McGregor Museum
Department of Archaeology

Proposed Blackwood Solar Energy Facility on Portion 1 of Pandamsfontein 1593, south east of Kimberley, in the Tokologo Local Municipality, Free State: Heritage Impact Assessment Report

David Morris
August 2014

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1. INTRODUCTION

Blackwood Solar Energy Facility (Pty) Ltd has appointed Savannah Environmental (Pty) Ltd to undertake an Environmental Impact Assessment Process and compile an Environmental Management Programme (EMP) for the proposed solar energy facility and associated infrastructure 25 km south east of Kimberley in the western Free State.

Savannah Environmental has appointed the McGregor Museum to provide specialist input with respect to heritage.

This document gives a Phase 1 Archaeological Impact Assessment with comments on cultural heritage.

The project proposes construction of a 75 MW photovoltaic facility and associated infrastructure on the farm Pandamsfontein in the western Free State, east of Kimberley.

1.1 Focus and Content of Heritage Report

This heritage Impact Assessment is focused on the proposed development footprint of the solar energy facility. It is proposed that the project would entail construction of:

» Arrays of photovoltaic (PV) panels
» Appropriate mounting structures
» Cabling between the project components, to be lain underground where practical.
» An on-site substation and overhead power line to facilitate the connection between the solar energy facility and the Eskom grid via one of the following options:

- A loop in/loop out of the 132kV power line which traverses the site;
- Construction of an overhead distribution power line of approximately 20km in length to the Boundary Substation.

» Internal access roads and fencing.
» Workshop area for maintenance, storage, and offices.

1.2 Heritage Specialist

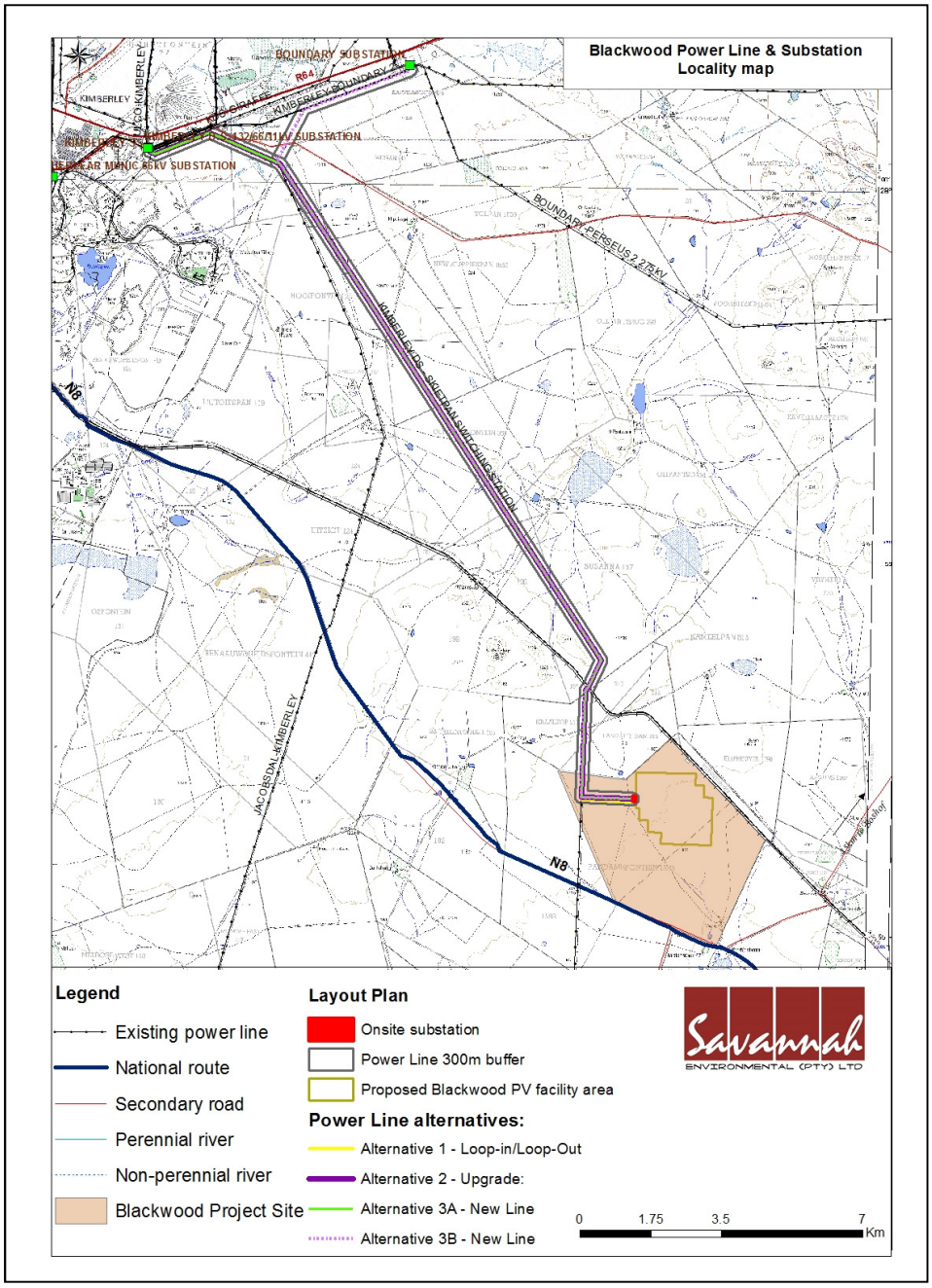
The author of this report is a qualified archaeologist (PhD, UWC) accredited as a Principal Investigator by the Association of Southern African Professional Archaeologists. The author has worked as a museum archaeologist in Kimberley in the Northern Cape since 1985. In addition the author has a comprehensive knowledge of the area's history and built environment, and received UCT-accredited training at a workshop on *Architectural and Urban Conservation: researching and assessing local (built) environments* (S. Townsend, UCT). He is also Chairman of the Historical Society of Kimberley and the Northern Cape.

