ACWA Power SolarReserve Redstone

Photovoltaic (PV) Power Project

Heritage Impact Assessment

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Declaration of Independence

- I, Wouter Fourie, declare that –
- General declaration:
- I act as the independent heritage practitioner in this application
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting heritage impact assessments, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I will take into account, to the extent possible, the matters listed in section 38 of the NHRA when preparing the application and any report relating to the application;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- I will ensure that information containing all relevant facts in respect of the application is distributed or made available to interested and affected parties and the public and that participation by interested and affected parties is facilitated in such a manner that all interested and affected parties will be provided with a reasonable opportunity to participate and to provide comments on documents that are produced to support the application;
- I will provide the competent authority with access to all information at my disposal regarding the application, whether such information is favourable to the applicant or not
- All the particulars furnished by me in this form are true and correct;
- I will perform all other obligations as expected from a heritage practitioner in terms of the Act and the constitutions of my affiliated professional bodies; and
- I realise that a false declaration is an offence in terms of regulation 71 of the Regulations and is punishable in terms of section 24F of the NEMA.

Disclosure of Vested Interest

- I do not have and will not have any vested interest (either business, financial, personal or other) in the proposed activity proceeding other than remuneration for work performed in terms of the Regulations;

HERITAGE CONSULTANT: PGS Heritage (Pty) Ltd

CONTACT PERSON: Project Manager – Lead Heritage Specialist

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SIGNATURE: ______________________

ACKNOWLEDGEMENT OF RECEIPT

Report Title	***Redstone CSP Project - Photovoltaic (PV) Power Plant - Heritage Impact Assessment***		
Control	Name	Signature	Designation
Author	**W Fourie**		**Heritage Specialist**
Reviewed			

CLIENT: ACWA Power SolarReserve Redstone Solar Thermal Power Plant (RF (Pty) Ltd

CONTACT PERSON: Leanna Janse van Rensburg

SIGNATURE: ________________________________

The heritage impact assessment report has been compiled taking into account the NEMA Appendix 6 requirements for specialist reports as indicated in the table below.

NEMA Regs (2014) - Appendix 6	Relevant section in report
Details of the specialist who prepared the report	Page 2 of Report – Contact details and company
The expertise of that person to compile a specialist report including a curriculum vita	Section 1.2 – refer to Appendix A
A declaration that the person is independent in a form as may be specified by the competent authority	Page ii of the report
An indication of the scope of, and the purpose for which, the report was prepared	Section 1.1
The date and season of the site investigation and the relevance of the season to the outcome of the assessment	Section 5.1
A description of the methodology adopted in preparing the report or carrying out the specialised process	Section 3
The specific identified sensitivity of the site related to the activity and its associated structures and infrastructure	Section 5.1
An identification of any areas to be avoided, including buffers	Section 5.1
A map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	No sensitive areas identified refer to Figure 10
A description of any assumptions made and any uncertainties or gaps in knowledge;	Section 1.3
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 5.1
Any mitigation measures for inclusion in the EMPr	Section 7
Any conditions for inclusion in the environmental authorisation	Section 7
Any monitoring requirements for inclusion in the EMPr or environmental authorisation	Section 7
A reasoned opinion as to whether the proposed activity or portions thereof should be authorised and	Section 6
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	
A description of any consultation process that was undertaken during the course of carrying out the study	Not applicable. The public consultation process is being handled as part of the Basic Environmental Impact Assessment process.
A summary and copies if any comments that were received during any consultation process	Not applicable. To date not comments regarding heritage resources that require input from a specialist have been raised.
Any other information requested by the competent authority.	Not applicable.

EXECUTIVE SUMMARY

PGS Heritage (Pty) Ltd was appointed by ACWA Power SolarReserve Redstone Solar Thermal Power Plant (RF (Pty) Ltd to undertake a Heritage Impact Assessment that forms part of the Basic Environmental Impact Assessment for the proposed Photovoltaic Power Plant with the generation capacity of up to 20 MW, with up to 30MW hours storage (the "PV Power Project"), for the auxiliary load requirements of the ACWA Power SolarReserve Redstone Solar Thermal Power Plant (the Redstone CSP Project), on the Remaining Extent of the Farm No.: 469, Hay District. The planned PV Power Project will be located approximately 30 km east of the town Postmasburg in the Northern Cape Province, adjacent to the Redstone CSP Project.

The HIA completed in 2011 (PGS) has shown that the area between Postmasburg and Daniëlskuil generally referred to as the Ghaap plato has a rich history of occupation from the Stone Age with hunter gatherers to the Thlaping and Thlaro during the Iron Age period. The 1800's saw the rise of the Griqua people in the area and their loss of sovereignty after 1880 to Cape rule. The field work of 2011 identified a total of 25 heritage sites of which none are impacted by the proposed additional PV Power Project options of this application.

The heritage impacts assessment discussed in section 5, of this report, indicates a pre-mitigation rating of MEDIUM negative and will be reduced to LOW negative with the implementation of proposed management measures as listed in section 7 of this report.

Further to these recommendations the general Heritage Management Guideline in Section 7 needs to be incorporated in to the EMPr for the PV Power Project.

The overall impact of the development on heritage resources is seen as acceptably low and can impacts can be mitigated to acceptable levels.

TABLE OF CONTENT

List of Figure

Appendixes

A – CV of heritage specialist

TERMINOLOGY AND ABBREVIATIONS

Archaeological resources

This includes:

- material remains resulting from human activity which are in a state of disuse and are in or on land and which are older than 100 years including artefacts, human and hominid remains and artificial features and structures;
- rock art, being any form of painting, engraving or other graphic representation on a fixed rock surface or loose rock or stone, which was executed by human agency and which is older than 100 years, including any area within 10m of such representation;
- wrecks, being any vessel or aircraft, or any part thereof, which was wrecked in South Africa, whether on land, in the internal waters, the territorial waters or in the maritime culture zone of the republic as defined in the Maritimes Zones Act, and any cargo, debris or artefacts found or associated therewith, which is older than 60 years or which SAHRA considers to be worthy of conservation;
- features, structures and artefacts associated with military history which are older than 75 years and the site on which they are found.

Cultural significance

This means aesthetic, architectural, historical, scientific, social, spiritual, linguistic or technological value or significance

Development

This means any physical intervention, excavation, or action, other than those caused by natural forces, which may in the opinion of the heritage authority in any way result in a change to the nature, appearance or physical nature of a place or influence its stability and future well-being, including:

- construction, alteration, demolition, removal or change in use of a place or a structure at a place;
- carrying out any works on or over or under a place;
- subdivision or consolidation of land comprising a place, including the structures or airspace of a place;
- constructing or putting up for display signs or boards;
- any change to the natural or existing condition or topography of land; and
- any removal or destruction of trees, or removal of vegetation or topsoil

Early Stone Age

The archaeology of the Stone Age between 700 000 and 2 500 000 years ago.

Fossil

Mineralised bones of animals, shellfish, plants and marine animals. A trace fossil is the track or footprint of a fossil animal that is preserved in stone or consolidated sediment.

Heritage

That which is inherited and forms part of the National Estate (historical places, objects, fossils as defined by the National Heritage Resources Act 25 of 1999).

Heritage resources

This means any place or object of cultural significance and can include (but not limited to) as stated under Section 3 of the NHRA,

- places, buildings, structures and equipment of cultural significance;
- places to which oral traditions are attached or which are associated with living heritage;
- historical settlements and townscapes;
- landscapes and natural features of cultural significance;
- geological sites of scientific or cultural importance;
- archaeological and palaeontological sites;
- graves and burial grounds, and
- sites of significance relating to the history of slavery in South Africa;

Holocene

The most recent geological time period which commenced 10 000 years ago.

Late Stone Age

The archaeology of the last 30 000 years associated with fully modern people.

Late Iron Age (Early Farming Communities)

The archaeology of the last 1000 years up to the 1800's, associated with iron-working and farming activities such as herding and agriculture.

Middle Stone Age

The archaeology of the Stone Age between 30 000-300 000 years ago, associated with early modern humans.

Palaeontology

Any fossilised remains or fossil trace of animals or plants which lived in the geological past, other than fossil fuels or fossiliferous rock intended for industrial use, and any site which contains such fossilised remains or trace.

Abbreviations	Description
AIA	Archaeological Impact Assessment
ASAPA	Association of South African Professional Archaeologists

CRM	Cultural Resource Management
DEA	Department of Environmental Affairs
DWS	Department of Water and Sanitation
ECO	Environmental Control Officer
EIA practitioner	Environmental Impact Assessment Practitioner
EIA	Environmental Impact Assessment
ESA	Early Stone Age
GPS	Global Positioning System
HIA	Heritage Impact Assessment
I&AP	Interested & Affected Party
LSA	Late Stone Age
LIA	Late Iron Age
MSA	Middle Stone Age
MIA	Middle Iron Age
NEMA	National Environmental Management Act
NHRA	National Heritage Resources Act
PHRA	Provincial Heritage Resources Authority
PSSA	Palaeontological Society of South Africa
SADC	Southern African Development Community
SAHRA	South African Heritage Resources Agency

