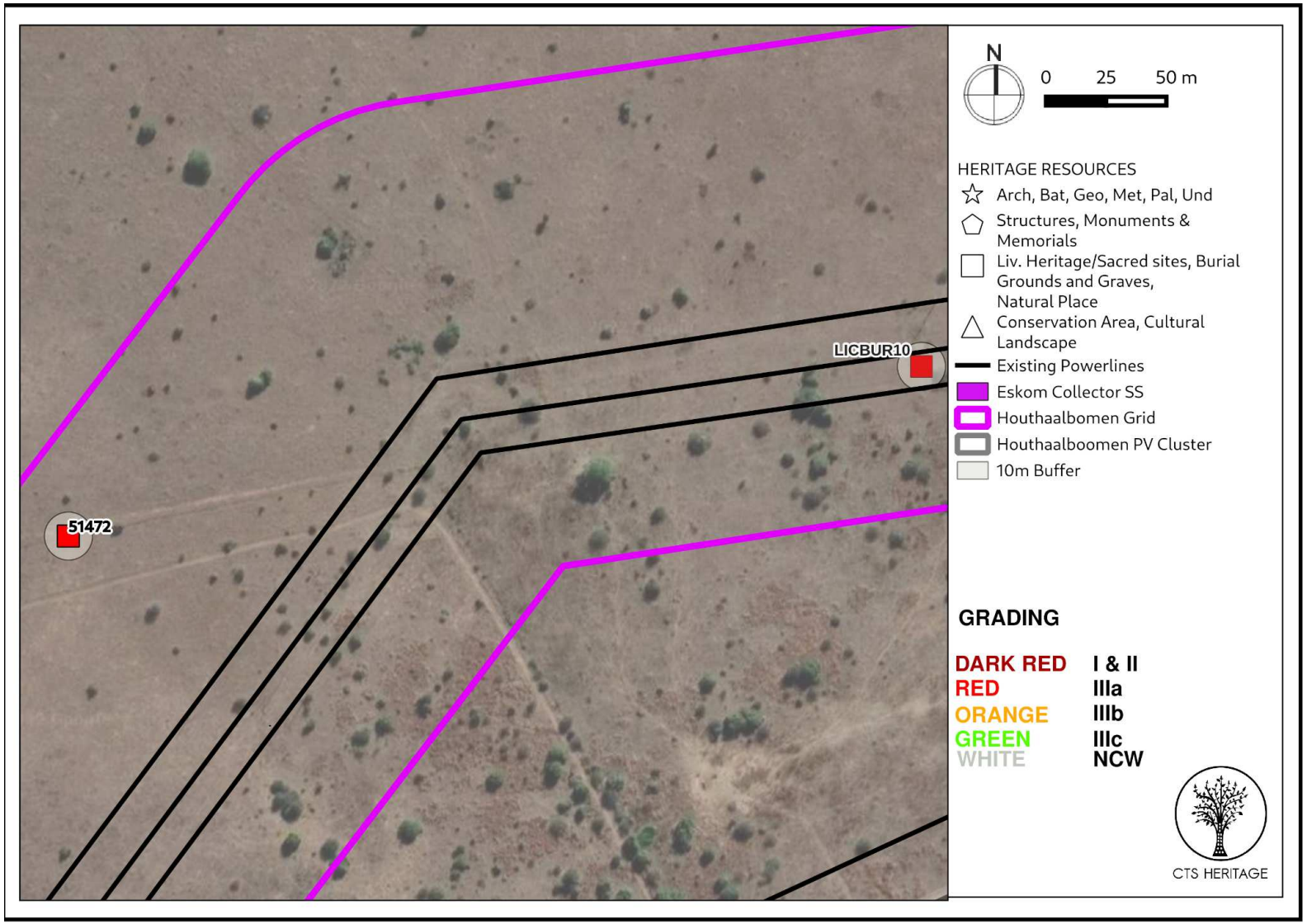
NATURE: The construction phase of the project will require excavation, which may impact on heritage resources if present.				
		Archaeology		**Palaeontology**
MAGNITUDE	**H (8)**	A low significance artefact scatter and two possible burials were identified within the development area	**L (2)**	Loose sands 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 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.
PROBABILITY	**P (5)**	It is possible that significant burials 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	**M**	(8+5+1)x5=70	**L**	(2+5+1)x1=8
STATUS		Neutral		Neutral
REVERSIBILITY	**L**	Any impacts to heritage resources that do occur are irreversible	**L**	Any impacts to heritage resources that do occur are irreversible
IRREPLACEABLE LOSS OF RESOURCES?	**H**	Possible	**L**	Unlikely
CAN IMPACTS BE MITIGATED		Yes		Yes
MITIGATED SIGNIFICANCE		(8+5+1)x1=14		(2+5+1)x1=8
MITIGATION: - A 10m no-go development area must be implemented around site LICBUR10 and Site 51472 - The attached Chance Fossil Finds Procedure must be implemented				
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.				