The author is independent of the organization commissioning this specialist input, and provides this Specialist Report within the framework of the National Heritage Resources Act (No 25 of 1999).

The National Heritage Resources Act no. 25 of 1999 (NHRA) protects heritage resources which include archaeological and palaeontological objects/sites older than 100 years, graves older than 60 years, structures older than 60 years, as well as intangible values attached to places. The Act requires that anyone intending to disturb, destroy or damage such sites, objects and/or structures may not do so without a permit from the relevant heritage resources authority. This means that a Heritage Impact Assessment should be performed, resulting in a specialist report as required by the relevant heritage resources authority/ies to assess whether authorisation may be granted for the disturbance or alteration, or destruction of heritage resources.

2. DESCRIPTION OF THE AFFECTED ENVIRONMENT

The environment in question is in a generally flat western Free State grassland/Kimberley Thornveld setting on a Hutton Sands-covered calcrete substrate. Dolerite hills cluster beyond the project area. It is estimated that surface archaeological traces including those in disturbances and erosion features would provide informative indications of the likely archaeological landscape in question.



Map 1. Map indicating the project area north of the N8 south east of Kimberley and associated power lines alternatives and substation relative to the major Alexandersfontein pan (lighter-coloured East North East of the project).

2.1 Heritage features of the region

Previous archaeological surveys carried out in the region include impact assessments east of the project site in the vicinity of Bosvark (proposed gypsum mining) and, particularly, at Alexandersfontein/Benfontein, a large Pleistocene lake on the margins of which numerous Stone Age occurrences have been recorded in lake-shore and spring eye settings. For the broader region the following comments serve as background or

baseline information from which heritage predictions were made for testing in the HIA study.

2.1.1 Colonial frontier

Nineteenth century farming infrastructure representing the influx of frontier (Trekboer, in some cases Griqua) settlers occurs in the area in the form of stone kraals and dwellings (or ruins thereof), as well as graves (e.g. Morris 2011). Some such features, it was conceivable, could be found on the property in question, together with more recent features (built environment older than 60 years being subject to provisions of the National Heritage Resources Act). The property is also close to the Diamond Fields (Kimberley) and hence could include material traces pertaining to the diamond rush, as also to the period of the Anglo-Boer War (although no action was fought at this particular spot). Significant historical infrastructure includes the railway that links Kimberley and Bloemfontein; but unlike other railways in the region, it post-dates the Anglo-Boer War, and hence one would not expect evidence of a blockhouse line, a feature of the main railway through Kimberley from the south.

2.1.2 Later Stone Age

Later Stone Age sites have been noted in the region, particularly on the farm Benfontein (Alexandersfontein). A notable feature, apart from surface scatters of stone tools, are rock engraving sites on dolerite hills (Morris 1988) such as at Tafelkop and near Bosvark (Morris 2011), as well as on a series of hills on the farms Olifantsfontein and Suzanna just west of the property (Fock & Fock 1989).