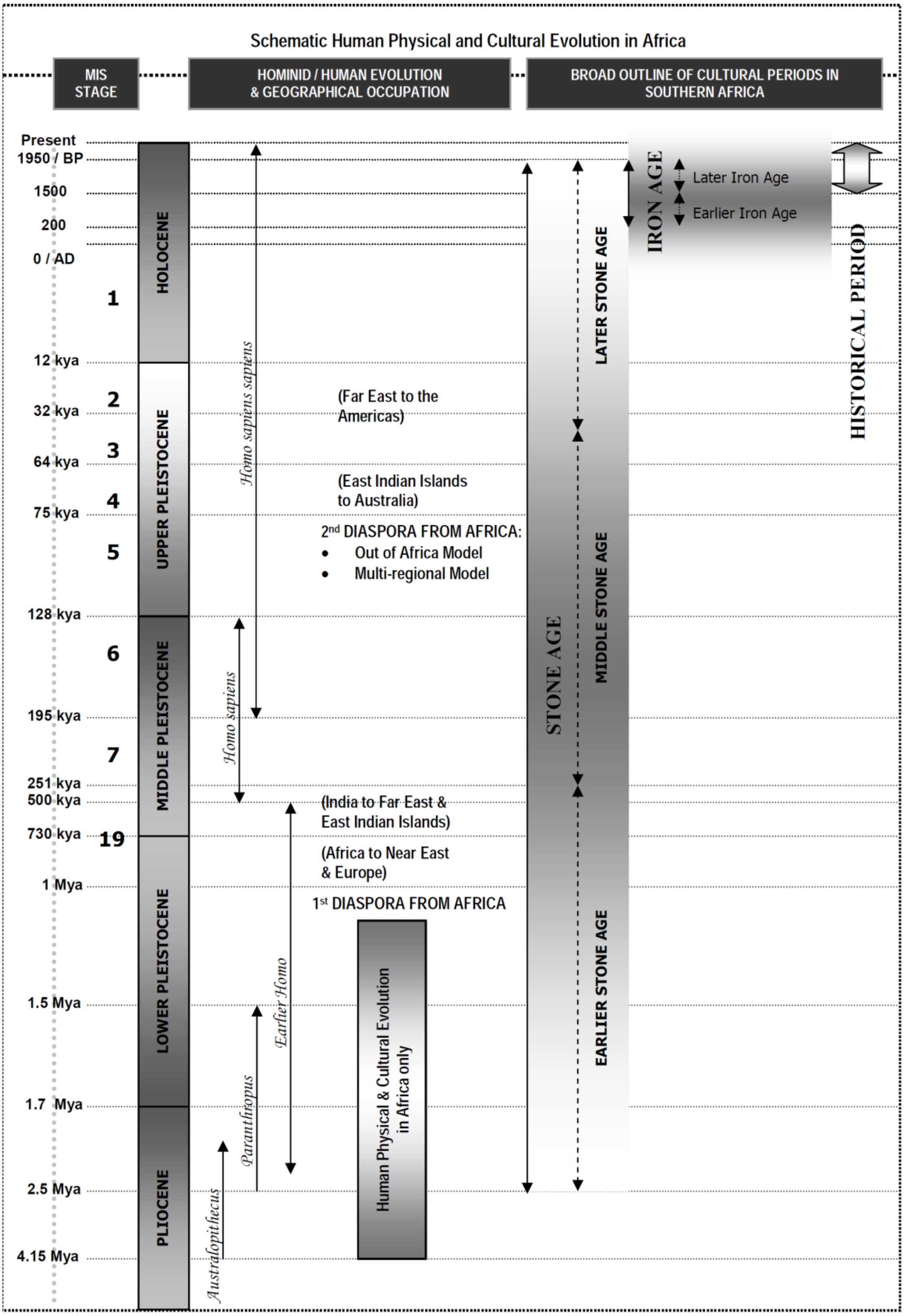

Figure 1: Human and Cultural Time line in Africa (Morris, 2008)

1 INTRODUCTION

PGS Heritage (Pty) Ltd was appointed by ACWA Power SolarReserve Redstone Solar Thermal Power Plant (RF (Pty) Ltd to undertake a Heritage Impact Assessment (HIA) that forms part of the Basic Environmental Impact Assessment (BA) for the proposed Photovoltaic (PV) Power Plant with the generation capacity of up to 20 MW, with up to 30MW hours storage, for the auxiliary load requirements (the "PV Power Project") ACWA Power SolarReserve Redstone Solar Thermal Power Plant (the "Redstone CSP Project"), on the Remaining Extent of the Farm 469, Hay District. The planned PV Power Project will be located approximately 30 km east of the town Postmasburg in the Northern Cape Province, adjacent to the Redstone CSP Project.

1.1 Scope of the Study

The aim of the study is to identify possible heritage sites and finds that may occur in the proposed development footprint. The HIA aims to inform the BA to assist the developer in managing the discovered heritage resources in a responsible manner, in order to protect, preserve, and develop them within the framework provided by the National Heritage Resources Act of 1999 (Act 25 of 1999) (NHRA).

1.2 Specialist Qualifications

This HIA Report was compiled by PGS Heritage (PGS).

The staff at PGS has a combined experience of nearly 40 years in the heritage consulting industry. PGS and its staff have extensive experience in managing HIA processes. PGS will only undertake heritage assessment work where they have the relevant expertise and experience to undertake that work competently.

Wouter Fourie, the Project Coordinator, is registered with the Association of Southern African Professional Archaeologists (ASAPA) as a Professional Archaeologist and is accredited as a Principal Investigator; he is further an Accredited Professional Heritage Practitioner with the Association of Professional Heritage Practitioners (APHP).

1.3 Assumptions and Limitations

Not detracting in any way from the comprehensiveness of the fieldwork undertaken, it is necessary to realise that the heritage resources located during the fieldwork do not necessarily represent all the possible heritage resources present within the area. Various factors account for this, including the subterranean nature of some archaeological sites and the current dense vegetation cover. As such, should any heritage features and/or objects not included in the present inventory be located or observed, a heritage specialist must immediately be contacted.

Such observed or located heritage features and/or objects may not be disturbed or removed in any way until such time that the heritage specialist has been able to make an assessment as to the significance of the site (or material) in question. This applies to graves and cemeteries as well. In the event that any graves or burial places are located during the development, the procedures and requirements pertaining to graves and burials will apply as set out below.

The assessment and findings are based on the fieldwork and subsequent mitigation work completed for the approved Redstone CSP Project – Case Number 2918.

1.4 Legislative Context

The identification, evaluation and assessment of any cultural heritage site, artefact or find in the South African context is required and governed by the following legislation:

- National Environmental Management Act (NEMA), Act 107 of 1998
- National Heritage Resources Act (NHRA), Act 25 of 1999
- Mineral and Petroleum Resources Development Act (MPRDA), Act 28 of 2002

The following sections in each Act refer directly to the identification, evaluation and assessment of cultural heritage resources.

- National Environmental Management Act (NEMA) Act 107 of 1998
  - Basic Environmental Assessment (BEA) – Section (23)(2)(d)
  - Environmental Scoping Report (ESR) – Section (29)(1)(d)
  - Environmental Impact Assessment (EIA) – Section (32)(2)(d)
  - Environmental Management Plan (EMP) – Section (34)(b)
- National Heritage Resources Act (NHRA) Act 25 of 1999
  - Protection of Heritage Resources – Sections 34 to 36; and
  - Heritage Resources Management – Section 38
- Mineral and Petroleum Resources Development Act (MPRDA) Act 28 of 2002
  - Section 39(3)

The NHRA stipulates that cultural heritage resources may not be disturbed without authorization from the relevant heritage authority. Section 34(1) of the NHRA states that, “no person may alter or demolish any structure or part of a structure which is older than 60 years without a permit issued by the relevant provincial heritage resources authority…” The NHRA is utilized as the basis for the identification, evaluation and management of heritage resources and in the case of CRM those resources specifically impacted on by development as stipulated in Section 38 of NHRA. This study falls under s38(8) and requires comment from the relevant heritage resources authority.

2 TECHNICAL DETAILS OF THE PROJECT

2.1 Locality

The proposed PV Power Project Site will be situated on the Remaining Extent of the Farm No. 469, Hay District. The planned PV Power Project will be located approximately 30 km east of the town Postmasburg in the Northern Cape Province, adjacent to the Redstone CSP Project (Figure 2).

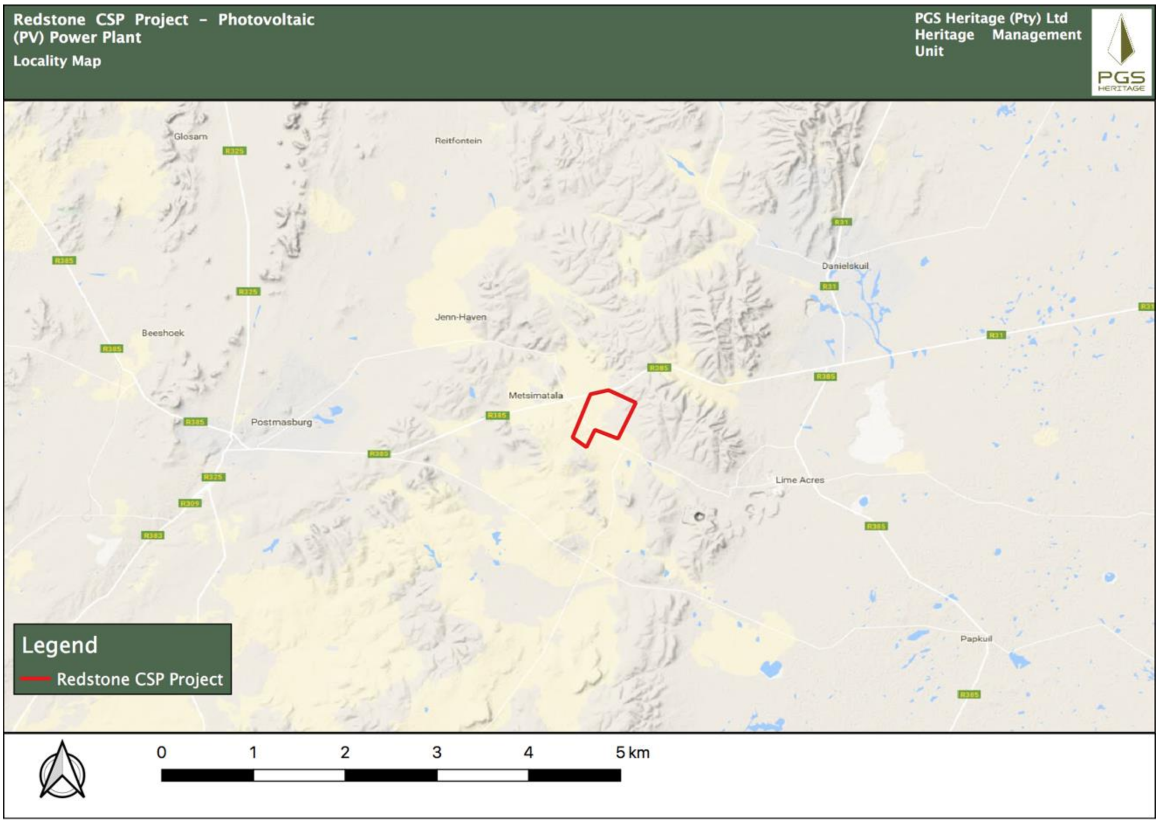

Figure 2: Locality of study area

2.2 Technical Project Description

The ACWA Power SolarReserve Redstone Solar Thermal Power Plant (RF (Pty) Ltd, (Redstone CSP Project) proposes the development, construction and operation of a Photovoltaic (PV) Power Plant with the generation capacity of up to 20 MW, with up to 30MW hours storage, for the auxiliary load requirements, on the Remaining Extent of the Farm 469, Hay District. The planned PV Power Plant will be located approximately 30 km east of the town Postmasburg in the Northern Cape Province, adjacent to the Redstone CSP Project.

