

# PGS HERITAGE

## **HERITAGE SCOPING REPORT, FOR INCLUSION IN THE ENVIRONMENTAL SCOPING REPORT FOR THE PROPOSED ARNOT NEW ASH DISPOSAL FACILITY, MPUMALANGA**

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**Revision No.:** 0.1  
**Project No.:** 197HIA



### **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

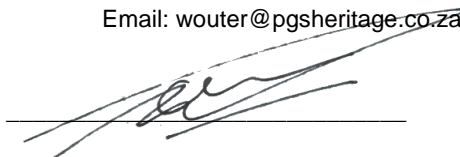
**CONTACT PERSON:**

Project Manager – Lead Heritage Specialist


Tel: +27 (0) 12 332 5305

Email: wouter@pgsheritage.co.za

**SIGNATURE:**



### **ACKNOWLEDGEMENT OF RECEIPT**

<b>Report Title</b>	<i>Heritage Scoping Report for inclusion in the Environmental Scoping report for the Proposed Development of the Arnot New Ash Disposal Facility, Mpumalanga</i>		
<b>Control</b>	<b>Name</b>	<b>Signature</b>	<b>Designation</b>
<b>Author</b>	W Fourie		Heritage Specialist/ Principal Investigator
<b>Reviewed</b>			EIMS

**CLIENT:** Environmental Impact Assessment Services (EIMS)

**CONTACT PERSON:** John von Mayer  
Tel: (011) 789 7170

**SIGNATURE:** \_\_\_\_\_

## EXECUTIVE SUMMARY

PGS Heritage (Pty) Ltd was appointed by Environmental Impact Management Services (Pty) Ltd, to undertake a Heritage Scoping that forms part of the Environmental Scoping Report (ESR) as part of the planning to implementation process of the proposed Arnot new ash disposal facility, at the Arnot power station, Middleburg, Nkangala district Municipality, Mpumalanga Province.

The Heritage Scoping has shown that the study area and surrounding area has some heritage resources situated inside the three alternative foot print areas. Through data analysis and a site investigation the following issues were identified from a heritage perspective.

### 1.1 Archaeological Heritage

The data analysis has enabled the identification of possible heritage sensitive areas that included:

- Dwellings
- Clusters of dwellings (homesteads and farmsteads);
- Archaeological Sensitive areas (based on historical descriptions);
- Structures

Note that these structures refer to possible heritage sites as listed in *Table 1*.

*Table 1 - Tangible Heritage site in the study area*

Name	Description	Legislative protection
<b>Archaeology – Iron age settlements</b>	Older than 100 years	NHRA Sect 3 and 35
<b>Architectural Structures</b>	Possibly older than 60 years	NHRA Sect 3 and 34
<b>Cemeteries</b>	Graves	NHRA Sect 3 and 36 and MP Graves Act

### 1.2 Findings from fieldwork

During the heritage study 6 heritage resource were identified of which 5 is situated within the buffer areas of the Alternatives 1 and 2.

### 1.3 Cemeteries and possible graves

The cemeteries (**ARN3-4 and 6**) could be directly impacted by the proposed construction activities of the ADF but area situated outside the proposed footprint areas and can be conserved with the necessary management measures. The cemeteries have high heritage

significance and are given a Grade 3A significance rating in accordance with the system described in Section 3.1 of this document.

#### *1.3.1 Mitigation*

Recommendations for management measures dependant on the spoil site selected and cemeteries affect will be as follow:

1. Demarcate the cemeteries inside the final development buffer as no-go areas during construction and include a 50 meter buffer around the cemetery

### **1.4 Heritage structures**

Only **ARN2** is situated inside the buffer area of Alternative 2 and should not be directly impacted by the development. The cluster that historically functioned as a single farmstead is protected under Section 34 of the NHRA and has a medium heritage significance and given a grading of Generally protected B.

The tree lane at **ARN5** is not grade as it has not heritage significance and no historical context.

#### *1.4.1 Mitigation*

Recommended mitigation measures in the vent of spoil Area 2 selected is as follows:

1. Demarcate the site inside the final development buffer as no-go areas during construction and include a 50 meter buffer around the cemetery

### **1.5 Palaeontology**

The palaeontological sensitivity of the area is rated as very high and will require a field assessment and finds protocol as part of the EIA report.