2.1.3 Pleistocene: Middle and Earlier Stone Age

Assemblages ascribed to the Pleistocene age Earlier and Middle Stone Age and 'Fauresmith' industries (Beaumont & Morris 1990; Underhill 2011) are known to occur in the area, typically within and at the base of the red Hutton Sands overlying calcrete or dolerite. Mostly very low density occurrences have been noted in surveys nearby, while in certain localities sites of higher density and significance have been documented, notably on the fringes of the Alexandersfontein Pan (e.g. Butzer *et al*. 1973; Butzer 1976; Morris 2002).

2.2 Description and evaluation of environmental issues and potential impacts

Heritage resources including archaeological sites are in each instance unique and non-renewable resources. Area and linear developments such as those envisaged can have a permanent destructive impact on these resources. The objective of an HIA would be to assess the sensitivity of such resources where present, to evaluate the significance of

potential impacts on these resources and, if and where appropriate, to recommend no-go areas and measures to mitigate or manage said impacts.

Area impacts are possible in the case of the Blackwood Solar Energy Facility development and infrastructure; the power lines and access roads would represent linear impacts.

2.2.1 Direct, indirect and cumulative impacts (in terms of nature, magnitude and extent)

The destructive impacts that are possible in terms of heritage resources would tend to be direct, once-off events occurring during the initial construction period. In the long term, the proximity of operations in a given area could result in secondary indirect impacts resulting from the movement of people or vehicles in the immediate or surrounding vicinity. The Environmental Management Plan should seek to minimize the latter impacts as far as possible.

With respect to the magnitude and extent of potential impacts, it has been noted that the erection of power lines would have a relatively small impact on Stone Age sites, in light of Sampson's (1985) observations during surveys beneath power lines in the Karoo (actual modification of the landscape tends to be limited to the footprint of each pylon), whereas a road or a water supply pipeline would tend to be far more destructive (modification of the landscape surface would be within a continuous strip), albeit relatively limited in spatial extent, i.e. width (Sampson compares such destruction to the pulling out of a thread from an ancient tapestry).

2.2.2 Summary observations derived from previous experience of the area

- Based on previous experience, the terrain on which the proposed Blackwood Solar Energy Facility would be located is likely to include traces of Stone Age utilization of the landscape with palimpsests of material spanning Pleistocene and Holocene times.
- Where there are dolerite outcrops or hills, rock engravings may occur.
- Nineteenth- and twentieth-century cultural history may occur in the form of stone kraals, ruins of dwellings, extant dwellings and infrastructure (those over 60 years old are explicitly protected by the Act), and graves. Intangible heritage values attached to places may be recoverable from current or former inhabitants (farmers, farm-workers).
- The likelihood of palaeontological features of significance occurring would be subject to a separate desktop enquiry.

3. PROPOSED METHODOLOGY FOR FULL HERITAGE STUDY

A site was necessary to inspect various parts of the terrain on foot, focusing on areas of expected impact. Heritage traces would be evaluated in terms of their archaeological

significance (see tables below). The predictions set out in section 2.2.2 above needed to be tested by way of observations made on the ground.

3.1 Assumptions and constraints

It was assumed that, by and large in this landscape, with its sparse vegetation and generally shallow soil profiles, some sense of the archaeological traces to be found in the area would be readily apparent from surface observations (including assessment of places of erosion or past excavations of any kind exposing erstwhile below-surface features). In parts of this landscape a prevailing erosion regime would mean that archaeological traces would be mostly on the surface; however, sub-surface occurrences could be expected where the landscape is mantled by Hutton Sands or other forms of sedimentation, or where material has been deliberately buried (most obviously, graves).

A proviso is routinely given that, should sites or features of significance be encountered during construction (this could include an unmarked burial, an ostrich eggshell water flask cache, or a high density of stone tools, for instance), specified steps are necessary (cease work, report to heritage authority).

3.2 Potentially significant impacts to be assessed in the HIA process

Any area or linear, primary and secondary, disturbance of surfaces in the development locales could have a destructive impact on heritage resources, where present. In the event that such resources are found, they are likely to be of a nature that potential impacts could be mitigated by documentation and/or salvage following approval and permitting by the South African Heritage Resources Agency and, in the case of any built environment features, by the Free State Provincial Heritage Resources Authority. Although unlikely, there may be some that could require preservation *in situ* and hence modification of intended placement of development features.