The proposed Project Site is located within the governing boundaries of the Tsantsabane Local Municipality and the ZF Mgcawu District Municipality. The PV Power Project is designed to allow the ACWA Power SolarReserve Redstone Solar Thermal Power Plant RF (Pty) Ltd to generate renewable green energy for self-consumption in order to operate and run the Redstone CSP Projects auxiliary load requirements. The Redstone CSP Project was authorised under the National Environmental Management Act 107 of 1998 (NEMA) by the Department of Environmental Affairs (DEA) Ref. Nr 12/12/20/2316 (AM7).

Option A: The PV Power Project is proposed on the western boundary of the Project Site, adjacent to the Redstone CSP Project, for ease of access to the power block/substation (Figure 3).

Option B: The PV Power Project is proposed within the heliostat field of the Redstone CSP Project for ease of access to the power block/substation (Figure 4).

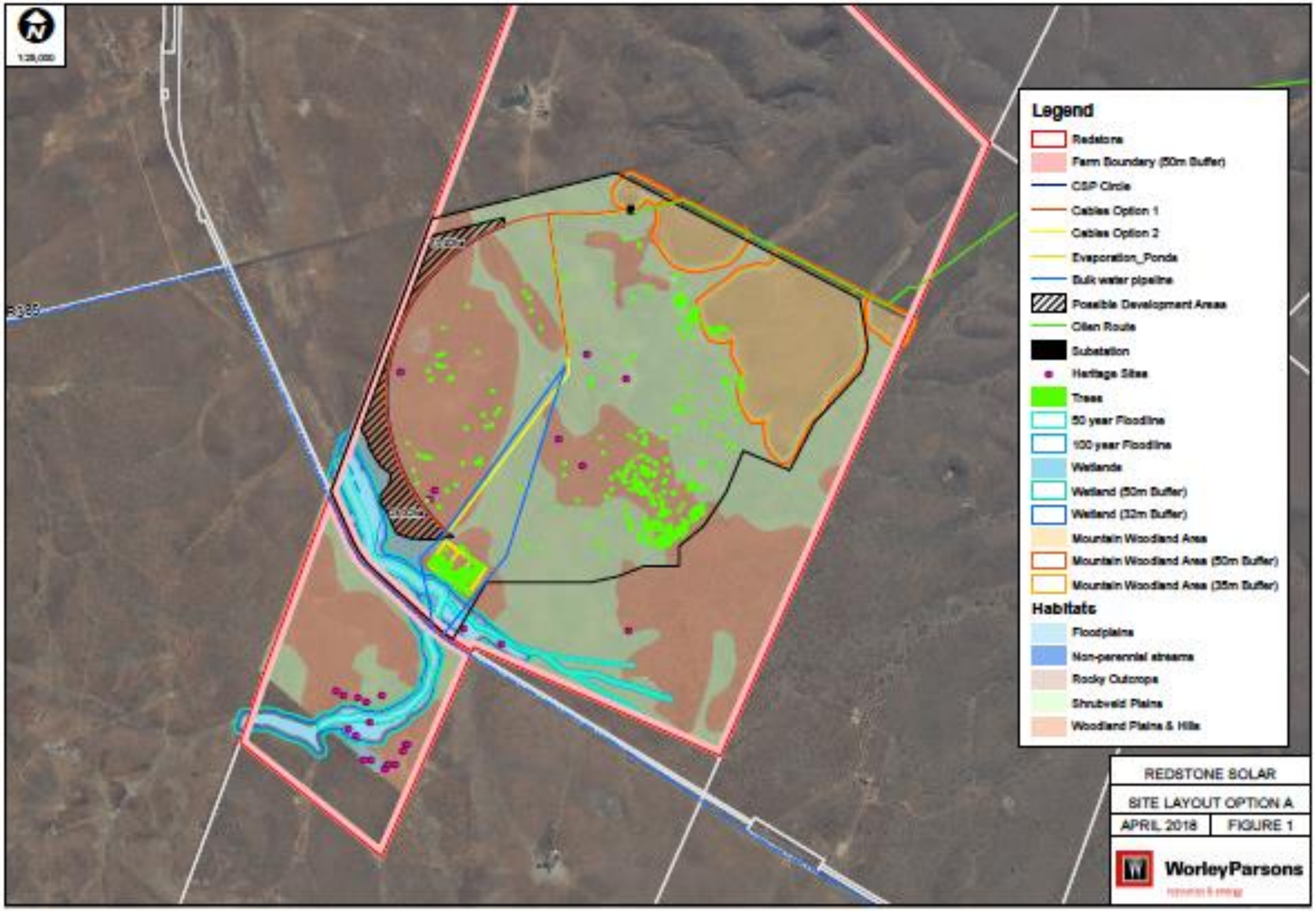

Figure 3: Proposed layout - Option A

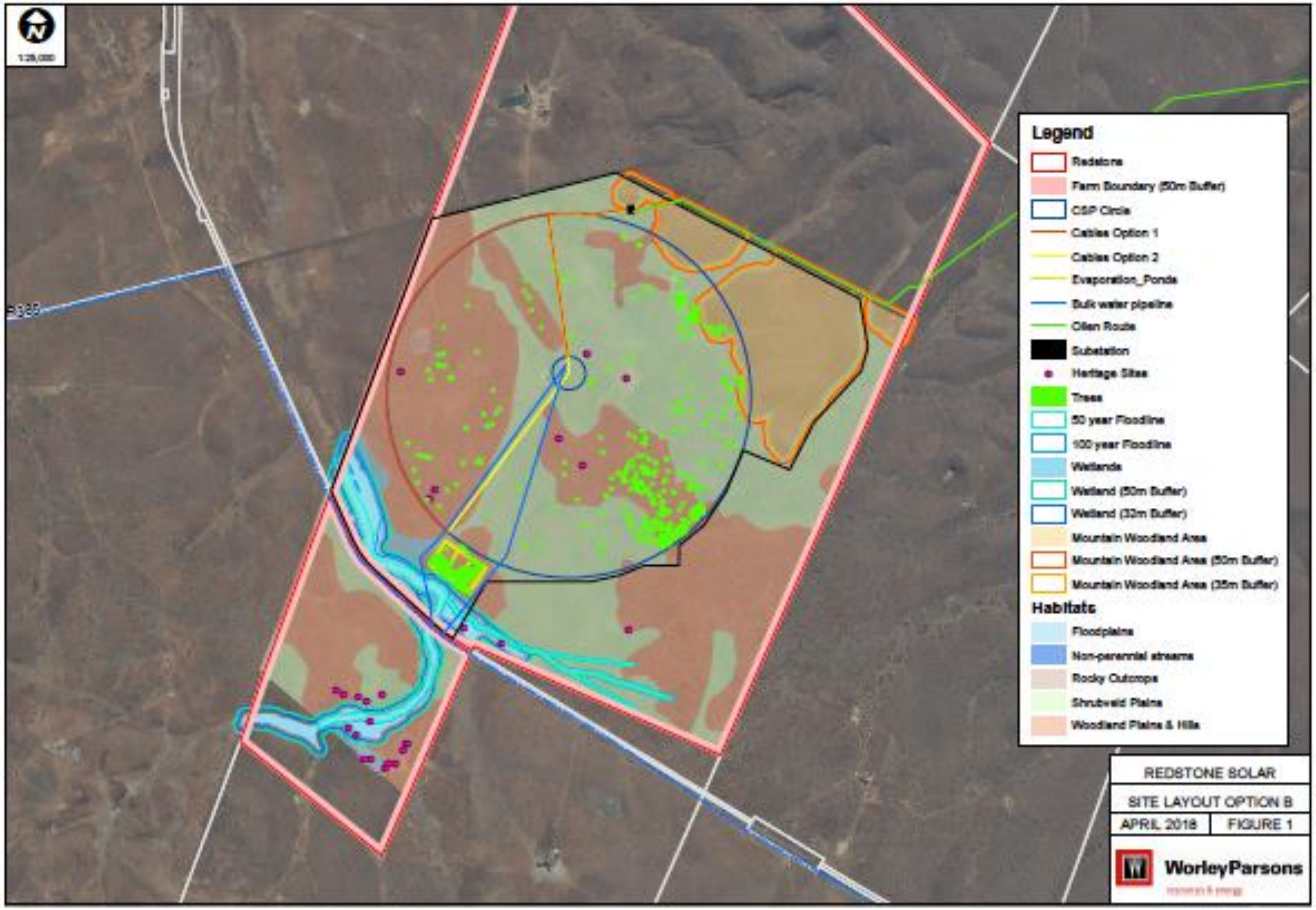

Figure 4: Proposed layout - Option B

Total construction and development costs of the plant are estimated at approximately US$20million. Details on the proposed power generating technology; auxiliary services and infrastructure; and project phases and associated activities are provided below.

