PGS
HERITAGE & GRAVE
RELOCATION CONSULTANTS

SolarReserve SA (Pty) Ltd

132kV Power line connection to the Humansrus Solar Thermal Energy Power Plant, Postmasburg

Heritage Impact Assessment

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Declaration of Independence

The report has been compiled by PGS Heritage & Grave Relocation Consultants an appointed Heritage Specialist for SiVest. The views stipulated in this report are purely objective and no other interests are displayed during the decision making processes discussed in the Heritage Impact Assessment Process that includes the Scoping as well as this final report

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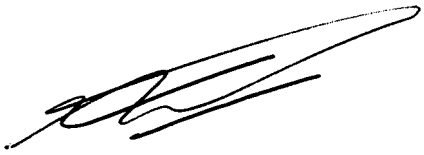

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EXECUTIVE SUMMARY

The HI, 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.

Table 1: Comparison of summarised impacts on environmental parameters

Environmental parameter	**Issues**	**Rating prior to mitigation**	**Average**	**Rating post mitigation**	**Average**
Heritage	Destruction of cemetery	-72	High negative	-12	Low negative
	Impact on cultural landscape	-36	Medium negative	-30	Medium Nagative
			- 54		**-21**
			High Negative Impact		Low Negative Impact

Cemetery - **HR1**

It is recommended that the Option 1A be adjusted to accommodate the cemetery and that the cemetery e fenced with a 10 meter buffer.

It is further recommended that in the event that the cemeteries cannot be incorporated in to the alignment parameters, the graves be relocated after a full grave relocation process that includes comprehensive social consultation. The grave relocation process must include:

- 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;
- Site notices indicating the intent of the relocation
- Newspaper Notice indicating the intent of the relocation
- A permit from the local authority;
- A permit from the Provincial Department of health;
- 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;
- An exhumation process that keeps the dignity of the remains and family intact;

- An exhumation process that will safeguard the legal implications towards the developer;
- The whole process must be done by a reputable company that are well versed in relocations;
- The process must be conducted in such a manner as to safeguard the legal rights of the families as well as that of the development company.

Further to these recommendations the general Heritage Management Guideline in Sections 6 needs to be incorporated in to the EMP 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.

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1 INTRODUCTION

PGS Heritage & Grave Relocation Consultants was appointed by SiVest to undertake a Heritage Impact Assessment (HIA) that forms part of the Basic Environmental Assessment (BA) for the 132kV power line connection from the Concentrated Solar Project for SolarReserve SA (Pty) Ltd "Humansrus Solar Park", on the farm 469 "Humansrus" close to Postmasburg in the Northern Cape Province.

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 area. The Heritage Impact Assessment (HIA) aims to inform the EIA in the development of a comprehensive EMP 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 Heritage Scoping Report was compiled by PGS Heritage & Grave Relocation Consultants (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, Principal Archaeologist for this project, and the two field archaeologist, Henk Steyn and Marko Hutton are registered with the Association of Southern African Professional Archaeologists (ASAPA) and has CRM accreditation within the said organisation.

Since 2002 Dr Almond has also carried out palaeontological impact assessments for developments and conservation areas in the Western, Eastern and Northern Cape under the

aegis of his Cape Town-based company Natura Viva cc. He is a long-standing member of the Archaeology, Palaeontology and Meteorites Committee for Heritage Western Cape (HWC) and an advisor on palaeontological conservation and management issues for the Palaeontological Society of South Africa (PSSA), HWC and SAHRA. He is currently compiling technical reports on the provincial palaeontological heritage of Western, Northern and Eastern Cape for SAHRA and HWC. Dr Almond is an accredited member of PSSA and APHAP (Association of Professional Heritage Assessment Practitioners – Western Cape).

1.3 Assumptions and Limitations

Not subtracting 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 had 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.

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:

i. National Environmental Management Act (NEMA) Act 107 of 1998
ii. National Heritage Resources Act (NHRA) Act 25 of 1999
iii. Minerals and Petroleum Resources Development Act (MPRDA) Act 28 of 2002
iv. Development Facilitation Act (DFA) Act 67 of 1995

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

i. National Environmental Management Act (NEMA) Act 107 of 1998
    a. Basic Environmental Assessment (BEA) – Section (23)(2)(d)
    b. Environmental Scoping Report (ESR) – Section (29)(1)(d)
    c. Environmental Impacts Assessment (EIA) – Section (32)(2)(d)
    d. EMP (EMP) – Section (34)(b)
ii. National Heritage Resources Act (NHRA) Act 25 of 1999
    a. Protection of Heritage resources – Sections 34 to 36; and
    b. Heritage Resources Management – Section 38
iii. Minerals and Petroleum Resources Development Act (MPRDA) Act 28 of 2002
    a. Section 39(3)
iv. Development Facilitation Act (DFA) Act 67 of 1995
    a. The GNR.1 of 7 January 2000: Regulations and rules in terms of the Development Facilitation Act, 1995. Section 31.

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 NEMA (No 107 of 1998) states that an integrated EMP should (23:2 (b)) "…identify, predict and evaluate the actual and potential impact on the environment, socio-economic conditions and cultural heritage". In accordance with legislative requirements and EIA rating criteria, the regulations of SAHRA and ASAPA have also been incorporated to ensure that a comprehensive legally compatible AIA report is compiled.

1.5 Terminology and Abbreviations

Table 2: List of abbreviations

Abbreviations	***Description***
AIA	Archaeological Impact Assessment
ASAPA	Association of South African Professional Archaeologists
CRM	Cultural Resource Management
DEA	Department of Environmental Affairs
DWA	Department of Water Affairs
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 Agency
PSSA	Palaeontological Society of South Africa
ROD	Record of Decision
SADC	Southern African Development Community
SAHRA	South African Heritage Resources Agency

Archaeological resources

This includes:

i. 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;

ii. 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;

iii. 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;

iv. 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 the change to the nature, appearance or physical nature of a place or influence its stability and future well-being, including:

i. construction, alteration, demolition, removal or change in use of a place or a structure at a place;
ii. carrying out any works on or over or under a place;
iii. subdivision or consolidation of land comprising a place, including the structures or airspace of a place;
iv. constructing or putting up for display signs or boards;
v. any change to the natural or existing condition or topography of land; and
vi. 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 2500 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

Holocene

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

Late Stone Age

The archaeology of the last 20 000 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 20-300 000 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.

Refer to **Appendix B** for further discussions on heritage management and legislative frameworks

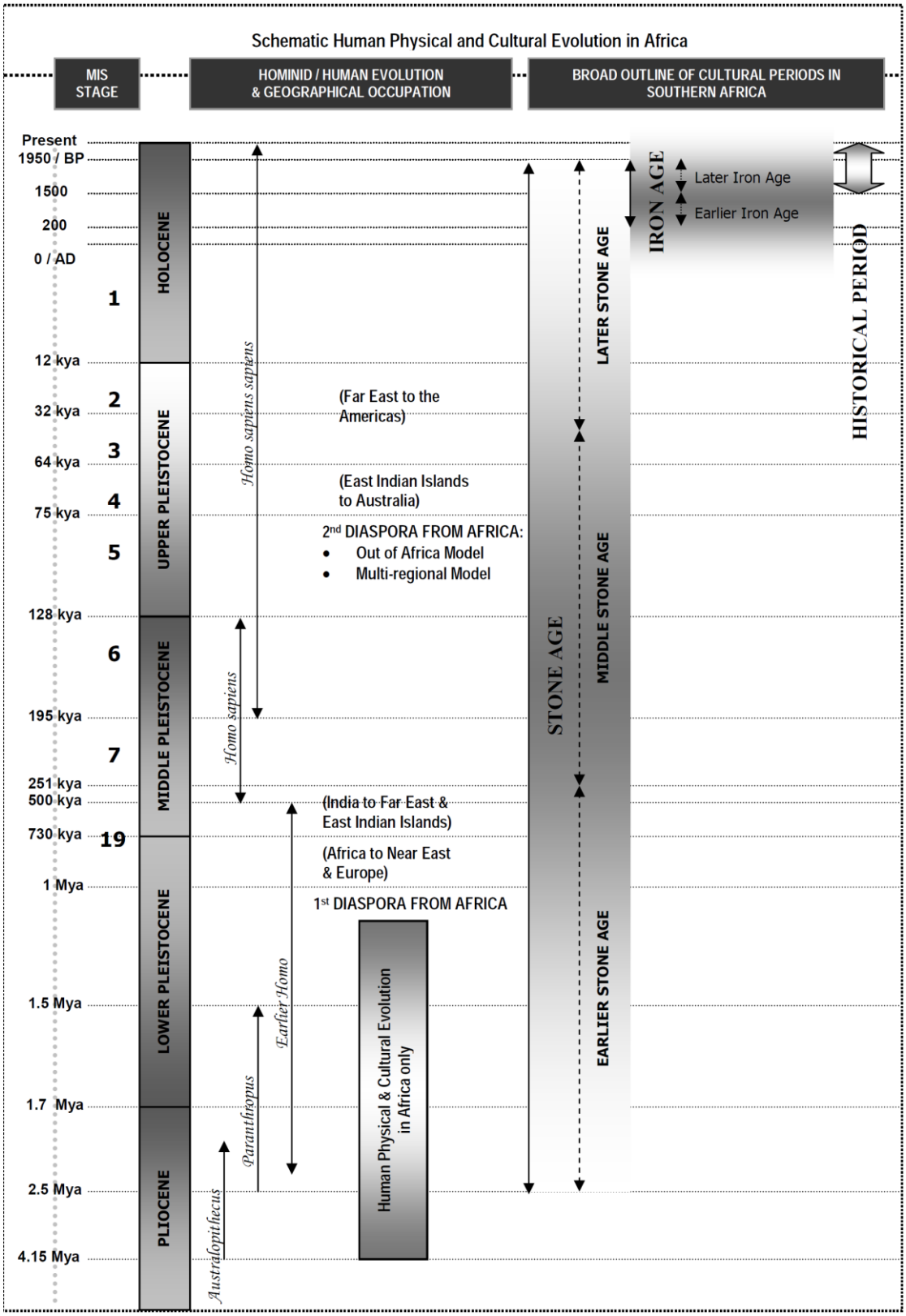


Figure 1 – Human and Cultural Time line in Africa (Morris, 2008)

2 TECHNICAL DETAILS OF THE PROJECT

2.1 Site Location and Description

Location	(E23.37224,S28.32263), The land is situated 30 kilometres west of Postmasburg on the R385.
Land	3 alignment options of approximately 7km each
Land Description	The land is greenfield veld (bush) type, zoned for agricultural use however used for grazing at present.