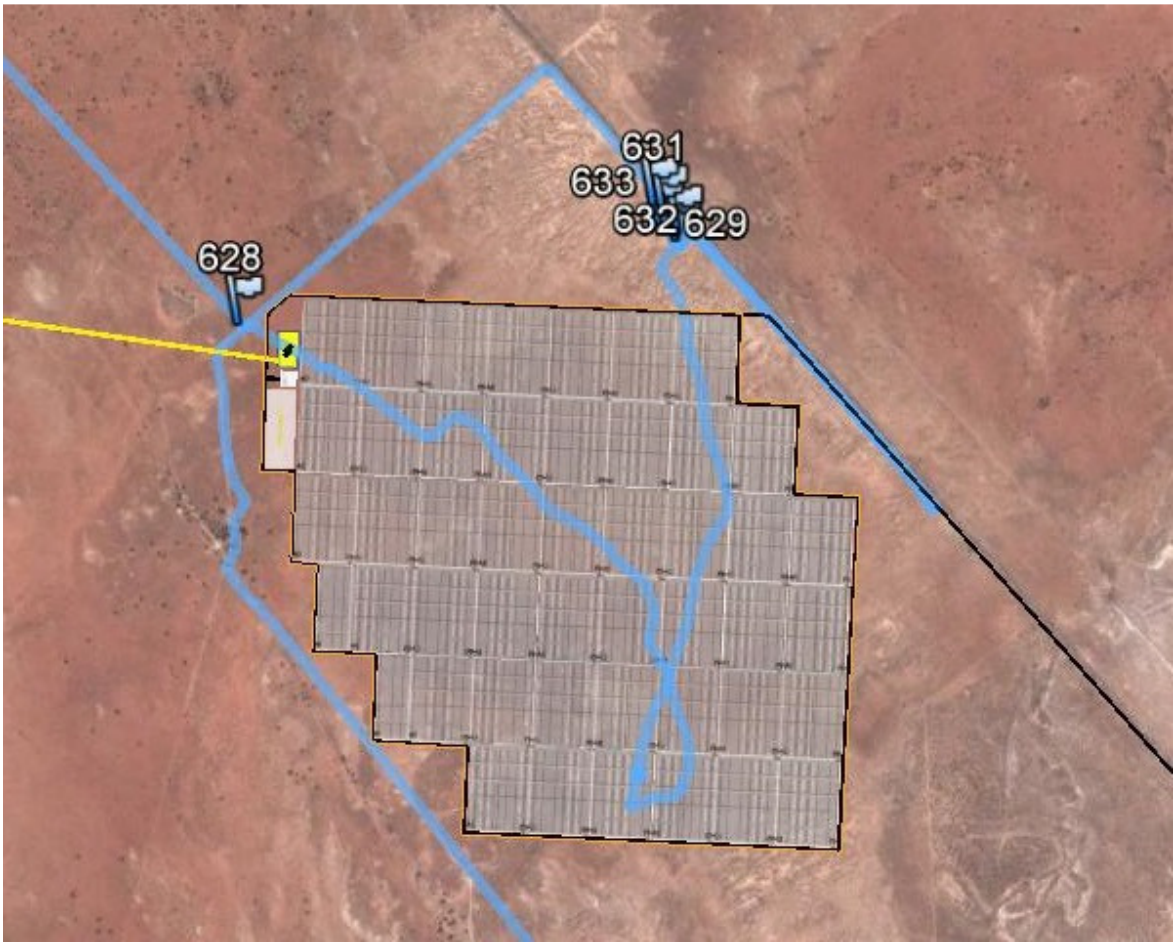
Disturbance of surfaces includes any construction: of a road, a pipeline, erection of a pylon, or preparation of a site for a sub-station, or plant, or building, or any other *clearance* of, or *excavation* into, a land surface. In the event of archaeological materials being present such activity would alter or destroy their context (even if the artefacts themselves are not destroyed, which is also obviously possible). Without context, archaeological traces are of much reduced significance. It is the contexts as much as the individual items that are protected by the heritage legislation.

Some of the activities indicated here have a generally lower impact than others. For example, Sampson (1985) has shown that powerlines tend to be less destructive on Stone Age sites than roads since access along the route of the line during construction and maintenance tends to be by way of a 'twee-spoor' temporary roadway (not scraped, the surface not significantly modified). Individual tower positions might be of high archaeological significance (e.g. a grave, or an engraving). Note: the impact of a 'twee-

spoor' could be far greater on Iron Age landscapes in other parts of South Africa, where stone walling might need to be breached.

4. OBSERVATIONS

During a field visit to Pandamsfontein and to the location of the proposed development, the footprint of the solar energy facility was inspected, as indicated in the attached GPS track log.



Map 2. Footprint of the proposed Blackwood Solar Energy Facility, with GPS track mapped.

Predictions from the desktop scoping survey, based on previous observations in the area, suggested:

- The terrain on which the proposed Blackwood Solar Energy Facility would be located is likely to include traces of Stone Age utilization of the landscape with palimpsests of material spanning Pleistocene and Holocene times.
- Where there are dolerite outcrops or hills, rock engravings may occur.
- Nineteenth- and twentieth-century cultural history may occur in the form of stone kraals, ruins of dwellings, extant dwellings and infrastructure (those over 60 years old are explicitly protected by the Act), and graves. Intangible heritage values

attached to places may be recoverable from current or former inhabitants (farmers, farm-workers).