Table 1:A brief project overview

Description of affected farm Portions	Remaining Extent of the Farm 469, Hay District Tsantsabane Local Municipality ZF Mgcawu District Municipality
Generation capacity	Up to 20MW
Type of technology	Crystalline - fixed or tracking
Structure heights	3 – 5m above ground (PV Module)
Surface area to be covered	Less than 20ha
Structure orientation	North facing PV power blocks/arrays with inverter and transformer collection
Laydown area dimensions	Not applicable The PV Power Plant will share infrastructure with the ACWA Power SolarReserve Redstone Solar Thermal Power Plant (RF (Pty) Ltd, CSP Plant. No new areas required for this purpose.
Supplementary facilities and services	▪ Substations and electrical systems ▪ Access and security services ▪ Operational power supply and use ▪ Water supply and use ▪ Procurement, storage and use of consumables ▪ Maintenance and repair to operational equipment ▪ Waste management ▪ Emissions management ▪ Storm-water management infrastructure ▪ Management and administration ▪ Staff facilities Fire protection

2.2.1 Photovoltaic Power Technology

The proposed PV Power Project utilises proven technology which produces energy by directly converting solar irradiation into electricity. Power is generated by the solar cells as long as they are exposed to sunlight. PV cell technology has been in continuous operation on earth as well as in space (satellites) for over 30 years. The technology is commercially proven and large multi-megawatt generation plants have been operating since the 1990s. With reference to the process flow diagram and illustrations in Figure 1 and Figure 2, respectively, the PV plant will comprise the following key process components:

2.2.2 PV Panel Field

A PV system consists of PV panels that encase the solar cells. Solar cells are solid-state semiconductor devices that convert light into direct-current electricity. The top layer of the panels is made from a mixture of silicon and phosphorous mixture, which gives it a negative charge. The inner layer, which constitutes the majority of the panel, is a mix of silicon and boron, giving it a positive charge. Where these negative and positively charged layers meet, an electric field (called a junction) is created. A top protective and anti-reflective layer of glass is applied to the surface of the PV panels, to protect the sensitive PV layers below and to prevent photons from reflecting off of the panel resulting in lost energy. As the sun's light (photons) hits the solar cell, they are absorbed into the junction, which "pushes" electrons in the silicon out of the way. When sufficient photons are absorbed, the electrons are pushed past the junction and flow freely to an external circuit.

The panels will be mounted on metal frames with a height of approximately 3-5 m above the ground, supported by rammed, concrete or screw pile foundations, and they will face north in order to capture the optimum amount of sunlight. The facility will either be a fixed PV plant where the solar panels are stationary; or a tracking PV plant where the solar panels rotate to track the sun's movement (the exact type of PV plant system will be determined following on-site solar resource modelling and detailed development design). This will only be determined once the project has reached Final Engineering Design stages.

PV panels are typically up to 6 m^2 in size and will be situated in long rows called arrays, usually made up of approximately 100 m sections extending across the proposed site. The length of the rows and the optimal design and layout will be determined during the Final Engineering Design stages. The general arrangement of the panel arrays may be based on [1 - 5 MW] power blocks or more depending on the final engineering design. A panel surface area of less than 20 hectares is required for the project to generate the required auxiliary load of up to 20MW.

2.2.3 Electrical Inverters and Transformers

The PV cells described above produce Direct Current (DC) electricity which will need to be converted into Alternating Current (AC) electricity prior to integration with the internal grid network. In this regard, approximately [40 - 50 separate inverters, one (1) per power block], may be required. The AC power from the inverters may be stepped-up to approximately 33 kV via pad-mounted transformers located at each inverter station. The inverters may be installed outdoors on concrete pads and under sunshades (to prevent the inverter temperatures exceeding manufacturer's recommended operating conditions), or the inverters may be placed in a prefabricated container that will keep the inverter in a climate-controlled environment.

2.2.4 Storage

The use of renewable energy on a large or utility scale leads to new challenges for grid stability and supply of power during demand periods. Energy storage is a fundamental and critical part of renewable energy systems. This application stabilises power supply, which will allow high quality uninterrupted power supply to the national grid. A modular storage solution is proposed for the

Proposed Project. Batteries and control electronics will be housed inside a modular container type structure/unit or within a built structure. These facilities will be constructed in conjunction with each inverter station and will be approximately 15 x 4 m in size, within the assessed development footprint.

The required power and capacity will be achieved through parallel connection of several solar storage units, which will be adapted to the project's particular requirements and based on the final engineering designs. The integration of the cabinets into containerised enclosures allow for safe operations – environmentally and for its operators. Batteries that are commonly used for storage include (but not limited to): lead-acid, lithium-ion, vanadium redox etc. and will only be determined upon final engineering design stages. Each battery type will be evaluated by the engineering team in order to assess the advantages and disadvantages of the each storage system with respect to the project's requirements on a technical level. The storage units/facility will be fitted with appropriate air-conditioning systems to ensure optimum operation at extreme ambient temperatures along with battery management units, solar central inverters, Switchgear, medium-voltage transformer, measuring and monitoring components, and data communication capabilities.

An effective technique combining a PV energy storage system with a unique smoothing strategy known as the Single Moving Average (SMA) may be applied in order to reduce PV power fluctuations but to also produce power during peak demand. A ramp rate limiter may be used to smooth power fluctuations as part of optimisation. The battery bank (battery blocks) may be placed in a prefabricated container that will keep the storage batteries in a climate controlled environment. Battery storage of up to 30MW hours has been considered for the Proposed Project.

2.2.5 Auxiliary Infrastructure and Services [Shared Csp Infrastructure]

In addition to the key process components/systems described above, the proposed project will require input resources such as water, will generate various waste outputs and will require of a number of support services and facilities such as site access and transportation, electrical systems and network integration, storage and use of consumables, general management and maintenance, safety and security, as well as other general supportive activities. It is further noted that construction-specific services and facilities will be necessary. The decommissioning and closure phase, should the plant not be refurbished once the electricity conversion capacity of the solar cells degrades beyond economic viability, would also involve decommissioning specific services and facilities.

2.2.6 Electrical Systems

PV Power Block Wiring Configuration

Subject to the final design, a typical power plant includes PV panels that may be wired together in groups of around 24 (dependent on the configuration of the plant), in a series configuration (called module strings) to maintain a DC voltage level always within the maximum power point tracking (MPPT) window of the inverter. The module strings are then paralleled for input into approximately 38 circuit, combiner boxes, distributed throughout the PV field for aggregated input into inverters. These module strings may be harnessed to the PV panel mounting structures, and are usually connected in parallel to meet the DC input requirements of the outdoor-rated, fused combiner boxes pole-mounted onto the mounting structures. The combiner boxes may include current monitoring and fault detection on each of the combiner box inputs and a local disconnect switch. Approximately 12 combined DC power feeds from combiner boxes will be underground cabled to the line side of each inverter unit. An estimated 36 of these strings are typically brought together in a single junction box in parallel configuration. 12 junction boxes would then feed to each central inverter station which delivers a maximum of 2 MW of AC power. Two step-up transformers may be located adjacent to each central inverter station.

The output generated by the PV Power plant will be fed into an underground AC-network taking the power to the site substation/power block from where it will be absorbed and utilised by the ACWA Power SolarReserve Redstone Solar Thermal Power Plant (RF (Pty) Ltd, CSP Facility for its auxiliary loads.

Project Substations

The project design will include an 11kV step-up substation that will allow the facility to be connected into the on-site Noko substation/power block connection point.

Network Integration and Switching Yard

The output generated by the PV Power plant will be fed from the PV step up substation via 11kV underground/surface cabling AC-network to the power to the site substation/power block from where it will be absorbed and utilised by the A Redstone CSP Project. Two routing options have been selected for the integration of the power generated by the PV Power Plant:

Route 1: Power to be evacuated via 11kV underground cables/surface cabling within the reserve of the Redstone CSP Project ring-road, to the Noko-Olien Substation and/or the Power Block.

Route 2: Power to be evacuated via 11kV underground cables/overhead power lines within the reserve of the Redstone CSP Project power block access roads, to the Noko-Olien Substation and/or the Power Block.

Please note: the PV Power Plant is designed to provide auxiliary load power to the Redstone CSP Project.

2.2.7 Control and Instrumentation System: [Shared CSP Infrastructure]

The substation which contains the plant switch gear may also contain a pre-engineered power distribution centre (PDC), approximately 3 x 7.5 m, which would house the metering, communication, and Supervisory Control and Data Acquisition (SCADA) equipment. These systems would manage the PV string, mounting structure, combiner and junction box and inverter/transformer unit monitoring, as well as overall system status. The control room may also be equipped with an Ethernet network for inter- and intranet connections and communications.

2.2.8 Earthing Network [Shared CSP Infrastructure]

An earthing system is required in order to prevent injury to staff as well as damage to equipment. The plant switchyard may incorporate a ground grid for personnel and equipment protection in accordance with IEEE standards. Earthing designs will ensure that the step and contact voltage levels will not be exceeded, whether by staff exposure or external exposure due to voltage transfer. In terms of the PV panel field, earthing may be done by means of grouping and earthing. Overhead tie-lines may include an optical ground wire (OPGW) for lightning protection. The earthing system network will be designed in accordance with SANS 62305 (1-4) & SANS10313.

2.2.9 Auxiliary Infrastructure [Shared CSP Infrastructure]

The PV Power Plant will be serviced by internal gravel roads approximately 3m wide in between the PV arrays. As the PV Power Plant is proposed to act as an auxiliary power supply for the existing Redstone CSP Project additional infrastructure and services requirements will be acquired from Redstone CSP Project as approved under EA DEA Ref. No.: 12/12/20/2316 (AM7) –

- Substations and electrical systems
- Access and security services
- Water supply, treatment, storage and use
- Procurement, storage and use of consumables
- Maintenance and repair to operational equipment
- Waste management
- Storm-water management infrastructure
- Management and administration
- Staff facilities
- Fire protection for plant services and infrastructure
- Auxiliary power supply

2.2.10 Construction Activities and Facilities

The construction phase will involve the construction and assembly of the PV panels, electrical systems, buildings, and other infrastructure required for the operation of the plant. In this regard, the activities and/or facilities relevant to the construction phase are listed below, with further details provided thereafter.

- Site establishment and the construction of access roads and services

- Site clearing and earthworks
- Bulk material laydown and consumable stores – shared service CSP
- Refuelling and maintenance – shared service CSP
- Power supply and use – shared service CSP
- Water supply and use – shared service CSP
- Construction camp – shared service CSP
- Staff facilities – shared service CSP
- Management and administration – shared service CSP
- Waste management – shared service CSP

The construction period for the PV Power Plant will take approximately 2 – 6 months.

2.2.11 Operational and Maintenance Activities And Facilities

The operational phase will involve the generation of power using the PV technology and electrical systems as described as well as the day-to-day management and maintenance of associated support services and infrastructure. In this regard, the activities and/or facilities relevant to the operational phase are listed below, with further details provided thereafter.