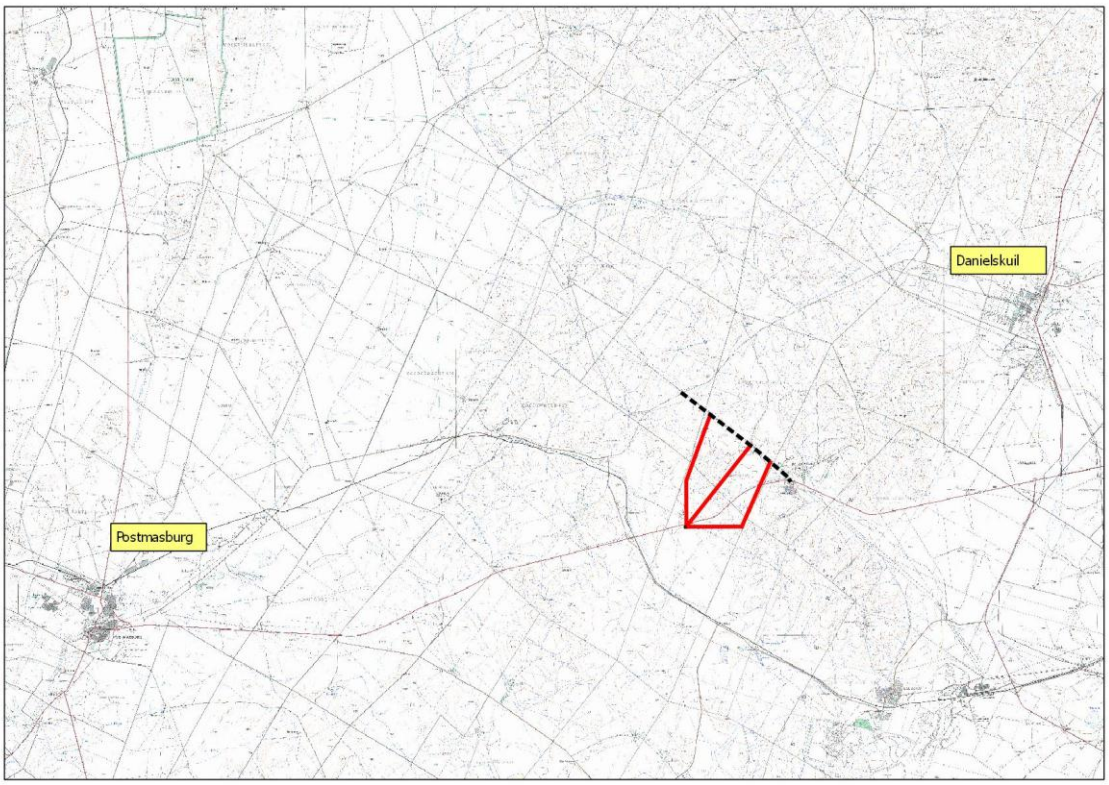


Figure 2 - Humansrus locality

2.2 Technical Project Description

The proposed project consists of the following main activities:

- Construction of 1 x 132kV overhead power line from the proposed Humansrus Solar Thermal Energy Power Plant to the existing 132kV power lines near Owendale substation.

- Construction of a substation and switch yard in the vicinity of the proposed Humansrus solar power plant Humansrus
- Construction of an access road.

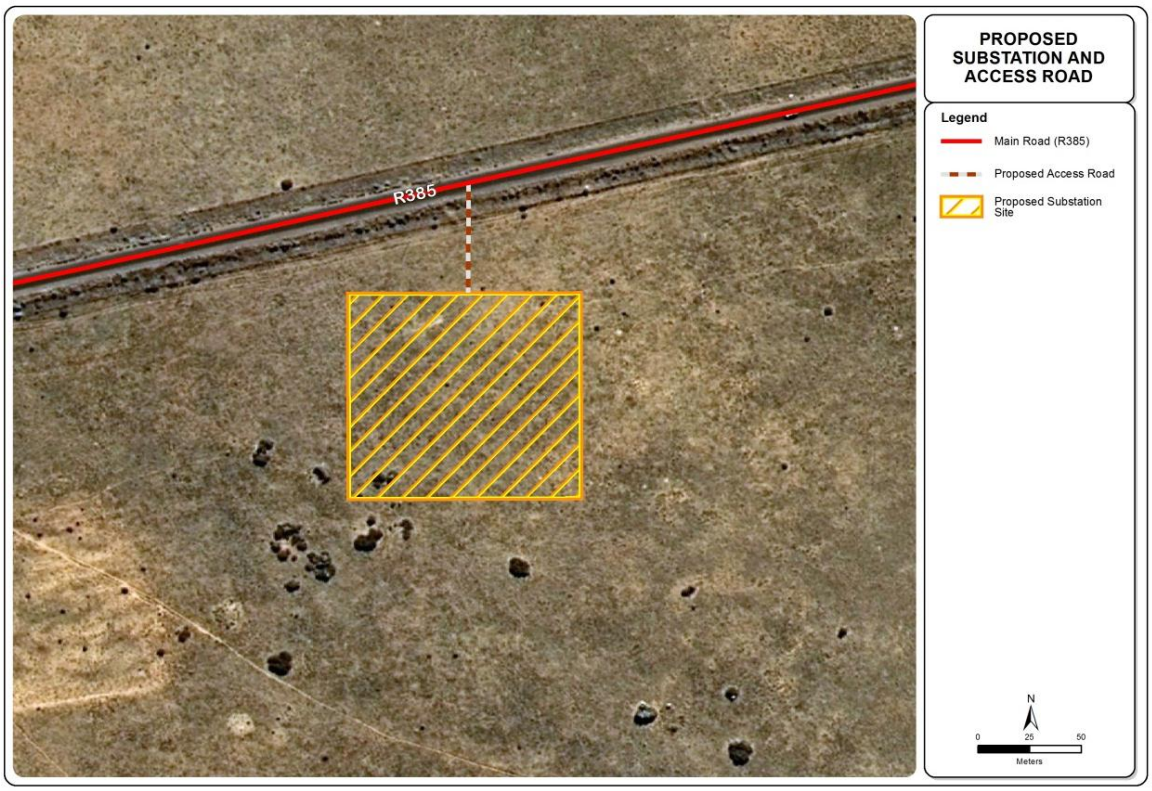
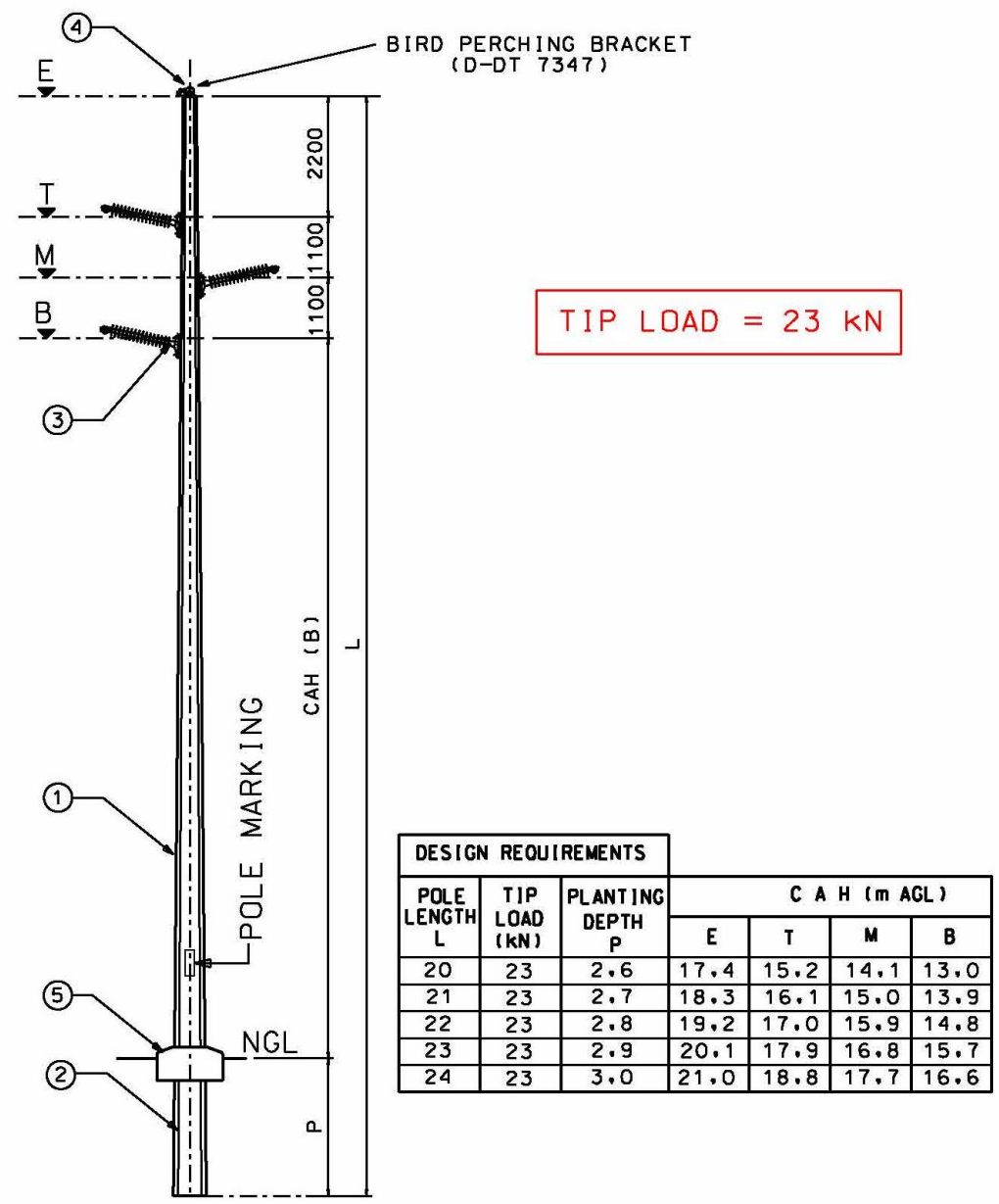


Figure 3 - Details of the substation site and new proposed access road

The power line will consist of a series of towers located approximately 200m apart, depending on the terrain and soil conditions. It is proposed that the Steel Monopole Suspension tower type (e.g. ESKOM D-DT 7611 & D-DT 7612) will be used for the proposed power line. This tower is between 16m and 22m in height and each tower will have a footprint of between 1.21m^2 and 16.81m^2. A diagram of the proposed tower is included in **Figure 4** below.



DESIGN REQUIREMENTS						
POLE LENGTH L	TIP LOAD (kN)	PLANTING DEPTH P	C A H (m AGL)			
			E	T	M	B
20	23	2.6	17.4	15.2	14.1	13.0
21	23	2.7	18.3	16.1	15.0	13.9
22	23	2.8	19.2	17.0	15.9	14.8
23	23	2.9	20.1	17.9	16.8	15.7
24	23	3.0	21.0	18.8	17.7	16.6

Figure 4 - Tower Type

There are three (3) proposed alignment alternatives that will be assessed during the Basic Assessment. These are as follows:

- Option 1A – approximately 5.8km (green)
- Option 1B – approximately 5.2km (blue)
- Option 1C – approximately 8.3km (purple)

These proposed alignment alternatives are indicated on the locality map below (**Figure 5**).