Rock Art

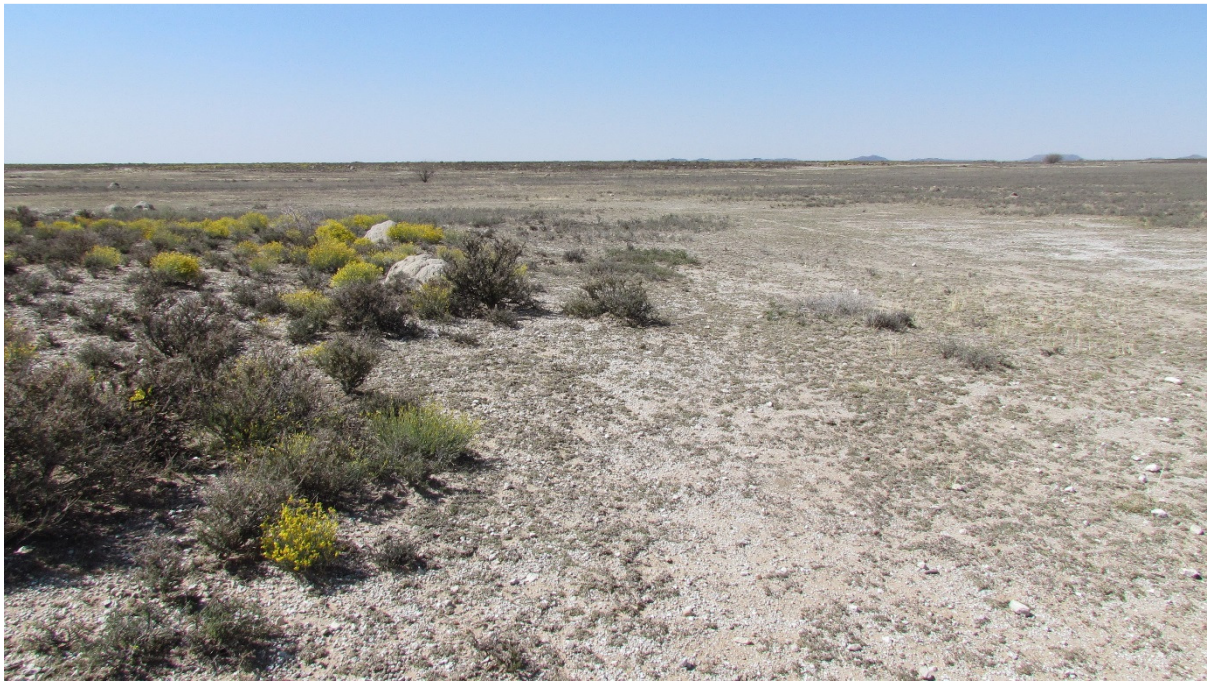
No dolerite exposures occur within in the area indicated for the solar panel array on Pandamsfontein, and no engravings were found.

Stone Age

As predicted, stone artefacts were found and probably occur across the entire terrain in question, within the relatively thin veneer of soil that overlies calcrete. Surface scatters of artefacts were noted in relatively rare situations where this veneer is cleared away (by erosion on higher ground west of the development area, e.g. at -28.887075° 24.939297° - illustrated below; and in scraped, worn-down roadways, particularly at the north-western edge of the property, e.g. at -28.881797° 24.939100°).

These artefacts appear principally to be Middle Stone Age in character. Artefact densities in this featureless plain are low where they occur at the surface and it is estimated that they would be similarly fairly sparse over the entire PV array footprint.

A relevant observation made some distance away from the solar energy facility site is of similar Stone Age material occurring at the edge of a small vlei which in all likelihood held water in times of wetter climate. At -28.905808° 24.955608° relatively high densities of this material occur at the margins of the vlei. This site is not likely to be impacted by the proposed development.



Vlei margin (above) with relatively high densities of artefacts (below) eroding at the surface.

Colonial Era

No traces specifically of farm-related infrastructure, e.g. kraals, dwellings, etc, were found in the project area.

Associated with the railway, however, the foundations of structures, a covered well, and two ash middens were located. The material in the ash middens dates these structures to the early part of the twentieth century. The railway was built in 1907 (Frank Higgo, pers.comm.). Farm owner, Mr Nicol Burger, suggested that this was a watering point for steam engines.