- Access and security services – shared service CSP
- Generation of electricity using PV technology
- Operational power supply and use
- Water supply, storage and use – shared service CSP
- Procurement, storage and use of consumables – shared service CSP
- Maintenance and repair to operational equipment – shared service CSP
- Waste management – shared service CSP
- Storm-water management infrastructure – shared service CSP
- Management and administration facilities – shared service CSP
- Fire protection for plant services and infrastructure – shared service CSP

The operational period for the PV Power Plant will is linked with that of the Redstone CSP Project Power Purchase Agreement of 25 years.

2.2.12 Decommissioning Activities and Facilities

Depending on refitting and maintenance of the plant as well as national energy market conditions, the PV Project could continue to operate – however long it is required to. However, should plant operations be ceased for whatever reason, decommissioning and closure of the PV Project will be undertaken in accordance with the applicable EIA regulations. It is suggested that a detailed plan for the decommissioning and closure of the facility will be drawn up before operations are ceased and submitted to the relevant competent authority for authorisation and ultimate implementation.

Similar to construction, the removal of the infrastructure associated with the project may involve the preparation of the area, given the amount of machinery and workers that will remain and work on the decommissioning. The following decommissioning activities are relevant:

- Operational access roads are expected to be in good condition and be appropriate for the transit of decommissioning equipment (heavy cranes, special trucks, etc.).
- A small temporary decommissioning camp may be established with associated staff facilities.
- Laydown areas may be prepared as required. In this regard vegetation may require stripping and topsoil may be stockpiled for use in rehabilitation.
- All waste materials and chemicals will be removed for reuse in other facilities or proper management through authorised waste management service providers.
- The elimination of all lubricants and chemical products stored in the plant will be carried out. These products may be sold or turned over to an authorised waste management service provider, as they are not the plant's main components.
- Re-usable elements will be components that can be used again, i.e. are not waste. It is advantageous to find a use for these so-called sub-products, due to the reduced costs involved with the consequent economic and environmental benefits. The possible sub-products from the PV plant may be multiple in terms of type, quantity and volume. Thus, certain substances are not considered "usable", such as electrical system oils, other lubricants, etc. Other materials from the plant may be reusable in other such facilities, depending on their condition.
- The PV panels, including the mounting structures, positioners, etc. will be dismantled and either sold (if still usable) or disposed of at appropriate facilities.
- Storage tanks, pipes and pumps may be managed by recycling or reusing.
- Electrical components will be removed and may be sold as second hand equipment (if usable) or for their copper content.
- Steel structures will be dismantled and may be sold as second hand equipment (if usable) or for their scrap value.
- Concrete structures and buildings (including foundations) will be demolished and the rubble will be disposed of at appropriate facilities, unless otherwise agreed for an alternative use in line with the decommissioning and closure plan.

3 ASSESSMENT METHODOLOGY

The section below outlines the assessment methodologies utilised in the study.

3.1 Methodology for Assessing Heritage Site significance

This HIA report was compiled by PGS for the proposed Redstone PV Project. The applicable maps, tables and figures, are included as stipulated in the NHRA (no 25 of 1999), the National

Environmental Management Act (NEMA) (no 107 of 1998). The HIA process consisted of three steps:

- Step I – Literature Review: The background information to the field survey leans greatly on the Heritage Scoping Report completed by PGS for this site in September 2010.
- Step II – Physical Survey: A physical survey was conducted on foot through the proposed project area by qualified archaeologists (February 2011), aimed at locating and documenting sites falling within and adjacent to the proposed development footprint.
- Step III – The final step involved the recording and documentation of relevant archaeological resources, as well as the assessment of resources in terms of the heritage impact assessment criteria and report writing, as well as mapping and constructive recommendations

The significance of heritage sites was based on four main criteria:

- site integrity (i.e. primary vs. secondary context),
- amount of deposit, range of features (e.g., stonewalling, stone tools and enclosures),
- Density of scatter (dispersed scatter)
    a. Low - <10/50m2
    b. Medium - 10-50/50m2
    c. High - >50/50m2
- uniqueness and
- potential to answer present research questions.

Management actions and recommended mitigation, which will result in a reduction in the impact on the sites, will be expressed as follows:

A - No further action necessary;
B - Mapping of the site and controlled sampling required;
C - No-go or relocate pylon position
D - Preserve site, or extensive data collection and mapping of the site; and
E - Preserve site

Impacts on these sites by the development will be evaluated as follows

3.1.1 Site Significance

Site significance classification standards prescribed by the South African Heritage Resources Agency (2006) and approved by the Association for Southern African Professional Archaeologists (ASAPA) for the Southern African Development Community (SADC) region, were used for the purpose of this report.

Table 2: Site significance classification standards as prescribed by SAHRA

FIELD RATING	GRADE	SIGNIFICANCE	RECOMMENDED MITIGATION
National Significance (NS)	Grade 1	-	Conservation; National Site nomination
Provincial Significance (PS)	Grade 2	-	Conservation; Provincial Site nomination
Local Significance (LS)	Grade 3A	High Significance	Conservation; Mitigation not advised
Local Significance (LS)	Grade 3B	High Significance	Mitigation (Part of site should be retained)
Generally Protected A (GP.A)	-	High / Medium Significance	Mitigation before destruction
Generally Protected B (GP.B)	-	Medium Significance	Recording before destruction
Generally Protected C (GP.A)	-	Low Significance	Destruction

3.2 Methodology for Impact Assessment

The significance (quantification) of potential environmental impacts identified have been determined using a ranking scale, based on the following (terminology has been taken from the Guideline Documentation on EIA Regulations, of the Department of Environmental Affairs and Tourism, April 1998):

3.2.1 Occurrence

- Probability of occurrence (how likely is it that the impact may occur?)
- Duration of occurrence (how long may it last?)

3.2.2 Severity

- Magnitude (severity) of impact (will the impact be of high, moderate or low severity?)
- Scale/extent of impact (will the impact affect the national, regional or local environment, or only that of the site?)

Each of these factors has been assessed for each potential impact using the ranking scales represented.

Table 3: Ranking scale of the four factors considered to determine significance rating

Probability	Duration
1 - very improbable (probably will not happen 2 - improbable (some possibility, but low likelihood) 3 - probable (distinct possibility) 4 - highly probable (most likely) 5 - definite (impact will occur regardless of any prevention measures)	1 - of a very short duration (0–1 years) 2 - of a short duration (2-5 years) 3 - medium-term (5–15 years) 4 - long term (> 15 years) 5 - permanent
Extent	Magnitude

1 - limited to the site 2 - limited to the local area 3 - limited to the region 4 - will be national 5 - will be international	0 - small and will have no effect on the environment 2 - minor and will not result in an impact on processes 4 - low and will cause a slight impact on processes 6 - moderate and will result in processes continuing but in a modified way 8 - high (processes are altered to the extent that they temporarily cease) 10 - very high and results in complete destruction of patterns and permanent cessation of processes

The environmental significance of each potential impact is assessed using the following formula:

Significance Points (SP) = (Magnitude + Duration + Extent) x Probability

The maximum value is 100 Significance Points (SP). Potential environmental impacts were rated as high, moderate or low significance on the following basis:

- < 30 significance points = LOW environmental significance.
- 31- 60 significance points = MODERATE environmental significance
- 60 significance points = HIGH environmental significance

This section in the final impacts table then summarises the potential impacts associated to the three different phases of the proposed development activities. The potential impacts and risks are explored by investigating each aspect (i.e. air quality, Wetland and Ecological, heritage and social) associated to the proposed activities.

For the purpose of this section, the mitigation measures recommended will only be summarising to demonstrate the approach taken to manage each risk. A detailed mitigation plan will form part of the final BAr and EMPr.

Table 4: Explanation of colour indicator

Colour	Significance Points	Explanation
	≤ 30	LOW environmental significance
	31 - 60	MODERATE environmental significance
	> 60	HIGH environmental significance

4 CURRENT STATUS QUO

4.1 Site Description

The property (Figure 5) is bordered to the north by the R385 which connects Daniëlskuil and Postmasburg (Figure 6), and the D3381 gravel road, from Lime Acres, which divides the south western section of the greater Project Site (Figure 7).

The central portion of the greater Project Site is undulating with the low-lying areas covered in grassveld. The areas to the west and east of the central flat lands is characterised by rising rocky ridges covered with shrubs and trees. The greater Project Site is currently being used for grazing by livestock and for the breeding of horses.

The southern and south western section of the Project Site is characterised by perennial stream and a tributary running down from the south western section of the study area. Due to the intermittent rainfall of the area the stream has created a dry pan/flood plain that is only filled during high rainfall episodes (Figure 8).