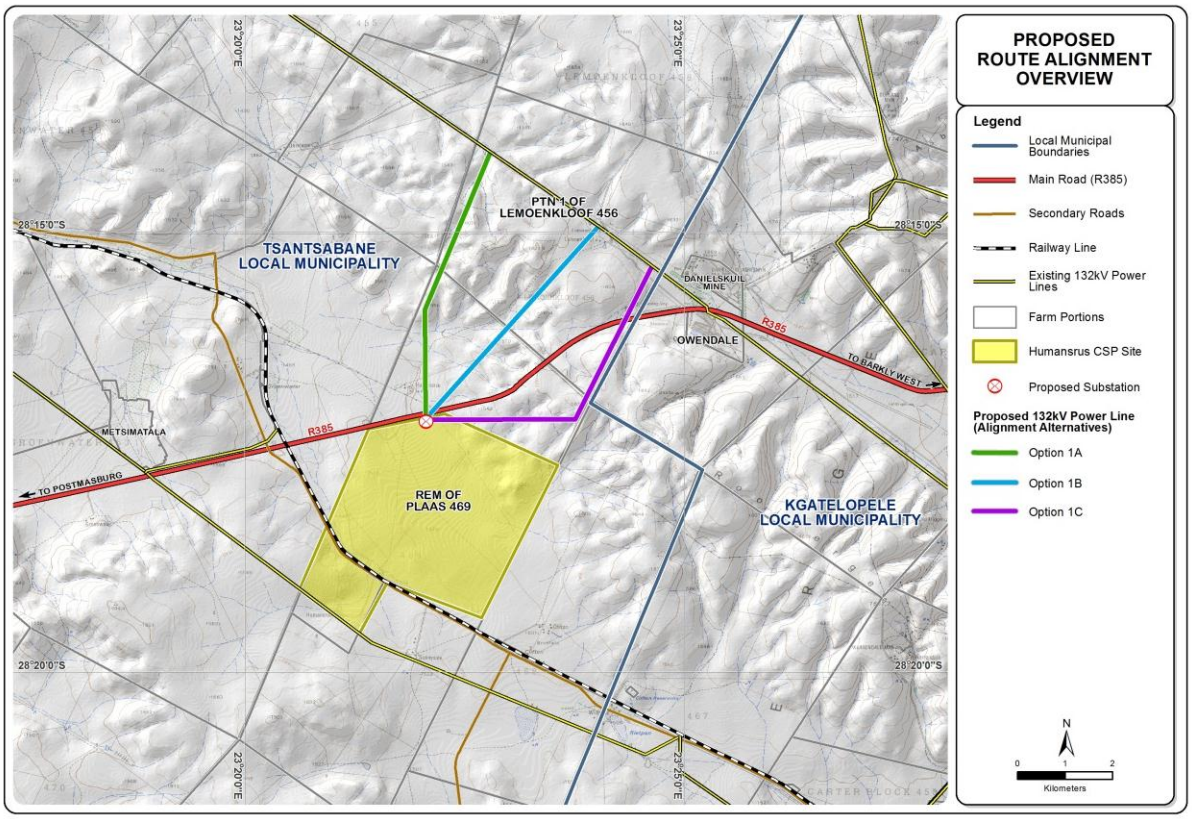


Figure 5 - Route Overview

A 32m wide servitude is required for the proposed 132kV distribution power line.

3 ASSESSMENT METHODOLOGY

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

3.1 Methodology for Assessing Heritage Site significance

This Heritage Impact Assessment (HIA) report was compiled by PGS Heritage and Grave Relocation Consultants (PGS) for the proposed Humansrus 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) and the Minerals and Petroleum Resources Development Act (MPRDA) (28 of 2002). 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)
    - Low - <10/50m2
    - Medium - 10-50/50m2
    - 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

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 3: 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 EIA Methodology assists in evaluating the overall effect of a proposed activity on the environment. The determination of the effect of an environmental impact on an environmental parameter is determined through a systematic analysis of the various components of the impact. This is undertaken using information that is available to the environmental practitioner through the process of the environmental impact assessment. The impact evaluation of predicted impacts was undertaken through an assessment of the significance of the impacts.

3.1 Determination of Significance of Impacts

Significance is determined through a synthesis of impact characteristics which include context and intensity of an impact. Context refers to the geographical scale i.e. site, local, national or global whereas Intensity is defined by the severity of the impact e.g. the magnitude of deviation from background conditions, the size of the area affected, the duration of the impact and the overall probability of occurrence. Significance is calculated as shown in Table 3.

Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. The total number of points scored for each impact indicates the level of significance of the impact.

3.2 Impact Rating System

Impact assessment must take account of the nature, scale and duration of effects on the environment whether such effects are positive (beneficial) or negative (detrimental). Each issue / impact is also assessed according to the project stages:

- planning
- construction
- operation
- decommissioning

Where necessary, the proposal for mitigation or optimisation of an impact should be detailed. A brief discussion of the impact and the rationale behind the assessment of its significance has also been included.

3.2.1 Rating System Used To Classify Impacts

The rating system is applied to the potential impact on the receiving environment and includes an objective evaluation of the mitigation of the impact. Impacts have been consolidated into one rating. In assessing the significance of each issue the following criteria (including an allocated point system) is used:

NATURE		
Include a brief description of the impact of environmental parameter being assessed in the context of the project. This criterion includes a brief written statement of the environmental aspect being impacted upon by a particular action or activity.		
GEOGRAPHICAL EXTENT		
This is defined as the area over which the impact will be expressed. Typically, the severity and significance of an impact have different scales and as such bracketing ranges are often required. This is often useful during the detailed assessment of a project in terms of further defining the determined.		
1	Site	The impact will only affect the site
2	Local/district	Will affect the local area or district
3	Province/region	Will affect the entire province or region
4	International and National	Will affect the entire country
PROBABILITY		
This describes the chance of occurrence of an impact		
1	Unlikely	The chance of the impact occurring is extremely low (Less than a 25% chance of occurrence).
2	Possible	The impact may occur (Between a 25% to 50% chance of occurrence).
3	Probable	The impact will likely occur (Between a 50% to 75% chance of occurrence).
4	Definite	Impact will certainly occur (Greater than a 75% chance of occurrence).
REVERSIBILITY		
This describes the degree to which an impact on an environmental parameter can be successfully reversed upon completion of the proposed activity.		
1	Completely reversible	The impact is reversible with implementation of minor mitigation measures
2	Partly reversible	The impact is partly reversible but more intense mitigation measures are required.
3	Barely reversible	The impact is unlikely to be reversed even with intense mitigation measures.
4	Irreversible	The impact is irreversible and no mitigation measures exist.

IRREPLACEABLE LOSS OF RESOURCES		
This describes the degree to which resources will be irreplaceably lost as a result of a proposed activity.		
1	No loss of resource.	The impact will not result in the loss of any resources.
2	Marginal loss of resource	The impact will result in marginal loss of resources.
3	Significant loss of resources	The impact will result in significant loss of resources.
4	Complete loss of resources	The impact is result in a complete loss of all resources.
DURATION		
This describes the duration of the impacts on the environmental parameter. Duration indicates the lifetime of the impact as a result of the proposed activity		
1	Short term	The impact and its effects will either disappear with mitigation or will be mitigated through natural process in a span shorter than the construction phase (0 – 1 years), or the impact and its effects will last for the period of a relatively short construction period and a limited recovery time after construction, thereafter it will be entirely negated (0 – 2 years).
2	Medium term	The impact and its effects will continue or last for some time after the construction phase but will be mitigated by direct human action or by natural processes thereafter (2 – 10 years).
3	Long term	The impact and its effects will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter (10 – 50 years).
4	Permanent	The only class of impact that will be non-transitory. Mitigation either by man or natural process will not occur in such a way or such a time span that the impact can be considered transient (Indefinite).
CUMULATIVE EFFECT		
This describes the cumulative effect of the impacts on the environmental parameter. A cumulative effect/impact is an effect which in itself may not be significant but may become significant if added to other existing or potential impacts emanating from other similar or diverse activities as a result of the project activity in question.		
1	Negligible Cumulative Impact	The impact would result in negligible to no cumulative effects
2	Low Cumulative Impact	The impact would result in insignificant cumulative effects
3	Medium Cumulative impact	The impact would result in minor cumulative effects
4	High Cumulative Impact	The impact would result in significant cumulative effects
INTENSITY / MAGNITUDE		
Describes the severity of an impact		

1	Low	Impact affects the quality, use and integrity of the system/component in a way that is barely perceptible.
2	Medium	Impact alters the quality, use and integrity of the system/component but system/ component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).
3	High	Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component is severely impaired and may temporarily cease. High costs of rehabilitation and remediation.
4	Very high	Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component permanently ceases and is irreversibly impaired (system collapse). Rehabilitation and remediation often impossible. If possible rehabilitation and remediation often unfeasible due to extremely high costs of rehabilitation and remediation.

SIGNIFICANCE

Significance is determined through a synthesis of impact characteristics. Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. This describes the significance of the impact on the environmental parameter. The calculation of the significance of an impact uses the following formula:

(Extent + probability + reversibility + irreplaceability + duration + cumulative effect) x magnitude/intensity.

The summation of the different criteria will produce a non weighted value. By multiplying this value with the magnitude/intensity, the resultant value acquires a weighted characteristic which can be measured and assigned a significance rating.

Points	Impact Significance Rating	Description
6 to 28	Negative Low impact	The anticipated impact will have negligible negative effects and will require little to no mitigation.
6 to 28	Positive Low impact	The anticipated impact will have minor positive effects.
29 to 50	Negative Medium impact	The anticipated impact will have moderate negative effects and will require moderate mitigation measures.
29 to 50	Positive Medium impact	The anticipated impact will have moderate positive effects.
51 to 73	Negative High impact	The anticipated impact will have significant effects and will require significant mitigation measures to achieve an acceptable level of impact.
51 to 73	Positive High impact	The anticipated impact will have significant positive effects.
74 to 96	Negative Very high impact	The anticipated impact will have highly significant effects and are unlikely to be able to be mitigated adequately. These impacts could be considered "fatal flaws".
74 to 96	Positive Very high impact	The anticipated impact will have highly significant positive effects.

An example of a ratings table:

IMPACT TABLE FORMAT	
Environmental Parameter	A brief description of the environmental aspect likely to be affected by the proposed activity e.g. Surface water
Issue/Impact/Environmental Effect/Nature	A brief description of the nature of the impact that is likely to affect the environmental aspect as a result of the proposed activity e.g. alteration of aquatic biota The environmental impact that is likely to positively or negatively affect the environment as a result of the proposed activity e.g. oil spill in surface water
Extent	A brief description of the area over which the impact will be expressed
Probability	A brief description indicating the chances of the impact occurring
Reversibility	A brief description of the ability of the environmental components recovery after a disturbance as a result of the proposed activity
Irreplaceable loss of resources	A brief description of the degree in which irreplaceable resources are likely to be lost
Duration	A brief description of the amount of time the proposed activity is likely to take to its completion
Cumulative effect	A brief description of whether the impact will be exacerbated as a result of the proposed activity

Intensity/magnitude	A brief description of whether the impact has the ability to alter the functionality or quality of a system permanently or temporarily	
Significance Rating	A brief description of the importance of an impact which in turn dictates the level of mitigation required	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	4	1
Probability	4	1
Reversibility	4	1
Irreplaceable loss	4	1
Duration	4	1
Cumulative effect	4	1
Intensity/magnitude	4	1
Significance rating	-96 (high negative)	-6 (low negative)
Mitigation measures	Outline/explain the mitigation measures to be undertaken to ameliorate the impacts that are likely to arise from the proposed activity. Describe how the mitigation measures have reduced/enhanced the impact with relevance to the impact criteria used in analyzing the significance. These measures will be detailed in the EMP.	