Map 7: Proposed Barleria Layout with sites indicated



Map 7a: Inset A indicating 10m buffer around site LICBUR10 and Site 51472 as recommended in the preferred layout



Map 7a: Inset A indicating 10m buffer around site LICBUR10 and Site 51472 as recommended in the preferred layout

5.2 Sustainable Social and Economic Benefit

According to the SIA (2021) completed for PV Facility that this OHL will connect to the National grid, "The majority of social impacts associated with the project are anticipated to occur during the construction phase of the development and are typical of the type of social impacts generally associated with construction activities. These impacts will be temporary and short-term (~18 months) but could have long-term effects on the surrounding social environment if not planned or managed appropriately." Potential positive socio-economic impacts primarily pertain to the creation of direct and indirect employment opportunities.

The SIA (2021) goes on to note that "It is anticipated that development of the PV Facility will result in the creation of approximately 50 full -time employment opportunities, comprising a mixture of skilled, semi-skilled and unskilled positions during the operational phase. Employment opportunities generated as a result of the project will be temporary in nature, and will last for the duration of the construction period (i.e. ~18 months). The general labour force will, as far as possible and where skills are available, be sourced from the local labour pool. Where relevant skills are unavailable from the local labour pool, these would need to be sought elsewhere. The injection of income into the area, albeit limited, in the form of wages will represent an opportunity for the local economy and businesses in the area.

Several indirect employment opportunities will also be created. Indirect employment opportunities will predominantly be created in the service industry, through the opportunity for the provision of secondary services to the construction team. Services may include, but are not limited to, accommodation, catering, and laundry services."

The other primary socio-economic benefit likely to result from this proposed development is the contribution to the infrastructure required for non-polluting renewable energy. According to the SIA (2021), "South Africa currently relies predominantly on coal-generated electricity to meet its energy needs. As a result, the country's carbon emissions are considerably higher than those of most developed countries partly because of the energy-intensive sectors which rely heavily on low quality coal, which is the main contributor to GHG emissions. The use of solar technology for power generation is considered a non-consumptive use of a natural resource which produces zero GHG emissions during its operation. The generation of RE utilising solar power will contribute positively to South Africa's electricity market. Given South Africa's reliance on Eskom as a power utility, the benefits associated with a REIPPP Programme are regarded as an important contribution, and the advancement of RE has been identified as a priority for South Africa.

Increasing the contribution of the RE sector to the local economy would contribute to the diversification of the local economy and provide greater economic stability. The growth in the RE sector as a whole could introduce new skills and development into the area. This is especially true with regards to solar power specifically considering the number of other solar power projects proposed within the broader area.

The development of RE projects have the potential to contribute to the stability of the economy, and could contribute to the local economy through employment generation (direct, indirect, and local service providers) and revenue generation for the LM. While the overall contribution of the project to South Africa's total energy requirements is small, the facility will also contribute towards offsetting the total carbon emissions associated with energy generation in South Africa. It should however be noted that such a benefit is associated with all RE projects and not only solar power projects in particular."

As such, the socio-economic benefits to be derived from the proposed development therefore outweigh the anticipated negative impacts to heritage resources identified in this assessment on condition that the recommendations made below are implemented.

5.3 Proposed development alternatives

A grid connection corridor was assessed in this assessment to accommodate any changes in the alignment within this corridor. As long as the recommendations indicated below are implemented, there is no objection to the proposed development of the grid connection anywhere within this corridor.

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.