GPS log	Latitude	Longitude
629: foundation of structure	-28.878429°	24.954201°
630: Midden	-28.878636°	24.954154°
631: foundation of structure	-28.877841°	24.953651°
632: foundation of structure	-28.877597°	24.953307°
633: Midden	-28.878154°	24.953507°

Foundations beyond tree stump – railway in the background.

Artefacts from the ash middens

5. DETERMINING SIGNIFICANCE

5.1 Determining archaeological significance

In addition to guidelines provided by the National Heritage Resources Act (Act No. 25 of 1999), a set of criteria based on Deacon (nd) and Whitelaw (1997) for assessing archaeological significance has been developed for Northern Cape settings (Morris 2000a). These criteria include estimation of landform potential (in terms of its capacity to contain archaeological traces) and assessing the value to any archaeological traces (in terms of their attributes or their capacity to be construed as evidence, given that evidence is not given but constructed by the investigator).

Estimating site potential

Table 1 (below) is a classification of landforms and visible archaeological traces used for estimating the potential of archaeological sites (after J. Deacon nd, National Monuments Council). Type 3 sites tend to be those with higher archaeological potential, but there are notable exceptions to this rule, for example the renowned rock engravings site Driekopseiland near Kimberley which is on landform L1 Type 1 – normally a setting of lowest expected potential. It should also be noted that, generally, the older a site the poorer the preservation, so that sometimes *any* trace, even of only Type 1 quality, can be of exceptional significance. In light of this, estimation of potential will always be a matter for archaeological observation and interpretation.

Assessing site value by attribute

Table 2 is adapted from Whitelaw (1997), who developed an approach for selecting sites meriting heritage recognition status in KwaZulu-Natal. It is a means of judging a site's archaeological value by ranking the relative strengths of a range of attributes (given in the second column of the table). While aspects of this matrix remain qualitative, attribute assessment is a good indicator of the general archaeological significance of a site, with Type 3 attributes being those of highest significance.

Table 1. Classification of landforms and visible archaeological traces for estimating the potential for archaeological sites (after J. Deacon, National Monuments Council).

Class	**Landform**	**Type 1**	**Type 2**	**Type 3**
L1	Rocky surface	Bedrock exposed	Some soil patches	Sandy/grassy patches
L2	Ploughed land	Far from water	In floodplain	On old river terrace
L3	Sandy ground, inland	Far from water	In floodplain or near feature such as hill	On old river terrace
L4	Sandy ground, Coastal	>1 km from sea	Inland of dune cordon	Near rocky shore
L5	Water-logged deposit	Heavily vegetated	Running water	Sedimentary basin
L6	Developed urban	Heavily built-up with no known record of early settlement	Known early settlement, but buildings have basements	Buildings without extensive basements over known historical sites
L7	Lime/dolomite	>5 myrs	<5000 yrs	Between 5000 yrs and 5 myrs
L8	Rock shelter	Rocky floor	Sloping floor or small area	Flat floor, high ceiling
Class	**Archaeo-logical traces**	**Type 1**	**Type 2**	**Type 3**
A1	Area previously excavated	Little deposit remaining	More than half deposit remaining	High profile site
A2	Shell or bones visible	Dispersed scatter	Deposit <0.5 m thick	Deposit >0.5 m thick; shell and bone dense
A3	Stone artefacts or stone walling or other feature visible	Dispersed scatter	Deposit <0.5 m thick	Deposit >0.5 m thick

Table 2. Site attributes and value assessment (adapted from Whitelaw 1997)

Class	**Attribute**	**Type 1**	**Type 2**	**Type 3**
1	Length of sequence/context	No sequence Poor context Dispersed distribution	Limited sequence	Long sequence Favourable context High density of arte/ecofacts
2	Presence of exceptional items (incl regional rarity)	Absent	Present	Major element
3	Organic preservation	Absent	Present	Major element
4	Potential for future archaeological investigation	Low	Medium	High
5	Potential for public display	Low	Medium	High
6	Aesthetic appeal	Low	Medium	High
7	Potential for implementation of a long-term management plan	Low	Medium	High

In terms of these significance matrices, the observations pertaining to the Stone Age in this study fall under landform L3 Type 1 and, as archaeological traces, Class A3 Type 1 (Table 1). By these criteria they reflect poor contexts and low significance. In terms of site attributes (Table 2), they all fall under Type 1 for all Classes 1-7, reflecting low significance, low potential and absence of contextual and key types of evidence.

On archaeological grounds, these occurrences can be said to be of low significance.

The colonial era site associated with the railway scores a little higher as L3 Type 1 and A3 Type 2 (Table 1), and in terms of attributes (Table 2): Type 2 for Classes 1-4 & 7; Type 1 for Classes 5 & 6.