4 CURRENT STATUS QUO

4.1 Site Description

The property is bordered to the south by the R385 which connects Daniëlskuil and Postmasburg (**Figure 6**).

The western portion of the property is undulating with the low-lying areas covered in grasveld. The areas to the east of the central flat lands is characterised by rising rocky ridges covered with shrubs and trees. The farm is currently being used for grazing by livestock.

The southern and south western section of the study area 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 7**).

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

Figure 7 – View of mountainous area to the eastern section of the study area.

4.1.1 Archival findings

The archival research 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.

Palaeontology (Refer to **Appendix C** for full Report)

The south-western and north-eastern portions of the study area are underlain by Late Precambrian (Early Proterozoic) sediments of the Late Precambrian **Transvaal Supergroup** within the Prieska Subbasin, as shown on the geological map in **Figure 8**.

The **Daniëlskuil Formation** (Vad) of the **Ghaap Group** (Asbestos Hills Subgroup) consists of some 200m of banded iron formations (BIF) that are almost 2.5 billion years old (Eriksson *et al.* 2006 and references therein). The only fossils that are likely to occur here are microbial assemblages embedded within finer-grained cherts or forming stromatolites (microbial mounds; Almond & Pether 2008).

The fossil record of the Early Proterozoic **Postmasburg Group** of the Transvaal Supergroup is very sparse (Almond & Pether 2008). Stromatolitic bioherms (microbial reef mounds) up to 5m long and 3m thick that are made up of manganese-rich laminated carbonates are recorded from the glacially-influenced **Makganyene Formation** (Vm) by Polteau *et al.* (2006). These carbonate rocks are interbedded with glacial diamictites in the Prieska Subbasin. The intimate association of warm-water carbonates and cold-water glacial deposits at low palaeolatitudes is of palaeoclimatic significance (See also Polteau 2000, 2005). No fossils are recorded from the overlying **Ongeluk Formation** (Vo), dated at approximately 2.2 Ga (billion years) which consists largely of basaltic and andesitic lavas that were erupted both subaerially and under water (Eriksson *et al.* 2006).

The central part of the study area is largely blanketed by unconsolidated aeolian (*i.e.* wind-blown) sands of the Quaternary **Gordonia Formation** (**Kalahari Group**) (Qs), the geology of which is reviewed by Partridge *et al.* (2006).

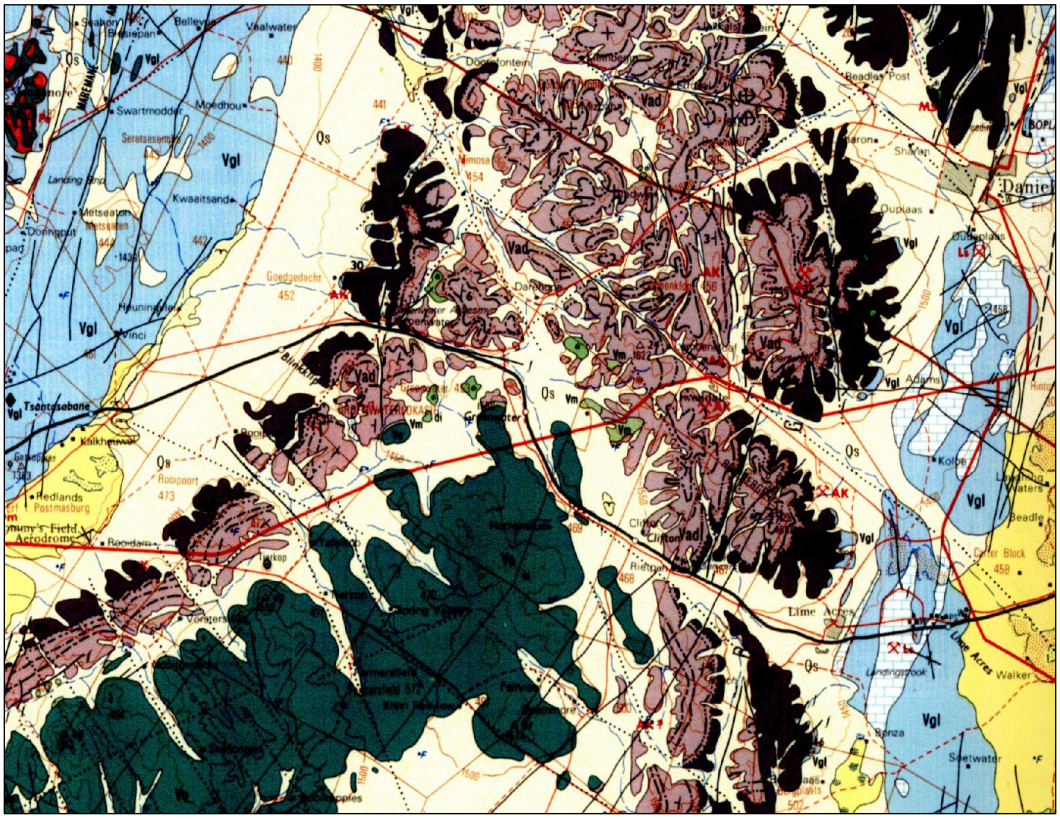


Figure 8 – Extract from 1: 250 000 geological map 2822 Postmasburg (Council for Geoscience, Pretoria) showing geology of the Humansrus study area in the Asbesberge

Archaeology

Stone Age

The Early inhabitants of Griqualand, both west and east, were the San people historical referred to as the Bushmen. Henderson (2000) describes some of the empirical evidence that points to the presence of the San people in the interior regions of South Africa. Among the things Henderson describes are the stone tool scatter and rock engravings near water course and/or sources such as springs; engravings are also noted as a common feature in small Koppies that define the landscape of the interior regions of South Africa.

Such evidence is corroborated with finds made in the study area in an initial study conducted in the survey area in 2010 by Webley. The field work found concentrations of Stone Age material around the dry pan in the southern section of the study area (**Figure 9**).

Other material culture found in the region that point to the presence of San people in the region include remains of ostrich shell-beads and ostrich egg-shell that were used by the San people to

carry water and as drinking vessels. James Backhouse (1844), describing his journey to Klaarwater (modern-day Griquatown) in 1839, notes stopping at Spuigslang Fountain where he observed Bushmen women and their children coming to the fountain for water using egg-shell for bottles and vessels. Henderson identifies the same localities in her 2000 report namely 'Spuigslang Fountain' and the 'Farm Spoedaan' in the Hay District. The similar egg-shell remains that Backhouse notes to have seen being used by the Bushmen women and children have been found in the area south-east of Hay District (Henderson, 2000).

General consensus between archaeologists working in the Northern Cape is that archaeological remains are mostly grouped around water sources (river systems, springs and pans) and other geographical structures such as ranges of hills or shelters found in broken country. These observations by various archaeologists in the 1970-1990, have been corroborated by more recent archaeological surveys for developments such as PGS (2009-2010), Webley & Halkett (2008), Webley et al. (2010), Webley & Halkett (2010), Morris (2008, 2010) and, Van Reyneveld (2005).

Archaeological excavations done at two specularite mines Doornfontein (Beaumont & Boshier, 1974) and Blinkklipkop (Thackery & Beaumont, 1983) produced artefacts and radiocarbon data dating back to 800 AD. The data also reflects an occupation from around 800AD up to around 1850AD, with glass beads, metal items indicating European contact in the upper layers.

Figure 9 – Low density scatter of MSA finds (Webley, 2010)

Rock Art

The Northern Cape is well known for its rock art in the form of rock painting and engravings, with the archaeological databases at the National Museum in Bloemfontein and the McGregor Museum in Kimberley containing hundreds of documented rock art sites with archaeological

field work on projects such as transmission line construction leading to the discovery of new sites (PGS, 2010).

Known engraving sites close to the study area are at:

- Danielskuil: Ouplaas (Morris & Beaumont, 1994), Townlands (Collins, 1973; Wilman, 1933);
- Lime Acres: Carter Block (Morris, 2008; Wilman, 1933);
- The farm Lemoenkloof just north of the study area (pers. Comms with Mst. Scholtz)

Iron Age

Iron Age expansion southwards past Kuruman in to the Ghaap plato and towards Postmasburg is dated to the 1600's (Humphreys, 1976 and Thackeray, 1983). Definite dates for Tswana presense in the Postmasburg area are around 1805 when Lichtenstein visited the area and noted the mining activities of the Tswana (probably the Thlaping) tribes in the area.

The area of Danielskuil was named by the Thlaro as *Thlaka la tlou* (reeds of the elephant) and with the Thlaping they settled the area from Campbell in the east to Postmasburg and towards the Langeberg close to Olifantshoek in the west before 1770 (Snyman, 1988) (**Figure 10**).

The Korana expansion after 1770 started to drive the Thlaro and Thlaping further north towards Kuruman (Shillington, 1985).

Figure 10 – Thlaping and Thlaro areas of residence, 1800-1870

Post 1800's

Ouzman (2005) traces the Korana to what he calls "pre-colonial Kora" in the Cape Province and their father (of "frontier Korana") to James Bloem, a 'white' Prussian from Thuringa who immigrated to the Cape in 1780, escaping to Namaqualand after accusations of murdering his wife.

Historical Context

Below we trace the formation of the Griqua nation and the establishment and the development of Griqualand in order to observe the evolution of the cultural landscape of Hay District where our study site is located.

The Formation of the Griqua Nation and the Establishment of Griqualand

The establishment of Griqualand, now characterised by Griquatown (south-west) and Campbell (south-east of the study area) and Daniëlskuil (Griequaland West) among the popular towns of Griqualand came about with the trekking of the so called 'Bastaards'- a name that acknowledges multiple ethnogenesis (Ross, 1976) in Ouzman (2005) and '....other lesser privileged inhabitants from the Cape Colony during a period when their rights to land and livestock were being eroded in Cape Colony' (Cronje, 2006). In the Cape they had been conscripted to serve in the commandos established by the Cape Government. Not incline to conscription, and possibly other laws of the Cape Colony they decided; under the leadership of Adam Kok I (1710-1795)(**Figure 11**), to trek (emigrate) to the interior regions of the country; in the processes occupying areas of land in the Orange River region.

It is here that in the second half of the 18th century Adam Kok I and his followers became dominant inhabitants of the region. However, following his emancipation in the mid-18th century, Kok I is suggested to have moved to the area immediate of Piketberg where in 1751 he acquired grazing rights to a farm, Stinkfontein, from the Dutch East India Company. It is here that a number of Khoi (Hottentots) descents, namely the Goringhaiqua and the Namaqua and some 'Bastaards' attached to Adam Kok I group first established themselves. Adam Kok I possibly got married to the daughter of the Xarixuriqua chief; a move that could have potentially strengthen his hold and enhanced his status among his group and followers as the leader of the newly formed nation to be later called, the Griqua's (circa. 1813).