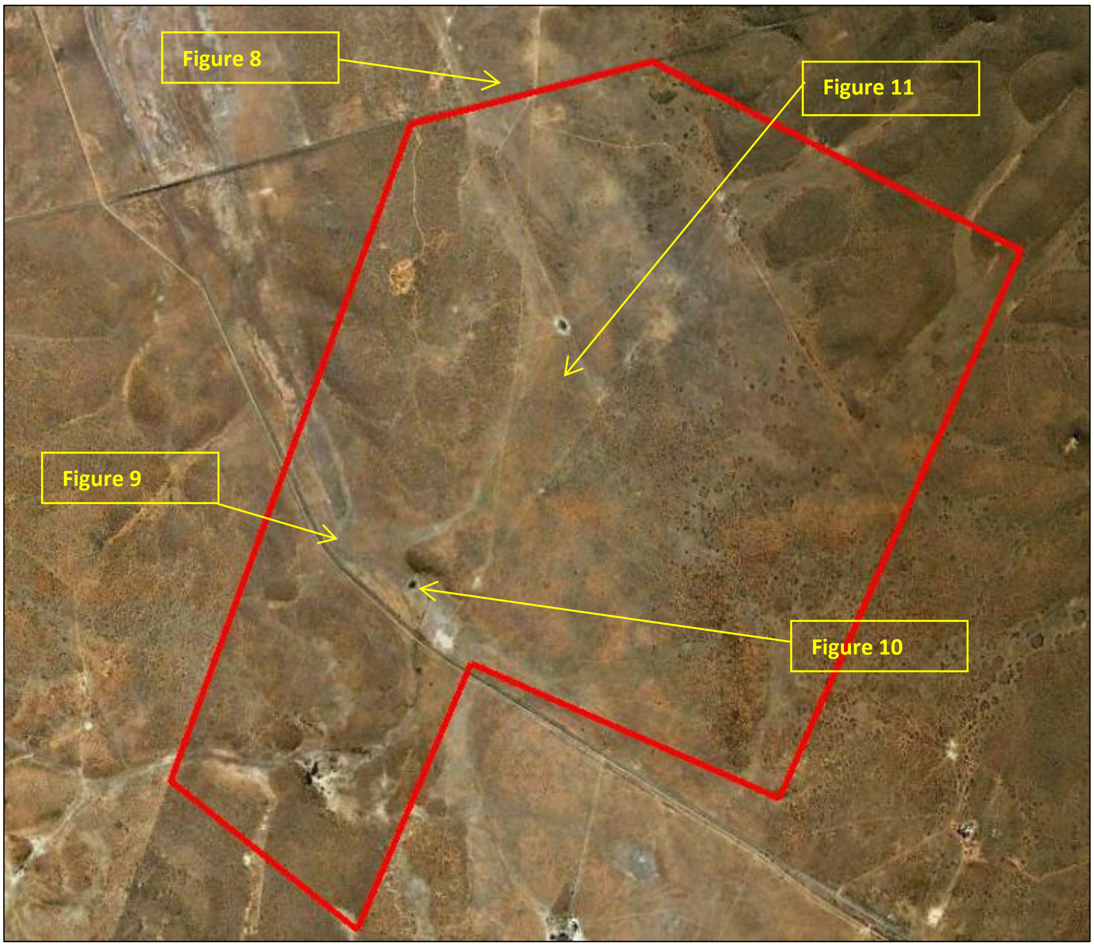

Figure 5: Aerial view of study area with position of photographs shown

Figure 6: View of to the R385 towards Postmasburg (Study area on the left)

Figure 7: View of gravel road and rail line in the southern section of the study area

Figure 8: View of dry pan from rail line in southern section of the study area

The south eastern section of the study area is also characterised by clumps of wild olive trees (Olea europea) (Figure 9).

Figure 9: Wild olive trees in the study area (Webley, 2010)

4.1.1 Archival findings

The original archival research (PGS, 2011) focused on available information sourced that was used to compile a background history of the study area and surrounds. This data then informed the possible heritage resources to be expected during field surveying.

4.1.2 Findings of the Heritage Scoping Document

The findings can be compiled as follow:

Palaeontology

No further palaeontological studies are recommended for this development (Almond, 2011).

Should substantial fossil remains be exposed during construction, however, the ECO should safeguard these, preferably in situ, and alert SAHRA as soon as possible so that appropriate action (e.g. recording, sampling or collection) can be taken by a professional palaeontologist.

Archaeology

The possibility of archaeological finds in the study area has been indicated by previous research in the greater Daniëlskuil-Postmasburg and Ghaap plato area. This is confirmed by a short reconnaissance survey by Webley (2010) and an initial site visit by an archaeologist from PGS of the study area. Concentrations of Stone Age artefact around the dry pans and rivers were found as well as spot finds in the flat sandy areas.

Although the current owners indicated no knowledge of rock art it is recommended that special attention is given to rocky areas as such sites could be prevalent.

Historical

As the area of Groenwater was settled since 1880 as a location for the Thlaping and Thlaro the possibility of scattered homesteads cannot be excluded and the report of Webley (2010) indicates the existence of structures only demarcated by single rows of rocks, indicating the position of the house foundations.

The position of the two wagon routes through the study area also leaves the possibility for ephemeral camp sites and outspans in the study area.

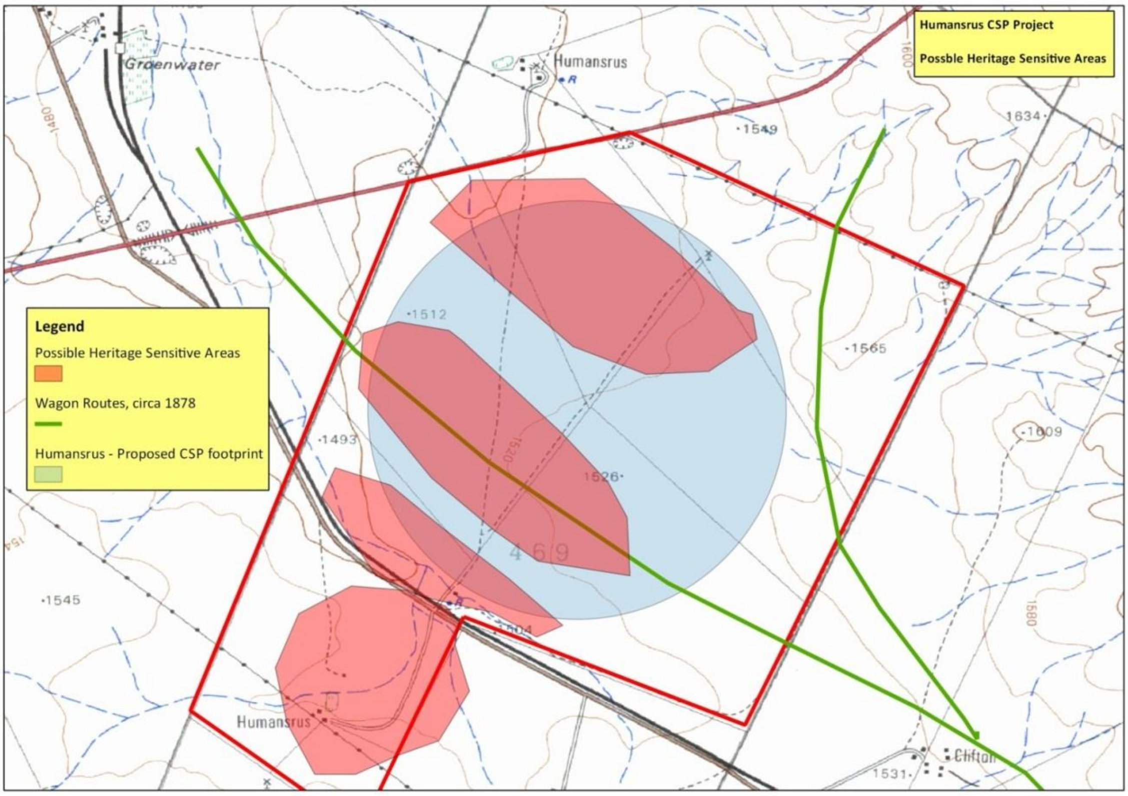

Figure 10: Heritage Sensitivity Map

4.1.3 Field work findings

A follow up visit to the study area was conducted in August 2011 with the aim of conducting an archaeological survey of the development area and giving particular attention to the areas identified during the Scoping phase as being potentially sensitive. Due to the size of the total study area field work focused on the areas identified in Figure 10 as the footprint areas of the development.

The footprint area for this project covers approximately 820 hectares in total. Due to the nature of cultural remains, with the majority of artefacts occurring below surface, a controlled-exclusive surface survey was conducted over a period of 4 days on foot by an archaeologist of PGS.

4.1.4 Heritage sites

The first sites discussed were identified during a survey conducted in November 2010 by the Archaeological Contracts Office (Webley, 2010) and confirmed during the field survey by PGS in August 2011. Together with the field survey of August 2011 revealed the following further sites and find spots close to the proposed PV field.

Table 5: Stone Age Find spots

Site Number	GPS Co-ordinates	Type	Description	Heritage Significance
PGS01	S28 17 46.2 E23 22 05.9	Stone artefacts	Low density scatter of MSA artefacts in pebble layer	Low

PGS02	S28 17 50.6 E23 21 15.3	Stone artefacts	Two large ESA cores	Low
PGS03	S28 18 52.9 E23 22 17.4	Stone artefacts	Low density scatter of MSA artefacts in pebble layer	Low
PGS04	S28 18 12.9 E23 22 04.8	Stone artefacts	Low density scatter of MSA artefacts in pebble layer	Low
PGS05	S28 18 06.4 E23 21 58.4	Stone artefacts	Low density scatter of MSA artefacts in pebble layer	Low
PGS07	S28 18 21.5 E23 21 23.2	Stone artefacts	Low density scatter of MSA artefacts in pebble layer	Low
ACO03	S28 19 16.7 E23 21 01.4	Stone artefacts	Miscellaneous scatter of ESA and LSA stone tools at the water seepage behind the house.	Low
ACO017	S28 18 52.4 E23 21 32.6	Stone artefacts around pan	Mix of ESA and MSA stone artefacts around a shallow pan	Low
ACO018	S28 18 55.9 E23 21 42.9	Stone artefacts along stream bed	MSA artefacts along banks of dry stream bed	Low
ACO019	S28 17 52.0 E23 22 16.7	Stone artefacts around pan	Mainly weathered MSA stone around the margins of a large pan	Low