5.2 Characterising the significance of impacts

The following criteria are used in this Environmental Impact Assessment to characterise the significance of direct, indirect and cumulative impacts (Jodas 2010):

- 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:
  - local extending only as far as the development site area – assigned a score of 1;
  - limited to the site and its immediate surroundings (up to 10 km) – assigned a score of 2;
  - will have an impact on the region – assigned a score of 3;
  - will have an impact on a national scale – assigned a score of 4; or
  - will have an impact across international borders – assigned a score of 5.
- 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; or
  - permanent - assigned a score of 5.
- The **magnitude**, quantified on a scale from 0-10, where a score is assigned:
  - 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, and a score assigned:
  * Assigned a score of 1–5, where 1 is very improbable (probably will not happen);
  * Assigned a score of 2 is improbable (some possibility, but low likelihood);
  * Assigned a score of 3 is probable (distinct possibility);
  * Assigned a score of 4 is highly probable (most likely); and
  * Assigned a score of 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 (refer formula below) 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 determined by combining the criteria in the following formula:

S= (E+D+M) P; where

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).

Impact tables summarising the significance of impacts (with and without mitigation)

At the western side of the proposed development footprint as indicated in Map 7 above.

Impact tables summarising the significance of impacts (with and without mitigation)

Colonial era ruin (foundations only) and ash middens (in vicinity of -28.878429° 24.954201°)

Nature: Acts or activities resulting in disturbance of surfaces and/or sub-surfaces containing artefacts (causes) resulting in the destruction, damage, excavation, alteration, removal or

collection from its original position (consequences), of any archaeological material or object (what affected).		
	Without mitigation	**With mitigation**
Extent	Regional (3)	Regional (3)
Duration	Permanent (5)	Permanent (5)
Magnitude	Very High (10)	Very High (10)
Probability	Definite (5)	Probable (3)
Significance	High (90)	Medium (54)
Status (positive or negative)	Negative	Negative
Reversibility	No	No
Irreplaceable loss of resources?	Yes, material trace reflecting part of the bygone age of steam, a feature of the history of railways in South Africa.	Other similar sites probably exist.
Can impacts be mitigated?	Yes – Recommend exclusion of this small site, if possible, which in any case lies outside of the indicated PV array layout.	On-going management as per EMP
Mitigation: Avoid disturbing this site if possible, beyond the indicated PV array layout; manage as part of EMP.		
Cumulative impacts: Cumulative Impacts: where any archaeological contexts occur the impacts are once-off permanent destructive events. Infrastructure development may lead to spatially extended impacts in the vicinity, hence the need to demarcate areas for zero impact.		
Residual Impacts: Depleted archaeological record.		

Across the remainder of the proposed development footprint on Pandamsfontein (Blackwood Solar Energy Facility PV facility & associated infrastructure).

Nature: Acts or activities resulting in disturbance of surfaces and/or sub-surfaces containing artefacts (causes) resulting in the destruction, damage, excavation, alteration, removal or collection from its original position (consequences), of any archaeological material or object (what affected).		
	Without mitigation	**With mitigation**
Extent	Local(1)	
Duration	Permanent (5)	
Magnitude	Minor (2)	
Probability	Improbable (2)	
Significance	Low (16)	
Status (positive or negative)		
Reversibility	No	No
Irreplaceable loss of resources?	Yes, where present – but occurrence is generally extremely low density and of low significance.	Not regarded as necessary
Can impacts be mitigated?	Yes – but not considered necessary.	Not regarded as necessary
Mitigation: Mitigation Measures: Artefact densities are low over the development footprint area in question. Unlike biological processes, heritage destruction generally has a once-off permanent impact and in view of this the figures given in the "Without mitigation" column		

err on the side of caution. Even so, the criteria for significance indicated in this matrix give a Low significance weighting (<30 points). Mitigation measures are not considered necessary.
Cumulative impacts: Cumulative Impacts: where any archaeological contexts occur the impacts are once-off permanent destructive events.
Residual Impacts: -

Substation site (within the Blackwood Solar Energy Facility).