### **1.6 Impact rating**

The overall impact on heritage resources is seen as low with the implementation of the recommended mitigation measures.

## 1.7 Alternative preferences

The following table indicates the alternative options provided for analysis and assessment according to their preference based on the impact foreseen on heritage resources.

*Table 2: Preference listing of spoil areas*

<b>Site name</b>	<b>Preference</b>	<b>Rating</b>
Alternative 1	Preferred (depending on final fieldwork during EIA)	1
Alternative 2	Preferred	1

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## 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 20 000 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 20 000-300 000 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.

<b>Abbreviations</b>	<b>Description</b>
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

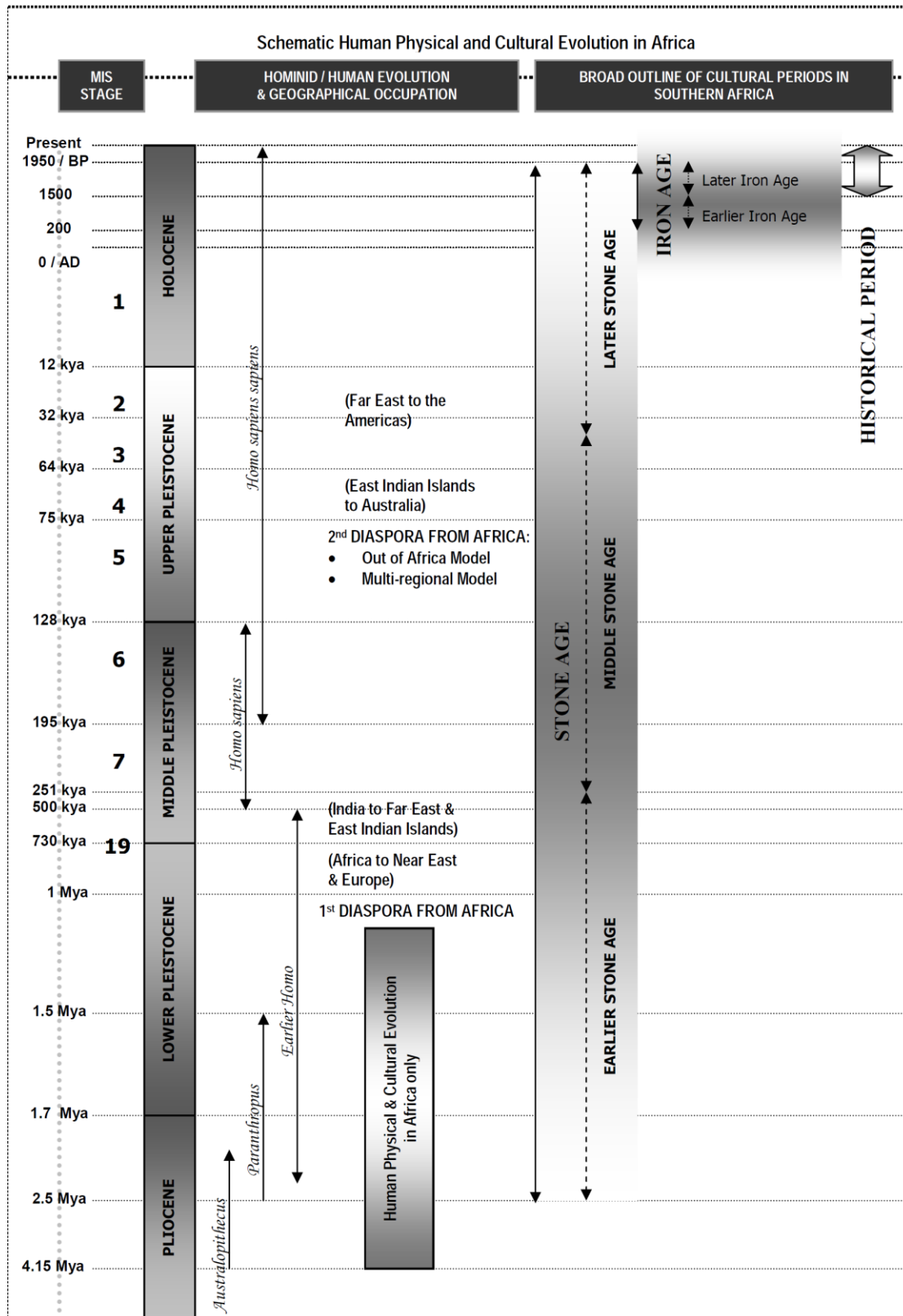


Figure 1 – Human and Cultural Time line in Africa (Morris, 2008)