According to the VIA (2021) completed for this project, "There are eight applications for Solar Energy Facilities (SEFs) in relative close proximity to the Watershed Substation. There are the Barleria, Dicoma and Setaria PV

projects (currently in process) and five approved/authorised, but not yet constructed, SEFs. The authorised facilities include: Lichtenburg Solar Park, Tlisitseng SEF and Lichtenburg 1, 2 and 3 PVs. These facilities are located north-east of the proposed Barleria PV facility.

The construction and operation of all of these renewable energy facilities is expected to increase the cumulative visual impact of industrial type infrastructure within the region… On the other hand, the location of these SEFs within a 6km radius of each other will contribute to the consolidation of SEF structures to this locality and avoid a potentially scattered proliferation of solar energy infrastructure throughout the region. It should also be borne in mind that the approval of the five latter SEFs has set the trend for applications for solar energy generation projects within this area, which is not likely to abate within the foreseeable future."

Considering the assessment of cumulative impacts on heritage resources, as per Table 5 and 6 below, the development of the proposed grid connection in the area is considered to be acceptable as no cumulative impacts of a high significance are expected to occur.

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 Pv S
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.				
		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)x2=16	**L**	(4+4+1)x3=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				

6. RESULTS OF PUBLIC CONSULTATION

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

7. CONCLUSION

The findings of the archaeology assessment largely correlate with the findings of Van der Walt (2014) and a number of additional heritage resources were identified. The stone age archaeological resources identified were all *ex situ* and are of low heritage significance. These have been graded IIIC in the tables and maps provided and no additional mitigation is recommended for these sites. They have been sufficiently recorded in this report.

A stone structure was identified within the development area. It is likely that this is a burial site (LICBUR10). This site is graded IIIA in the tables and maps provided and a no-development buffer of 10m is recommended around this site. Additionally, a possible burial was identified within the grid connection corridor by Van der Walt (2014). A further 10m no-development buffer zone must also be implemented around this site (SAHRIS Site ID . Furthermore, it is recommended that a management plan is developed to ensure the ongoing conservation of these sites for the duration of the lifespan of the development.

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 loose sands of the Quaternary. No fossils were seen

during the site survey and there were no rocky outcrops at all. There is a very small chance that stromatolites of the Malmani Subgroup (Chuniespoort Group, Transvaal Supergroup) may occur below the ground surface and may be disturbed. Therefore, a Fossil Chance Find Protocol should be added to the EMPr or site management plan. If fossils are found by the developer, environmental officer or other designated person, once excavations for foundations, access and infrastructure have commenced then they should be rescued and a palaeontologist called to assess and collect a representative sample.

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.

8. RECOMMENDATIONS

There is no objection to the proposed development of the Barleria PV facility on heritage grounds on condition that:

- A 10m no-go and no development buffer is implemented around the potential burial sites LICBUR10 and SAHRIS Site ID 51472
- A management plan is developed for the ongoing and long-term management of the burials within the development area.
- The attached Chance Fossil Finds Procedure must be implemented for the duration of the construction phase of the project
- The mitigation measures proposed in the VIA (2021) must be implemented
- Should any buried archaeological resources or burials be uncovered during the course of development activities, work must cease in the vicinity of these finds. The South African Heritage Resources Agency (SAHRA) must be contacted immediately in order to determine an appropriate way forward.

9. REFERENCES

Heritage Impact Assessments				
Nid	**Report Type**	**Author/s**	**Date**	**Title**
6237	AIA Phase 1	Johnny Van Schalkwyk, Robert de Jong, S Smith	01/08/1995	Reconnaissance of Remaining Cultural Resources in the Bakerville Diamond Fields
8330	AIA Phase 1	Francois P Coetzee	01/03/2008	Cultural Heritage Survey of the PPC Slurry Operation, near Zeerust, North West Province
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138895		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

Other 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 2 Pv Solar Energy Facility, North West Province: Visual Impact Assessment. (Unpublished)

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APPENDICES

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APPENDIX 1: Archaeological Assessment (2021)

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APPENDIX 2: Palaeontological Assessment (2021)

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APPENDIX 3: Chance Fossil Finds Procedure

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APPENDIX 4: Heritage Screening Assessment

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APPENDIX 5: Visual Impact Assessment