Adam Kok I initiated longstanding relations between himself, his successors and the administrators of the Cape Colony; in the process attracting either official support and/or sanctions (Cronje, 2006). This led to his recognition by the Cape Colony as the headman over the Khoi in the region, subsequently assuming the title of a chief or captaincy, Kaptyn as referred to in the Affairs of the Cape of Good Hope, 1871. His stay in the area did not last long as they had to move to the Kamiesberg area to escape increasing pressure and encroachment by the farmers who were moving west coast of the Cape Colony in their search for new lands for grazing and cultivation. Access to water sources also played a significant role in this encroachment.

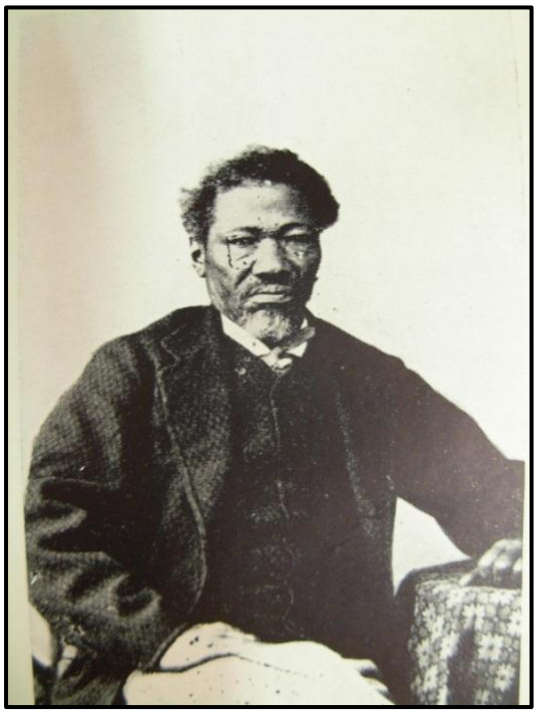


Figure 11 – Adam Kok I

Another resettlement by Kok and his group took place when he sent his son, Cornelius I, to explore the area along the Orange River; during this process several cattle posts were established for grazing purposes. Cronje (2006) suggests that, "in the course of time they increasingly adopted the Cape Dutch language but gave it their own idiom"; this became the language for the Griqua people. This is important because language is a defining trait of any nation and many Griqua people still speak Afrikaans to this day. However, the identity politics and rights to land of this newly formed nation did not end there as they continued for many generations to come which included periods of contestation for chieftainship and land between and among the Griqua's and many other nations, both 'black' and 'white'.

These contestations were pertinent in the period after Kok I stepped down as the chief of the Griqua people in Campbell, relinquishing his powers as chief to his son Cornelius Kok I. At the same time Adam Kok II (in Griquatown in 1816) was elected by London Missionary Society (LMS) as the overall chief in Griquatown.

The LMS tried to persuade the Griqua to abolish their hereditary leadership in favour of elected officials. Kok and Barend Barends did not take well to this proposed practice and moved away with their followers –Kok to Campbell and Barends to Daniëlskuil (Snyman, 1988).

The San residing at Daniëlskuil was not impressed with the new arrivals and a period of conflict resulted between Barends' Griqua and the local San inhabitants. This continued until 1820 when Jager Afrikaner (San representative) and Barends proclaimed a truce. The Griqua stayed fairly autonomous up to 1860 after which landowner's right and the expansion of the colonial empire started to encroach on their land.

In the 1860's this dispute of ownership of the Campbell lands and the surrounding areas between the Orange Free State and the Zuid Afrikaansche Republiek of the Transvaal on the one hand and Waterboer supported by the Cape Government on the other resulted in the eventual demise of the Griqua territory.

"The basis of Free State claims to the Campbell lands was the deed of sale dated December 1861 signed by Henry Harvey who purported to be the authorised agent of Adam Kok III" (Cronje, 2006). Meaning that Kok III had sold land to the Orange Free State without consulting with Waterboer, a process which had been negated by Sir Cathcart's devaluation of the treaty that had been sign earlier between Andries Waterboer and D'Urban. In the process Henry Harvey had also sold land of Kok III which did not belong to the Griqua government seated in Philippolis. Fires of these land claim sagas where propelled further when diamond field were discovered in the region.

This led to the 1871 discussion between Barkly (who had personally visited the area and the newly discovered diamond fields at Kimberley), the Presidents of the Orange Free State and the Zuid Afrikaansche Republiek to submit the border dispute with Waterboer to arbitration.

This process of border negotiation and arbitration ended with the 1871 declaration by Barkly (who had acceded to Waterboer's request) of Griqualand West as a British territory. This resulted in the division of Griqualand into Western and the Eastern parts.

By 1880 the whole of Griqualand West was under Cape rule and numerous locations were set aside for the Southern Tswana. The locations furthest to the west were those of Daniëlskuil, Groenwater, Blinkklip and Skeifontein (**Figure 12**) (Shillington, 1985).

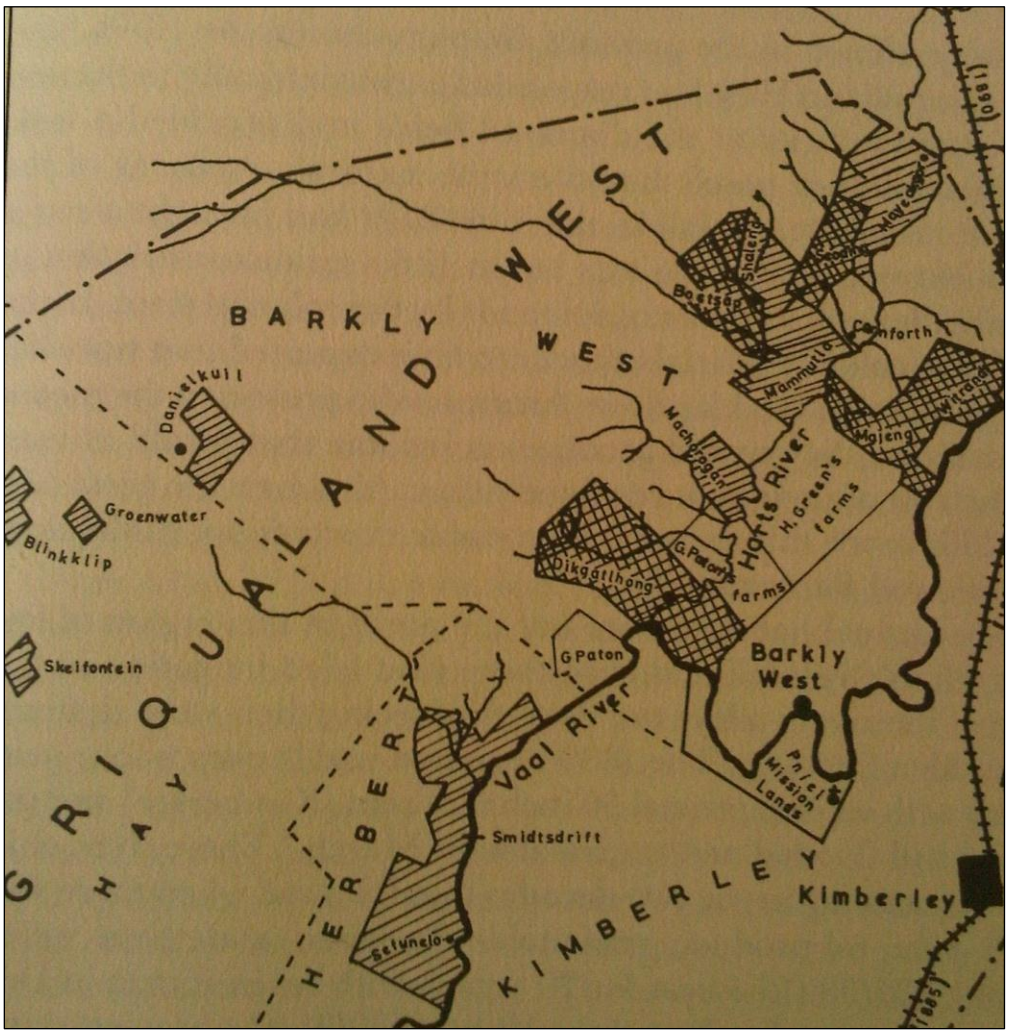


Figure 12 – Griqualand West locations, 1880-1900 (Shillington, 1985)

The Hay district

The Hay district is named after Lieutenant- General Charles Craufurd Hay. C.C. Hay was Lieutenant- General and Acting Governor of the Cape Colony in 1870. Hay was born 1809 and passed away in 1873 on the Isle of Wight. Hay accepted the position of lieutenant-general at the Cape on 25 January 1869, when Sir Philip Wodehouse left the Cape. Hay then acted as Governor and High Commissioner from 20 May until 31 December 1870.

During these months he resided over the dispute of the Griekwa Chief Nicolaas Waterboer and the Free State Government. Hay accepted Waterboer's Claims and championed his cause against the Free State government that proclaimed the Campbell Lands as Free State Territory.

His protracted handling of the situation lead to numerous treaties after him stepping down as Acting Governor and leaving South Africa to settle on the Isle of Wight. (Standard Encyclopaedia of Southern Africa).

Humansrus Farm History

The survey diagram of the general area (SG3296/1878) (Webley, 2010) identifies the adjoining farms Groenwater and Lemoenkloof (**Figure 13**) but Humansrus is not named suggesting it acquired its name after 1878.

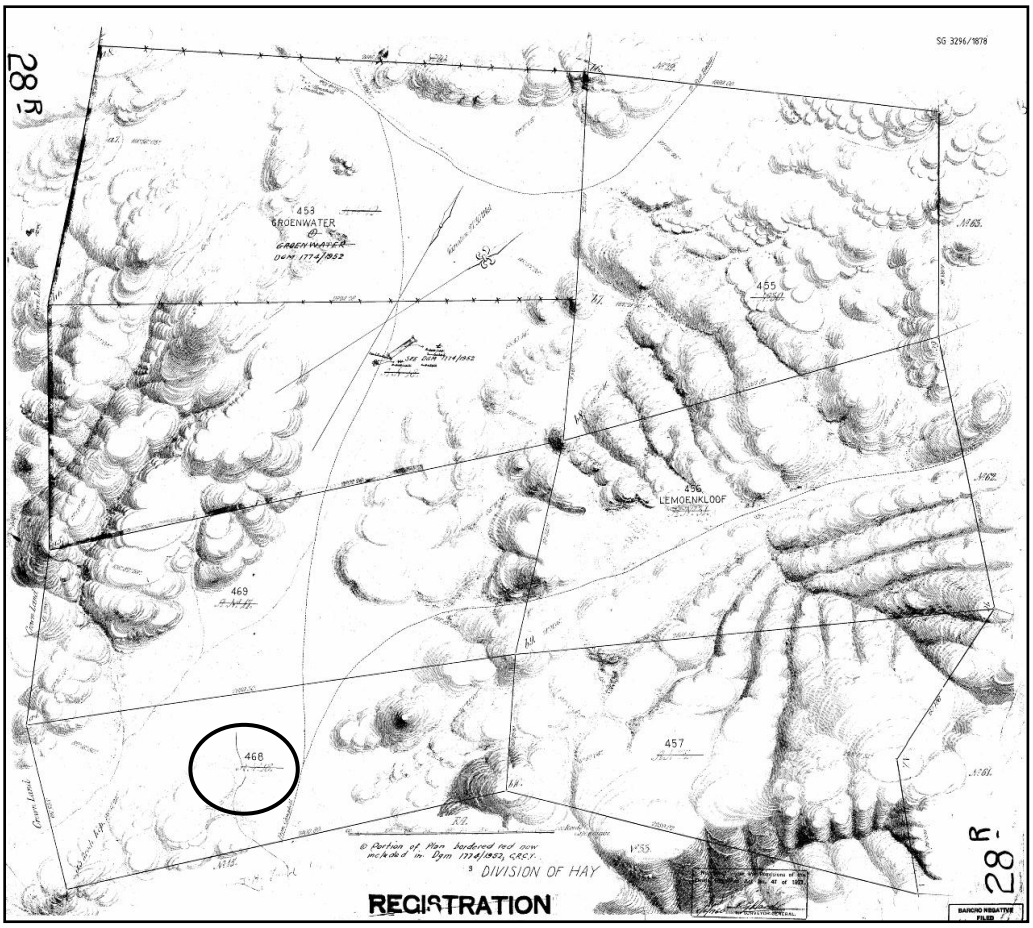


Figure 13 - Survey diagram (SG3296/1878) for the general area. The Farm 469 is indicated by the circle. Lemoenkloof and Groenwater are situated on the northern and western boundaries. There are no homesteads shown on Farm 469.