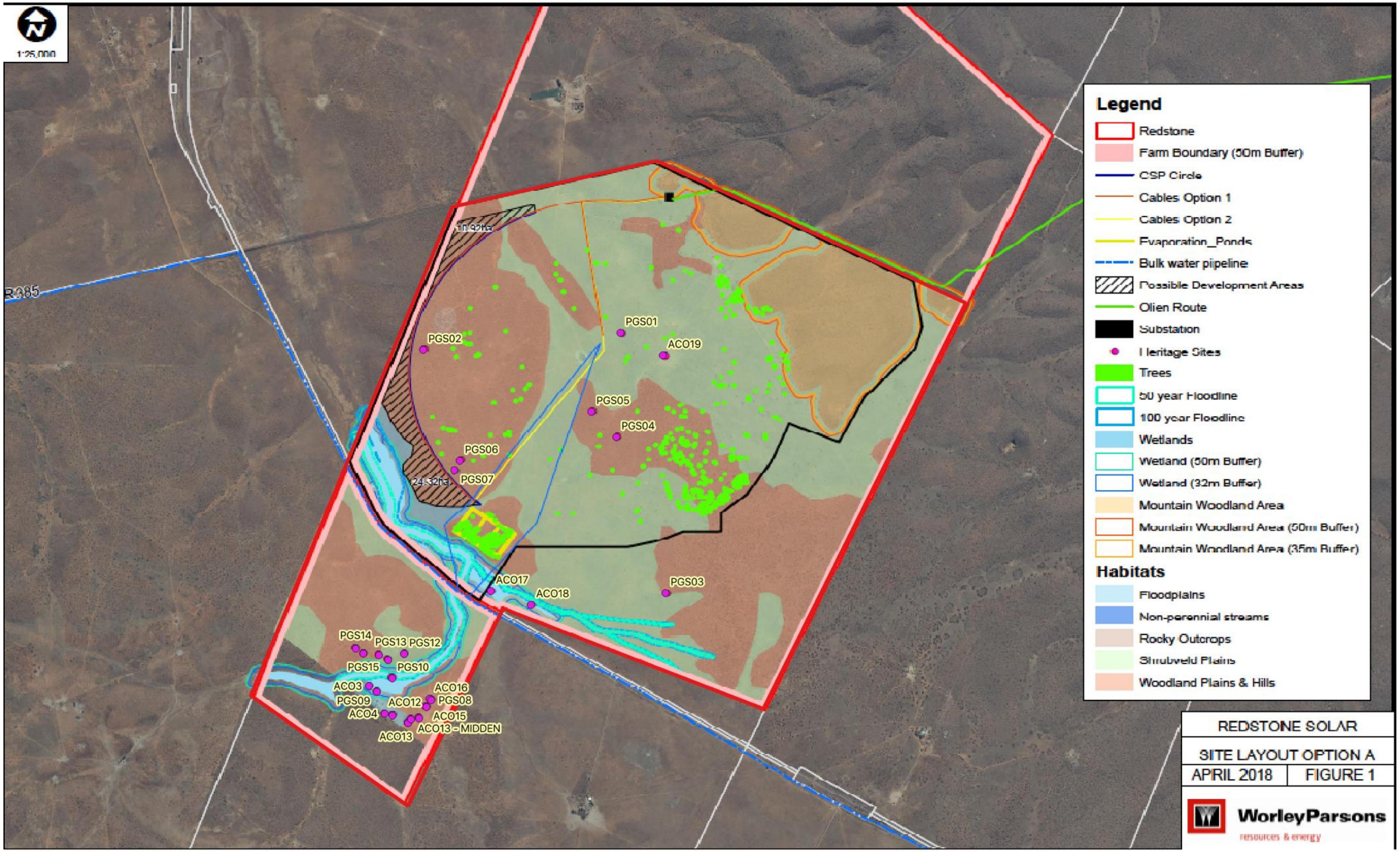

Figure 11: Heritage Resources in relation to the proposed layout A and B

The field work identified numerous areas where low density scatters of Middle and Later Stone Age lithics were present (Figure 12). Most of these scatters were found where pebble layers were exposed. This mostly occurred along dry river beds and pans that occur in the study area. As no context and in situ preservation were identified these sites were grade as of low heritage significance and rated as Generally Protected C.

Evaluating the possible impact of the development on the site the heritage significance must be considered as part of the evaluation, and thus the cost of mitigation or possible mitigation that will then have an implication on the severity of the impact.

PGS01 PGS02

Figure 12: MSA flakes(PGS01) and ESA cores (PGS02) found during the survey

Site PGS06

Coordinates: S28 18 19.0 E23 21 24.6

The site is situated on a low rise on the western side of the CSP foot print (Figure 13). The site is situated in a clearing between the shrub and grass land that characterises the rocky ridges in the western section of the study area. A medium density of MSA flakes , cores and waste are present in situ. A small scan of a $1m^2$ produced between 20-40 flakes and cores.

Site size: Approximately 5m x 5m.

Figure 13: View of site from north

Figure 14: Collection of lithics from site

The site is situated away from dry river beds and pans and points to a localised Stone Age site with indications of napping (production of lithics), the position of the site points to a possible hunting/lookout base. Heritage significance of the site is seen as of Medium significance and rated as Generally Protected B.

This site was mitigated in 2016 and a destruction permit issued by SAHRA – case - 10423

5 IMPACT ASSESSMENT

The impact table listed in this section projects the direct (Table 6) and cumulative impacts (Table 7) on unidentified heritage resources that can possibly be impacted by the development of the PV field. The impact rating system rated the impact on unidentified heritage resources during construction (Table 6) as MEDIUM pre-mitigation and reduced to Low with the implementation of mitigation measures.

The cumulative impact by addition of the proposed PV field on the existing heritage resources within the development is rated as LOW pre-mitigation and further reduced with the implementation of management measures.

Table 6: Direct impacts on heritage resources

Phase Construction					
Aspect:	Heritage				
Activity:	Site and vegetation clearing				
Impact:	Direct impact on chance finding of heritage resources during site clearing				
Significance rating:	Duration	Extent	Magnitude	Probability	Significance
Pre-Mitigation	5	1	10	2	32
Post-Mitigation	5	1	10	1	16
Mitigation Measures:	Demarcate find and manage through management guidelines in section 6 of this HIA Through the National Heritage. Resources Act (NHRA)				

Table 7: Cumulative impacts on heritage resources

Phase Construction					
Aspect:	**Heritage**				
Activity:	Site and vegetation clearing				
Impact:	Cumulative Impacts on heritage resources during site clearing				
Significance rating:	Duration	Extent	Magnitude	Probability	Significance
Pre-Mitigation	5	1	6	2	24
Post-Mitigation	5	1	6	1	12
Mitigation Measures:	Manage through management guidelines in section 6 of this HIA Through the National Heritage. Resources Act (NHRA)				

6 CONCLUSIONS AND RECOMMENDATIONS

The HIA completed in 2011 (PGS) has shown that the area between Postmasburg and Daniëlskuil generally referred to as the Ghaap plato has a rich history of occupation from the Stone Age with hunter gatherers to the Thlaping and Thlaro during the Iron Age period. The 1800's saw the rise of the Griqua people in the area and their loss of sovereignty after 1880 to Cape rule. The field work of 2011 identified a total of 25 heritage sites of which none are impacted by the proposed additional PV options of this application.

Both options are acceptable from a heritage impact perspective.

Further to these recommendations the general Heritage Management Guideline in Section 7 needs to be incorporated in to the EMPr for the project.

The overall impact of the development on heritage resources is seen as acceptably low and can impacts can be mitigated to acceptable levels.

7 HERITAGE MANAGEMENT GUIDELINES

7.1 General Management Guidelines

1) The National Heritage Resources Act (Act 25 of 1999) states that, any person who intends to undertake a development categorised as-
    a) the construction of a road, wall, transmission line, pipeline, canal or other similar form of linear development or barrier exceeding 300m in length;
    b) the construction of a bridge or similar structure exceeding 50m in length;
    c) any development or other activity which will change the character of a site-
        i) exceeding 5 000 m^2 in extent; or
        ii) involving three or more existing erven or subdivisions thereof; or
        iii) involving three or more erven or divisions thereof which have been consolidated within the past five years; or
        iv) the costs of which will exceed a sum set in terms of regulations by SAHRA or a provincial heritage resources authority;
    d) the re-zoning of a site exceeding 10 000 m^2 in extent; or
    e) any other category of development provided for in regulations by SAHRA or a provincial heritage resources authority, must at the very earliest stages of initiating such a development, notify the responsible heritage resources authority and furnish it with details regarding the location, nature and extent of the proposed development.

In the event that an area previously not included in an archaeological or cultural resources survey is to be disturbed, the South African Heritage Resources Agency (SAHRA) needs to be contacted. An enquiry must be lodged with them into the necessity for a Heritage Impact Assessment.

2) In the event that a further heritage assessment is required it is advisable to utilise a qualified heritage practitioner preferably registered with the Cultural Resources Management Section (CRM) of the Association of Southern African Professional Archaeologists (ASAPA).
3) This survey and evaluation must include:
    (a) The identification and mapping of all heritage resources in the area affected;
    (b) An assessment of the significance of such resources in terms of the heritage assessment criteria set out in section 6 (2) or prescribed under section 7 of the National Cultural Resources Act;
    (c) An assessment of the impact of the development on such heritage resources;
    (d) An evaluation of the impact of the development on heritage resources relative to the sustainable social and economic benefits to be derived from the development;
    (e) The results of consultation with communities affected by the proposed development and other interested parties regarding the impact of the development on heritage resources;
    (f) If heritage resources will be adversely affected by the proposed development, the consideration of alternatives; and
    (g) Plans for mitigation of any adverse effects during and after the completion of the proposed development.
4) It is advisable that an information section on cultural resources be included in the SHEQ training given to contractors involved in surface earthmoving activities. These sections must include basic information on:
    a. Heritage;
    b. Graves;
    c. Archaeological finds; and
    d. Historical Structures.
5) This module must be tailor made to include all possible finds that could be expected in that area of construction.
6) In the event that a possible find is discovered during construction, all activities must be halted in the area of the discovery and a qualified archaeologist contacted.
7) The archaeologist needs to evaluate the finds on site and make recommendations towards possible mitigation measures.
8) If mitigation is necessary, an application for a rescue permit must be lodged with SAHRA.
9) After mitigation an application must be lodged with SAHRA for a destruction permit. This application must be supported by the mitigation report generated during the rescue excavation. Only after the permit is issued may such a site be destroyed.

10) If during the initial survey sites of cultural significance is discovered, it will be necessary to develop a management plan for the preservation, documentation or destruction of such a site. Such a program must include an archaeological/palaeontological monitoring programme, timeframe and agreed upon schedule of actions between the company and the archaeologist.
11) In the event that human remains are uncovered or previously unknown graves are discovered a qualified archaeologist needs to be contacted and an evaluation of the finds made.
12) If the remains are to be exhumed and relocated, the relocation procedures as accepted by SAHRA needs to be followed. This includes an extensive social consultation process.

The definition of an archaeological/palaeontological monitoring programme is a formal program of observation and investigation conducted during any operation carried out for non-archaeological reasons. This will be within a specified area or site on land, inter-tidal zone or underwater, where there is a possibility that archaeological deposits may be disturbed or destroyed. The programme will result in the preparation of a report and ordered archive.