## **1 INTRODUCTION**

PGS Heritage (Pty) Ltd (PGS) was appointed by Environmental Impact Management Services (Pty) Ltd (EIMS), to undertake a Heritage Scoping Report (HSR) that forms part of the Environmental Scoping Report (HSR) as part of the planning to implementation process of the proposed Arnot new ash disposal facility, at the Arnot power station, Middleburg, Nkangala district Municipality, Mpumalanga 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 HSR aims to inform the ESR in the selection of the relevant sites to be studied during the Environmental Impact Assessment (EIA) 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 (Act 25 of 1999) (NHRA).

### **1.2 Specialist Qualifications**

This HSR was compiled by PGS.

The staff at PGS has a combined experience of nearly 70 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 and author, 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.

As section of Alternative 1 will need to be covered by a field assessment as part of the EIA phase.

#### **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. Mineral 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 Impact Assessment (EIA) – Section (32)(2)(d)
  - d. Environmental Management Plan (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. Mineral and Petroleum Resources Development Act (MPRDA) Act 28 of 2002
  - a. 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, and those

developments administered through NEMA, and MPRDA legislation. In the latter cases the feedback from the relevant heritage resources authority is required by the State and Provincial Departments managing these Acts before any authorizations are granted for development. The last few years have seen a significant change towards the inclusion of heritage assessments as a major component of Environmental Impacts Processes required by NEMA and MPRDA. This change requires us to evaluate the Section of these Acts relevant to heritage (Fourie, 2008).

The NEMA 23(2)(b) states that an integrated environmental management plan should, “...*identify, predict and evaluate the actual and potential impact on the environment, socio-economic conditions and cultural heritage*”.

A study of subsections (23)(2)(d), (29)(1)(d), (32)(2)(d) and (34)(b) and their requirements reveals the compulsory inclusion of the identification of cultural resources, the evaluation of the impacts of the proposed activity on these resources, the identification of alternatives and the management procedures for such cultural resources for each of the documents noted in the Environmental Regulations. A further important aspect to be taken account of in the Regulations under NEMA is the Specialist Report requirements laid down in Section 33 of the regulations (Fourie, 2008).

## 2 TECHNICAL DETAILS OF THE PROJECT

### 2.1 Site Location and Description

<b>Location</b>	The new ash disposal facility occurs near the Arnot power Station. Two (2) potential sites were identified as part of a screening/site selection process.
<b>Land</b>	Each proposed site is 120 ha in size, with a 1km buffer included.