An overlay of the 1878 map with a recent 1:50 000 topographical map revealing two main roads traversing the study area. The one road branches of towards Daniëlskuil while the main road continues on through the area of the current Groenwater Station and further north. Snyman (1988) confirms these routes as being in existence since 1816 when the original route from

Griquastad via Postmasburg to Kuruman changed to go via Daniëlsrus, which was a shorter route.

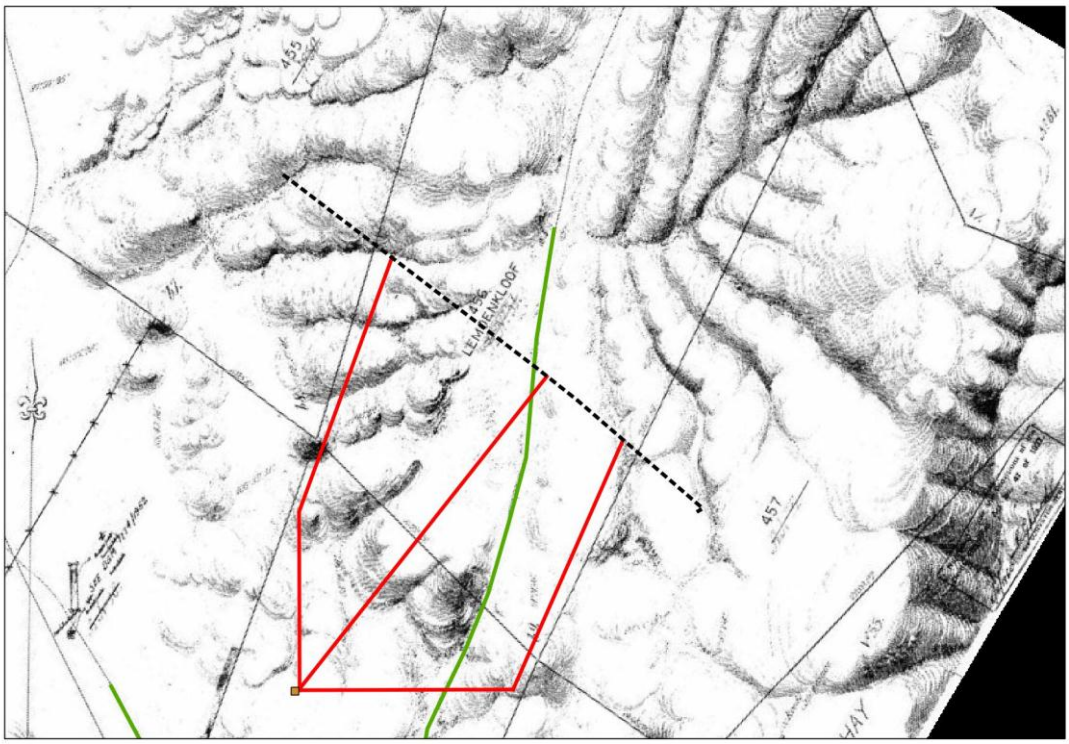


Figure 14 - Survey diagram (SG3296/1878) with overlay of alignment alternatives and Wagon routes in green

Webley (2010) indicates that the current owner's (Mr. Scholtz) grandfather purchased the portion of the farm on which the old Humansrus house is located, during the 1940's. No other information on the Human family other than the headstone in the family graveyard close to the ruins of the original farmstead is available - Hester G. Schoeman (ne Human) born 23 September 1877 - died 28 May 1913. Some tentative research indicates the grave of an A.J. Human (born in 1878) located in the Daniëlsrus cemetery – a possible family link that could be researched further if required.

4.1.2 Field work findings

A field survey of the three alignments was conducted in march 2012 with the aim of conducting an archaeological survey of the alignments.

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 2 days on foot by an archaeologist of PGS.

4.1.3 Heritage sites

Only one definitive heritage site was identified during the field work.

HR1

Coordinates: 28° 16' 51,9" S 23° 22' 03.4" E

A small informal cemetery with 4 graves was identified at this location (***Figure 15***). The cemetery was situated approximately 350m to the east of the farmstead of the farm. The cemetery was fenced, but the fence has fallen down in some places. The graves were placed in a single line next to each other and all of them were orientated from west to east.

One grave had a rectangular shaped brick and cement outline as dressing (***Figure 16***). A fragmented cement headstone was placed at the western end of the grave. Another grave had a rectangular shaped stone packed mound as dressing. A flat rock was placed upright at the western end to serve as headstone. One other grave had an oval shaped mound of packed rocks as dressing. This grave had no headstone. The last grave was only indicated with an upright placed rock at the western end of the grave.

The graves were not maintained and were overgrown with grass and other vegetation

Site size: Approximately 15m x 10m.

Figure 15 – Graves in between cactus growth

Figure 16 – Headstone in farmstead cemetery

The site receives a provisional heritage significance **Grading of 3B**. The cemetery falls in the alignment Option 1 A and the possible negative impact without mitigation is seen as **Negative High.**

Mitigation:

- Adjust the alignment layout and demarcate site with at least a 10 meter buffer.
- In the event that the sites cannot be excluded from the alignment an pylon placement a grave relocation process as described in Section 5 of this reports needs to be implemented.

5 IMPACT EVALUATION

The evaluation of impact on heritage resources discovered on the site during the field work and probable impacts on undiscovered heritage resources are evaluated below.

Impact on

IMPACT TABLE FORMAT	
Environmental Parameter	Destruction of Cemetery – Alignment Option 1_A
Issue/Impact/Environmental Effect/Nature	Destruction of cemeteries during construction
Extent	Limited to the site where the cemetery occurs on Option 1_A
Probability	Possible if no mitigation measures have been applied
Reversibility	Only reversibel through avoidance of cemetery or relocation as last option
Irreplaceable loss of resources	Cultural resources are irreplaceable
Duration	If the cemetery is not avoided and destroyed without mitigation measures the loss will be permanent
Cumulative effect	Low impact is expected
Intensity/magnitude	A brief description of whether the impact has the ability to alter the functionality or quality of a system permanently or temporarily

Significance Rating	A brief description of the importance of an impact which in turn dictates the level of mitigation required	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	1	1
Probability	3	1
Reversibility	4	1
Irreplaceable loss	4	1
Duration	4	1
Cumulative effect	2	1
Intensity/magnitude	4	2
Significance rating	-72 (high negative)	-12 (low negative)
Mitigation measures	Adjust the alignment layout and demarcate site with at least a 10 meter buffer. In the event that the sites cannot be excluded from the alignment an pylon placement a grave relocation process as described in Section 5 of this reports needs to be implemented.	

Impact on Cultural Landscape

Heritage significance of the cultural landscape is derived from the interaction between the natural landscape, such as valleys, undulating plains and rivers courses usually framed by mountain ranges or accentuated by ridges and koppies, and access routes, human settlements and farmsteads. Also interacting with these physical entities are intangible and historic landscapes and events that is known to have added to the cultural fabric of a place or area.

The evaluation of the study area and surrounds as demarcated shown the area to be rich in heritage resources spanning the archaeological to historical timeframe.

The cultural landscape of the study area has an agricultural rural appearance, with industrial activities associated with the proposed electrical energy generation in the form of the proposed Humansrus Solar Park to the south of the proposed alignment.

The larger study area is already impacted and sensitised towards infrastructure, notably the railway lines, roads (tarred and dirt) as well as some power lines to the northern parts of the alignments area., however the addition of the new alignments and substation may aggravate the cumulative effect of this infrastructure type on the cultural landscape.

The visual impact of the proposed power line and substation on the cultural landscape will be addressed in the Visual Impact Assessment of the EIA, as well as the possible mitigation measures. These mitigation measures will in most instances also alleviate impacts on the cultural landscape.

IMPACT TABLE FORMAT		
Environmental Parameter	Cultural Landscape	
Issue/Impact/Environmental Effect/Nature	Changes to cultural landscape by new power line	
Extent	Limited to the alignments	
Probability	Probable due to visibility of power line	
Reversibility	A brief description of the ability of the environmental components recovery after a disturbance as a result of the proposed activity	
Irreplaceable loss of resources	Reversible after decommissioning of the line	
Duration	If the cemetery is not avoided and destroyed without mitigation measures the loss will be permanent	
Cumulative effect	Combined with the construction and operation of the Humansrus Solar Park the cumulative impact is seen as high	
Intensity/magnitude	A brief description of whether the impact has the ability to alter the functionality or quality of a system permanently or temporarily	
Significance Rating	A brief description of the importance of an impact which in turn dictates the level of mitigation required	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	2	2
Probability	3	3

Reversibility	4	2
Irreplaceable loss	2	2
Duration	3	3
Cumulative effect	4	3
Intensity/magnitude	2	2
Significance rating	-36(Medium negative)	-30 (Medium negative)
Mitigation measures	To be incorporated with management measures from visual assessment.	

6 CONCLUSIONS AND RECOMMENDATIONS

The HIA 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 that feeds into the Heritage Impact has utilised the findings of the Scoping report to guide this work. The field work identified one heritage site that will require further mitigation:

Cemetery - **HR1**

It is recommended that the Option 1A be adjusted to accommodate the cemetery and that the cemetery e fenced with a 10 meter buffer.

It is further recommended that in the event that the cemeteries cannot be incorporated in to the alignment parameters, the graves be relocated after a full grave relocation process that includes comprehensive social consultation. The grave relocation process must include:

- 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;
- Site notices indicating the intent of the relocation
- Newspaper Notice indicating the intent of the relocation
- A permit from the local authority;
- A permit from the Provincial Department of health;
- 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;
- An exhumation process that keeps the dignity of the remains and family intact;
- An exhumation process that will safeguard the legal implications towards the developer;
- The whole process must be done by a reputable company that are well versed in relocations;
- The process must be conducted in such a manner as to safeguard the legal rights of the families as well as that of the development company.