Nature: Acts or activities resulting in disturbance of surfaces and/or sub-surfaces containing artefacts (causes) resulting in the destruction, damage, excavation, alteration, removal or collection from its original position (consequences), of any archaeological material or object (what affected).		
	Without mitigation	**With mitigation**
Extent	1	
Duration	5	
Magnitude	2	
Probability	2	
Significance	**16**	
Status (positive or negative)		
Reversibility	No	No
Irreplaceable loss of resources?	Yes, where present – but occurrence is generally extremely low density and of low significance.	Not regarded as necessary
Can impacts be mitigated?	Yes – but not considered necessary.	Not regarded as necessary
Mitigation: Mitigation Measures: Artefact densities are low over the development footprint area in question. Unlike biological processes, heritage destruction generally has a once-off permanent impact and in view of this the figures given in the "Without mitigation" column err on the side of caution. Even so, the criteria for significance indicated in this matrix give a Low significance weighting (<30 points). Mitigation measures are not considered necessary.		
Cumulative impacts: Cumulative Impacts: where any archaeological contexts occur the impacts are once-off permanent destructive events.		
Residual Impacts: -		

Power lines

Nature: Acts or activities resulting in disturbance of surfaces and/or sub-surfaces containing artefacts (causes) resulting in the destruction, damage, excavation, alteration, removal or collection from its original position (consequences), of any archaeological material or object (what affected).		
	Without mitigation	**With mitigation**
Extent	1	
Duration	5	
Magnitude	2	
Probability	2	
Significance	**16**	
Status (positive or negative)		
Reversibility	No	No

Irreplaceable loss of resources?	Yes, where present – but occurrence is generally extremely low density and of low significance.	Not regarded as necessary
Can impacts be mitigated?	Yes – but not considered necessary.	Not regarded as necessary
Mitigation: Mitigation Measures: Artefact densities are low over the development footprint area in question. Unlike biological processes, heritage destruction generally has a once-off permanent impact and in view of this the figures given in the "Without mitigation" column err on the side of caution. Even so, the criteria for significance indicated in this matrix give a Low significance weighting (<30 points). Mitigation measures are not considered necessary.		
Cumulative impacts: Cumulative Impacts: where any archaeological contexts occur the impacts are once-off permanent destructive events.		
Residual Impacts: -		

MEASURES FOR INCLUSION IN THE DRAFT ENVIRONMENTAL MANAGEMENT PLAN

OBJECTIVE: Archaeological or other heritage materials occurring in the path of any surface or sub-surface disturbances associated with any aspect of the development are highly likely to be subject to destruction, damage, excavation, alteration, or removal. The objective should be to limit such impacts to the primary activities associated with the development and hence to limit secondary impacts during the medium and longer term working life of the facility.

Project component/s	Any road or other linear construction over and above what is necessary and any spatial extension of other components addressed in this EIA.
Potential Impact	The potential impact if this objective is not met is that wider areas or extended linear developments may result in further destruction, damage, excavation, alteration, removal or collection of heritage objects from their current context on the site.
Activity/risk source	Activities which could impact on achieving this objective include deviation from the planned lay-out of infrastructure without taking heritage impacts into consideration.
Mitigation: Target/Objective	Mitigation measures as recommended, namely exclusion if possible of the colonial era foundations beside the railway. A facility environmental management plan that takes cognizance of heritage resources in the event of any future extensions of any infrastructure.

Mitigation: Action/control	Responsibility	Timeframe
Provision for on-going heritage monitoring in a facility environmental management plan which also provides guidelines on what to do in the event of any major heritage feature being encountered during any phase of development or operation. This report suggests avoidance of a colonial era ruin and set of ash	Environmental management provider with on-going monitoring role set up by the developer. Environmental management provider with on-going monitoring role set up by the developer.	Environmental management plan to be in place before commencement of development. -

middens next to the railway.		

Performance Indicator	Preservation of archaeological traces of the colonial era foundations and ash middens next to the railway. Inclusion of further heritage impact consideration in any future extension of infrastructural elements. Immediate reporting to relevant heritage authorities of any heritage feature discovered during any phase of development or operation of the facility.
Monitoring	Officials from relevant heritage authorities (National and Provincial) to be permitted to inspect the operation at any time in relation to the heritage component of the management plan.

6. CONCLUSIONS

Generally sparse heritage traces were found over almost all of the proposed development area. Remains of a colonial era (post-1907) railway-associated feature alongside the Kimberley-Bloemfontein line should be avoided if possible.

Three options are proposed for the transmission line connection, the last two options using the same existing corridor:

- Option 1: Short loop in/loop out configuration linking to the existing Kimberley DS-Skietpan Switching Station 132 kV power line which traverses the site;
- Option 2: Using footprint, but upgrading line;
- Option 3: New circa 20 km power line running parallel to the existing transmission line - Connecting to KDS or Boundary Substation.

The preferred option in terms of potential heritage impacts would be Option 1.

From an archaeological perspective the observed heritage resources over the indicated footprint of the Blackwood Solar Energy Facility, were found to be mainly of low density and low significance.

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