The purpose of an archaeological/palaeontological monitoring programme is:

- To allow, within the resources available, the preservation by record of archaeological/palaeontological deposits, the presence and nature of which could not be established (or established with sufficient accuracy) in advance of development or other potentially disruptive works
- To provide an opportunity, if needed, for the watching archaeologist to signal to all interested parties, before the destruction of the material in question, that an archaeological/palaeontological find has been made for which the resources allocated to the watching brief itself are not sufficient to support treatment to a satisfactory and proper standard.
- A monitoring is not intended to reduce the requirement for excavation or preservation of known or inferred deposits, and it is intended to guide, not replace, any requirement for contingent excavation or preservation of possible deposits.
- The objective of the monitoring is to establish and make available information about the archaeological resource existing on a site.

PGS can be contacted on the way forward in this regard.

Table 8: Roles and responsibilities of archaeological and heritage management

ROLE	RESPONSIBILITY	IMPLEMENTATION
A responsible specialist needs to be allocated and should sit in at all relevant meetings, especially when changes in design are discussed, and liaise with SAHRA.	The client	Archaeologist and a competent archaeology supportive team
If chance finds and/or graves or burial grounds are identified during construction or operational phases, a specialist must be contacted in due course for evaluation.	The client	Archaeologist and a competent archaeology supportive team

ROLE	RESPONSIBILITY	IMPLEMENTATION
Comply with defined national and local cultural heritage regulations on management plans for identified sites.	The client	Environmental Consultancy and the Archaeologist
Consult the managers, local communities and other key stakeholders on mitigation of archaeological sites.	The client	Environmental Consultancy and the Archaeologist
Implement additional programs, as appropriate, to promote the safeguarding of our cultural heritage. (i.e. integrate the archaeological components into employee induction course).	The client	Environmental Consultancy and the Archaeologist,
If required, conservation or relocation of burial grounds and/or graves according to the applicable regulations and legislation.	The client	Archaeologist, and/or competent authority for relocation services
Ensure that recommendations made in the Heritage Report are adhered to.	The client	The client
Provision of services and activities related to the management and monitoring of significant archaeological sites.	The client	Environmental Consultancy and the Archaeologist
After the specialist/archaeologist has been appointed, comprehensive feedback reports should be submitted to relevant authorities during each phase of development.	Client and Archaeologist	Archaeologist

7.2 All phases of the project

7.2.1 Archaeology

Based on the findings of the HIA, all stakeholders and key personnel should undergo an archaeological induction course during this phase. Induction courses generally form part of the employees' overall training and the archaeological component can easily be integrated into these training sessions. Two courses should be organised – one aimed more at managers and supervisors, highlighting the value of this exercise and the appropriate communication channels that should be followed after chance finds, and the second targeting the actual workers and getting them to recognize artefacts, features and significant sites. This needs to be supervised by a qualified archaeologist. This course should be reinforced by posters reminding operators of the possibility of finding archaeological/palaeontological sites.

The project will encompass a range of activities during the construction phase, including ground clearance, establishment of construction camps area and small scale infrastructure development associated with the project.

It is possible that cultural material will be exposed during operations and may be recoverable, but this is the high-cost front of the operation, and so any delays should be minimised. Development surrounding infrastructure and construction of facilities results in significant disturbance, but construction trenches do offer a window into the past and it thus may be possible to rescue some of the data and materials. It is also possible that substantial alterations will be implemented during this phase of the project and these must be catered for. Temporary infrastructure is often changed or added to the subsequent history of the project. In general these are low impact developments as they are superficial, resulting in little alteration of the land surface, but still need to be catered for.

During the construction phase, it is important to recognize any significant material being unearthed, making and to make the correct judgment on which actions should be taken. A responsible archaeologist/palaeontologist must be appointed for this commission. This person does not have to be a permanent employee, but needs to sit in at relevant meetings, for example when changes in design are discussed, and notify SAHRA of these changes. The archaeologist would inspect the site and any development recurrently, with more frequent visits to the actual workface and operational areas.

In addition, feedback reports can be submitted by the archaeologist to the client and SAHRA to ensure effective monitoring. This archaeological monitoring and feedback strategy should be incorporated into the Environmental Management Plan (EMP) of the project. Should an archaeological/palaeontological site or cultural material be discovered during construction (or operation), such as burials or grave sites, the project needs to be able to call on a qualified expert to make a decision on what is required and if it is necessary to carry out emergency recovery. SAHRA would need to be informed and may give advice on procedure. The developers therefore should have some sort of contingency plan so that operations could move elsewhere temporarily while the material and data are recovered. The project thus needs to have an archaeologist/palaeontologist available to do such work. This provision can be made in an archaeological/palaeontological monitoring programme.

7.2.2 Graves

In the case where a grave is identified during construction the following measures must be taken.

Mitigation of graves will require a fence around the cemetery with a buffer of at least 20 meters.

If graves are accidentally discovered during construction, activities must cease in the area and a qualified archaeologist be contacted to evaluate the find. To remove the remains a rescue permit must be applied for with SAHRA and the local South African Police Services must be notified of the find.

Where it is then recommended that the graves be relocated a full grave relocation process that includes comprehensive social consultation must be followed.

The grave relocation process must include:

i. A detailed social consultation process, that will trace the next-of-kin and obtain their consent for the relocation of the graves, that will be at least 60 days in length;
ii. Site notices indicating the intent of the relocation
iii. Newspaper Notice indicating the intent of the relocation
iv. A permit from the local authority;
v. A permit from the Provincial Department of health;
vi. A permit from the South African Heritage Resources Agency if the graves are older than 60 years or unidentified and thus presumed older than 60 years;
vii. An exhumation process that keeps the dignity of the remains intact;
viii. An exhumation process that will safeguard the legal implications towards the developing company;
ix. The whole process must be done by a reputable company that are well versed in relocations;
x. The process must be conducted in such a manner as to safeguard the legal rights of the families as well as that of the developing company.

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Appendix A – CV of heritage specialist

PROFESSIONAL CURRICULUM
FOR WOUTER FOURIE

Name: Wouter Fourie
Profession: Archaeologist
Date of birth: 1974-04-30
Parent Firm: PGS Heritage (Pty) Ltd
Position at Firm: Director
Years with firm: 15
Years of experience: 21
Nationality: South African
HDI Status: White

EDUCATION:

Name of University or Institution : University of Pretoria
Degree obtained : BA
Major subjects : Archaeology, Geography and Anthropology
Year : 1996

Name of University or Institution : University of Pretoria
Degree obtained : BA [Hons] (Cum laude)
Major subjects : Archaeology and Geography
Year : 1997

Name of University or Institution : National Nuclear Regulator
Certificate obtained : Radiation Protection Officer Certificate
Year : 1999

Name of University or Institution : University of Cape Town
Certificate obtained : Project Management Foundations short course
Year : 2015

Name of University or Institution : University of Cape Town
Certificate obtained : MPhil – Conservation of Built Environment
Year : 2016-Current

Professional Qualifications:
Professional Heritage Practitioner – Association of Professional Heritage Practitioners (APHP)
Professional Archaeologist - Association of Southern African Professional Archaeologists - Professional Member – No 043

CRM Accreditation
Principal Investigator - Grave Relocations
Field Director – Iron Age
Field Supervisor – Colonial Period and Stone Age
Accredited with Amafa KZN

KEY QUALIFICATIONS
Archaeological Mitigation and excavations, Cultural Resource Management and Heritage Impact Assessment Management, Project management, Archaeology, Anthropology,

Applicable survey methods, Fieldwork and project management, Geographic Information Systems

INTERNATIONAL PROJECTS

- 2017 – current: Position: Heritage Specialist and Project Manager – Lesotho Highland Development Authority – Polihali Dam Project - Heritage Management Plan development and Implementation. Mokhotlong, Kingdom of Lesotho – Project Value: R 35,5 mil
- 2016 – current – Position: Heritage Specialist and Project Manager - Anadarko International – Grave Relocation Action Plan and implementation for the Afungi Liquid Natural Gas Project, Palma, Northern Mozambique – Project Value: R 2,5 mil
- 2013 – 2016 - Position: Heritage Specialist and Project Manager - SLR Consulting - Heritage Impact Assessment, Manica Gold Project, Manica Province, Mozambique - Project Value: R 80 000
- 2012 - Position: Heritage Specialist and Project Manager - SLR Consulting - Heritage Impact Assessment, Namoya SALR – Gold Mine, Maniema Province in the eastern Democratic Republic of Congo (DRC) - Project Value: R 120 000
- 2012 - Position: Heritage Specialist and Project Manager - Consolidated Contractors Group S.A.L. -Mitigation and Grave Relocation at Site 37-A3-16 on the Mahalpye to Kudumatse Road Construction Project Central District, Botswana - Project Value: R 90 000

HERITAGE IMPACT ASSESSMENTS

South African

Below a selected list of over 400 heritage studies completed

2017

- Manungu Colliery, Heritage Impact Assessment. Carolina, Mpumalanga. – Position: Heritage Specialist. Project Value: R 65 000.
- Ilima Colliery, Heritage Impact Assessment. Carolina, Mpumalanga. – Position: Heritage Specialist. Project Value: R 110 000.
- Clanwilliam Dam Heritage Project (2014-2017). Clanwilliam, Western Cape. Department of Water and Sanitation – Position: Heritage Specialist. Project Value: R 7,5 mil
- Leeuwberg Wind Energy Project. Loeriesfontein, Northern Cape. SiVEST. – Position: Heritage Specialist. Project Value: R 120 000.
- Leeudoringstad Solar Energy Project. North West Province. SiVEST. – Position: Heritage Specialist. Project Value: R 50 000.
- Lephalale Combined Power Project, Limpopo Province. Kongiwe Environmental. – Position: Heritage Specialist. Project Value: R 100 000.

POSITIONS HELD

- 2003 – current: Director - PGS Heritage (Pty) Ltd
- 2006 – 2008: Project Manager – Matakoma-ARM, Heritage Contracts Unit, University of the Witwatersrand
- 2005-2007: Director – Matakoma Heritage Consultants (Pty) Ltd
- 2000-2004: CEO– Matakoma Consultants
- 1998-2000: Environmental Coordinator – Randfontein Estates Limited. Randfontein, Gauteng
- 1997-1998: Environmental Officer – Department of Minerals and Energy. Johannesburg, Gauteng