Further to these recommendations the general Heritage Management Guideline in Section 7 needs to be incorporated in to the EMP 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).

   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.

3. 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.

   This module must be tailor made to include all possible finds that could be expected in that area of construction.

4. 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.

5. The archaeologist needs to evaluate the finds on site and make recommendations towards possible mitigation measures.

6. If mitigation is necessary, an application for a rescue permit must be lodged with SAHRA.

7. 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.
8. 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.
9. 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.
10. 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 4: 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
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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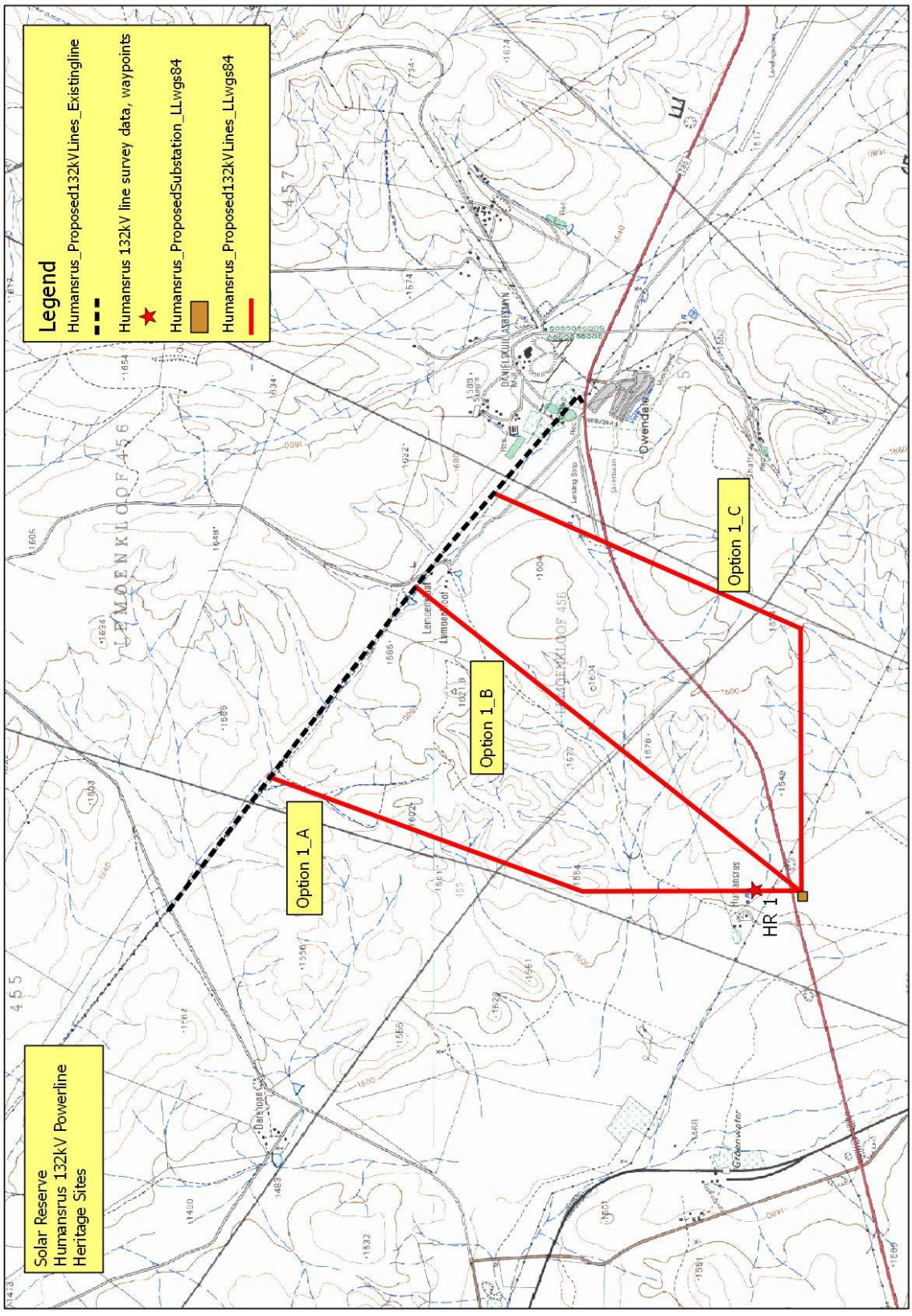
Appendix A

HERITAGE SITE DISTRIBUTION MAP



3.1 General principles

In areas where there has not yet been a systematic survey to identify conservation worthy places, a permit is required to alter or demolish any structure older than 60 years. This will apply until a survey has been done and identified heritage resources are formally protected.

Archaeological and palaeontological sites, materials, and meteorites are the source of our understanding of the evolution of the earth, life on earth and the history of people. In the new legislation, permits are required to damage, destroy, alter, or disturb them. People who already possess material are required to register it. The management of heritage resources are integrated with environmental resources and this means that before development takes place heritage resources are assessed and, if necessary, rescued.

In addition to the formal protection of culturally significant graves, all graves, which are older than 60 years and are not in a cemetery (such as ancestral graves in rural areas), are protected. The legislation protects the interests of communities that have interest in the graves: they may be consulted before any disturbance takes place. The graves of victims of conflict and those associated with the liberation struggle will be identified, cared for, protected and memorials erected in their honour.

Anyone who intends to undertake a development must notify the heritage resource authority and if there is reason to believe that heritage resources will be affected, an impact assessment report must be compiled at the construction company's cost. Thus, the construction company will be able to proceed without uncertainty about whether work will have to be stopped if an archaeological or heritage resource is discovered.

According to the National Heritage Act (Act 25 of 1999 section 32) it is stated that:

An object or collection of objects, or a type of object or a list of objects, whether specific or generic, that is part of the national estate and the export of which SAHRA deems it necessary to control, may be declared a heritage object, including –

- objects recovered from the soil or waters of South Africa, including archaeological and palaeontological objects, meteorites and rare geological specimens;
- visual art objects;
- military objects;
- numismatic objects;
- objects of cultural and historical significance;
- objects to which oral traditions are attached and which are associated with living heritage;
- objects of scientific or technological interest;
- books, records, documents, photographic positives and negatives, graphic material, film or video or sound recordings, excluding those that are public records as defined in section 1 (xiv) of the National Archives of South Africa Act, 1996 (Act No. 43 of 1996), or in a provincial law pertaining to records or archives; and
- any other prescribed category.

Under the National Heritage Resources Act (Act No. 25 of 1999), provisions are made that deal with, and offer protection, to all historic and pre-historic cultural remains, including graves and human remains.

3.2 Graves and cemeteries

Graves younger than 60 years fall under Section 2(1) of the Removal of Graves and Dead Bodies Ordinance (Ordinance no. 7 of 1925) as well as the Human Tissues Act (Act 65 of 1983) and are the jurisdiction of the National Department of Health and the relevant Provincial Department of Health and must be submitted for final approval to the Office of the relevant Provincial Premier. This function is usually delegated to the Provincial MEC for Local Government and Planning, or in some cases the MEC for Housing and Welfare. Authorisation for exhumation and reinterment must also be obtained from the relevant local or regional council where the grave is situated, as well as the relevant local or regional council to where the grave is being relocated. All local and

regional provisions, laws and by-laws must also be adhered to. In order to handle and transport human remains the institution conducting the relocation should be authorised under Section 24 of Act 65 of 1983 (Human Tissues Act).

Graves older than 60 years, but younger than 100 years fall under Section 36 of Act 25 of 1999 (National Heritage Resources Act) as well as the Human Tissues Act (Act 65 of 1983) and are the jurisdiction of the South African Heritage Resource Agency (SAHRA). The procedure for Consultation Regarding Burial Grounds and Graves (Section 36(5) of Act 25 of 1999) is applicable to graves older than 60 years that are situated outside a formal cemetery administrated by a local authority. Graves in the category located inside a formal cemetery administrated by a local authority will also require the same authorisation as set out for graves younger than 60 years over and above SAHRA authorisation.

If the grave is not situated inside a formal cemetery but is to be relocated to one, permission from the local authority is required and all regulations, laws and by-laws set by the cemetery authority must be adhered to.

Appendix C

PALAEONTOLOGICAL STUDY

RECOMMENDED EXEMPTION FROM FURTHER PALAEONTOLOGICAL STUDIES:

Proposed concentrated solar power development on Farm 469 (Humansrus), near Postmasburg, Northern Cape Province

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The company Solar Reserve SA is proposing to develop a 100MW (maximum_ concentrated solar power (CSP) plant on Farm 469, Hay RD (Humansrus, Kheis Local Municipality) situated in the Asbesberge range, approximately 30 km east of Postmasburg (Map Fig.1).

The geology of the proposed development area is shown on 1: 250 000 geological map 2822 Postmasburg (Council for Geoscience, Pretoria) (Fig. 2). Brief explanatory notes are printed on the published map.

The south-western and north-eastern portions of the study area are underlain by Late Precambrian (Early Proterozoic) sediments of the Late Precambrian **Transvaal Supergroup** within the Prieska Subbasin, as shown on the geological map in Fig. 2.

The **Daniëlskuil Formation** (Vad) of the **Ghaap Group** (Asbestos Hills Subgroup) consists of some 200m of banded iron formations (BIF) that are almost 2.5 billion years old (Eriksson *et al.* 2006 and references therein). The only fossils that are likely to occur here are microbial assemblages embedded within finer-grained cherts or forming stromatolites (microbial mounds; Almond & Pether 2008).

The fossil record of the Early Proterozoic **Postmasburg Group** of the Transvaal Supergroup is very sparse (Almond & Pether 2008). Stromatolitic bioherms (microbial reef mounds) up to 5m long and 3m thick that are made up of manganese-rich laminated carbonates are recorded from the glacially-influenced **Makganyene Formation** (Vm) by Polteau *et al.* (2006). These carbonate rocks are interbedded with glacial diamictites in the Prieska Subbasin. The intimate association of warm-water carbonates and cold-water glacial deposits at low palaeolatitudes is of palaeoclimatic significance (See also Polteau 2000, 2005). No fossils are recorded from the overlying **Ongeluk Formation** (Vo), dated at approximately 2.2 Ga (billion years) which consists largely of basaltic and andesitic lavas that were erupted both subaerially and under water (Eriksson *et al.* 2006).

The central part of the study area is largely blanketed by unconsolidated aeolian (*i.e.* wind-blown) sands of the Quaternary **Gordonia Formation** (**Kalahari Group**) (Qs), the geology of which is reviewed by Partridge *et al.* (2006). The Gordonia dune sands are considered to range in age from the Late Pliocene / Early Pleistocene to Recent, dated in part from enclosed Middle to Later Stone Age stone tools. The fossil record of the Kalahari Group as a whole is generally sparse and low in diversity. The Gordonia Formation dune sands were mainly active during cold, drier intervals of the Pleistocene Epoch that were inimical to most forms of life, apart from hardy, desert-adapted species. Porous dune sands are not generally conducive to fossil preservation. However, mummification of soft tissues may play a role here and migrating lime-rich groundwaters derived from the underlying Dwyka Group may lead to the rapid calcretisation of organic structures such as burrows and root casts. Occasional terrestrial fossil remains that might be expected within this unit include calcretized rhizoliths (root casts) and termitaria (*e.g. Hodotermes*, the harvester termite), ostrich egg shells (*Struthio*) and shells of land snails (*e.g. Trigonephrus*) (Almond 2008, Almond & Pether 2008). Other fossil groups such as freshwater bivalves and gastropods (*e.g. Corbula, Unio*) and snails, ostracods (seed shrimps), charophytes (stonewort algae), diatoms (microscopic algae within siliceous shells) and stromatolites (laminated microbial limestones) are associated with local watercourses and pans. Microfossils such as diatoms may be blown by wind into nearby dune sands. These Kalahari fossils (or subfossils) can be expected to occur sporadically but widely, and the overall palaeontological sensitivity of the Gordonia Formation is therefore considered to be low. Underlying calcretes might also contain trace fossils such as rhizoliths, termite and other insect burrows, or even mammalian trackways. Mammalian bones, teeth and horn cores (also tortoise remains, and fish, amphibian or even crocodiles in wetter depositional settings) may be occasionally

expected within Kalahari Group sediments and calcretes, notably those associated with ancient alluvial gravels. The younger fluvial and alluvial sands and gravels within the proposed development area are unlikely to contain any substantial fossil or subfossil remains.

The overall palaeontological sensitivity of the Transvaal Supergroup and Kalahari Group sediments mapped within the study region, including the sandy to gravely superficial sediments (alluvium, colluvium, soils), is low to very low (Almond & Pether 2008). The proposed development has a small footprint and deep excavations are not envisaged for CSP installations. **For these reasons, no further palaeontological studies are recommended for this development.**

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.

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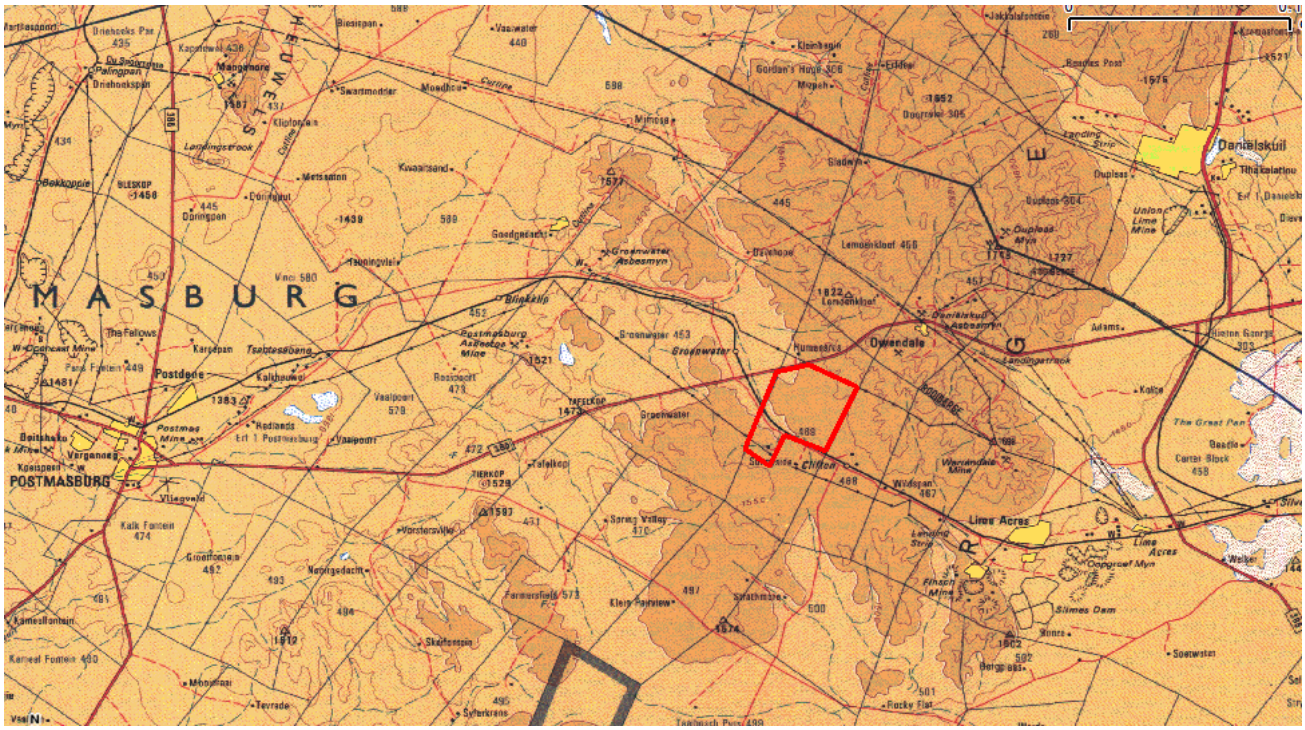

Fig. 1. Map showing the location of the Farm 469 (Humansrus) in the Asbesberge mountain range on the south side of the R31, *c*. 30km east of Postmasburg, Northern Cape Province (red polygon)

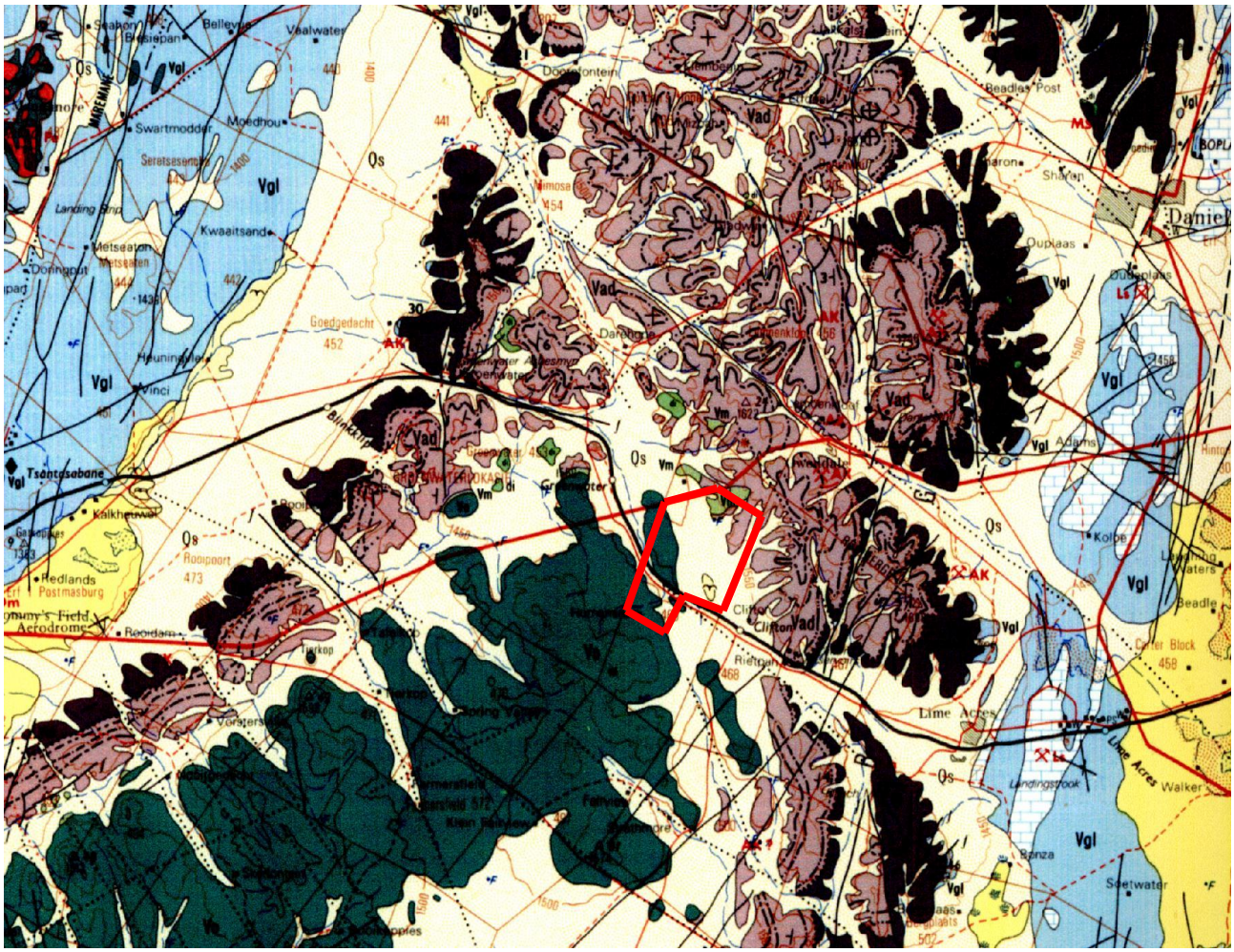

Fig. 2. Extract from 1: 250 000 geological map 2822 Postmasburg (Council for Geoscience, Pretoria) showing geology of the Humansrus study area in the Asbesberge (red polygon).

Geological units mapped within the study area include:

TRANSVAAL SUPERGROUP

Ghaap Group (Asbestos Hills Subgroup):

Vad (purplish-grey) = Daniëlskuil Formation (banded iron formation, 2.4Ga)

Postmasburg Group:

Vm (pale green) = Makganyene Formation (glacial diamictite)

Vo (dark green) = Ongeluk Formation (lavas, 2.2 Ga)

LATE CAENOZOIC DRIFT

Qs (pale yellow) = aeolian sand of the Gordonia Formation (Kalahari Group)

Dark yellow = alluvium

QUALIFICATIONS & EXPERIENCE OF THE AUTHOR

Dr John Almond has an Honours Degree in Natural Sciences (Zoology) as well as a PhD in Palaeontology from the University of Cambridge, UK. He has been awarded post-doctoral research fellowships at Cambridge University and in Germany, and has carried out palaeontological research in Europe, North America, the Middle East as well as North and South Africa. For eight years he was a scientific officer (palaeontologist) for the Geological Survey / Council for Geoscience in the RSA. His current palaeontological research focuses on fossil record of the Precambrian - Cambrian boundary and the Cape Supergroup of South Africa. He has recently written palaeontological reviews for several 1: 250 000 geological maps published by the Council for Geoscience and has contributed educational material on fossils and evolution for new school textbooks in the RSA.

Since 2002 Dr Almond has also carried out palaeontological impact assessments for developments and conservation areas in the Western, Eastern and Northern Cape under the aegis of his Cape Town-based company *Natura Viva* cc. He is a long-standing member of the Archaeology, Palaeontology and Meteorites Committee for Heritage Western Cape (HWC) and an advisor on palaeontological conservation and management issues for the Palaeontological Society of South Africa (PSSA), HWC and SAHRA. He is currently compiling technical reports on the provincial palaeontological heritage of Western, Northern and Eastern Cape for SAHRA and HWC. Dr Almond is an accredited member of PSSA and APHAP (Association of Professional Heritage Assessment Practitioners – Western Cape).

Declaration of Independence

I, John E. Almond, declare that I am an independent consultant and have no business, financial, personal or other interest in the proposed development project, application or appeal in respect of which I was appointed other than fair remuneration for work performed in connection with the activity, application or appeal. There are no circumstances that compromise the objectivity of my performing such work.

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