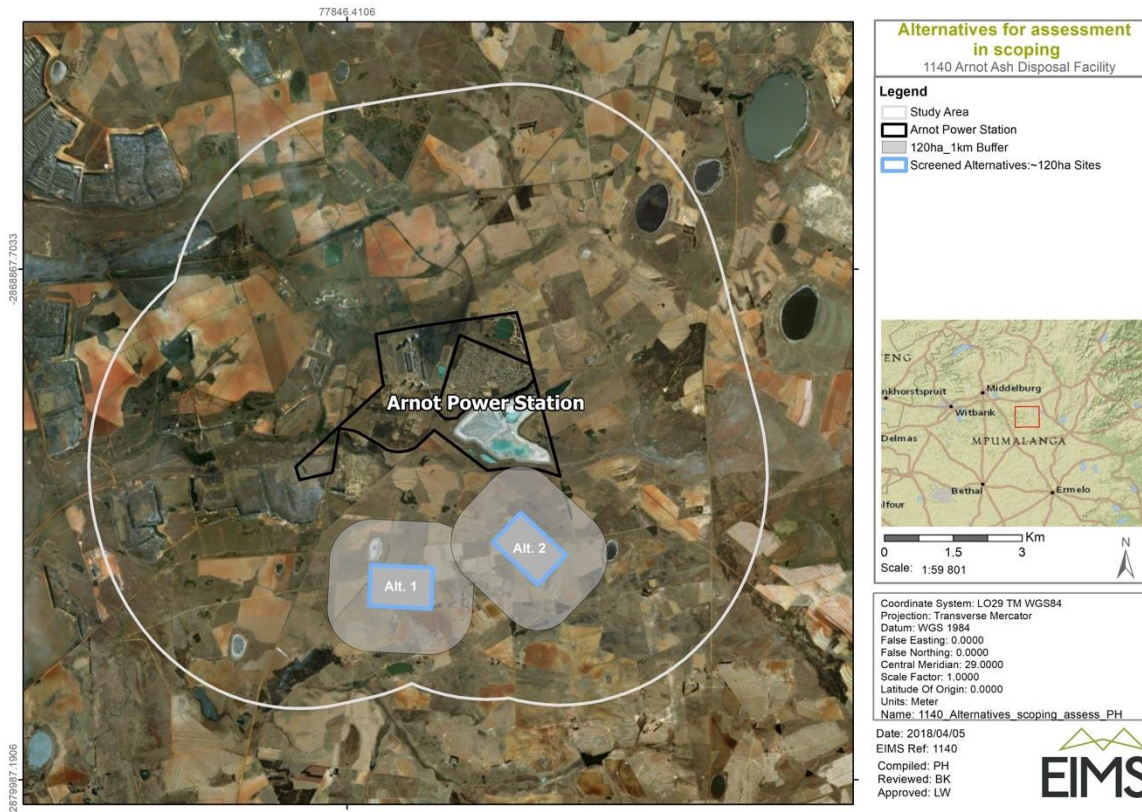


Figure 2 – Two alternatives site locations for assessment during the HSR (Image provided by EIMS, 2018)

## 2.2 Technical Project Description

### 2.2.1 Background

Arnot Power Station (Arnot)'s first ash facility was commissioned in 1971 and uses a wet ashing system. All ash produced by Arnot is pumped in the form of a slurry to the three (3) ash disposal facilities. Arnot's ash disposal facilities are situated approximately 1.5 km to the South-East of the Power Station in the Rietkuilspruit valley. The whole ash disposal complex, (including the silt trap and low level ash water return dams) covers approximately 200 hectares. These three current ash facilities have a remaining disposal capacity of  $\pm 30$  million m<sup>3</sup> as at 29 February 2016.

There are four (4) 300 NB slurry disposal pipelines transporting ash from the North and South ash plants to the ash facilities, two (2) pipelines per Ash Plant (North and South). At the ash disposal facilities, a ring feed arrangement is utilised to distribute the ash slurry to the different areas of the ash disposal facility.

Valves, situated on various outlets on ring feed surrounding the facilities are operated independently to enable the disposal of the ash slurry to the different areas of the ash disposal area to facilitate the construction of the facility.

Two (2) streams were diverted to enable Arnot to ash at the current location. It was necessary to construct the stream diversion in order to keep the toe of the ash disposal facility above the natural ground water table, thus keeping the toe as dry as possible and to construct the ash disposal facility on good stable founding material.

### *2.2.2 Need for the project*

The current Ash disposal facility at Arnot Power Station has been providing disposal services since the establishment of the station. This ash disposal site is facing challenges, which need to be addressed.

The ash complex was designed to operate until the original end of the station life in 2021. This date has been revised to 2032. An ashing capacity study was compiled and showed that the rate of rise of the ashing complex will be more than 4m by the year 2026. The main reason that Arnot Power Station is in need of a new ashing facilities is to reduce this rate of rise to an acceptable rate. It was therefore recommended that the new facility should be 70ha.

### *2.2.3 General overview and specification for the ash disposal facilities:*

To provide Arnot Power Station with the capacity to dispose all of the ash it produces as part of its operation from 2026 until the end of station life in 2032. The project will deliver a wet ashing facility with required liners and the required slurry system pipework and pumping systems and supporting infrastructure. This includes the building of:

- Access roads for operations and maintenance.
- Drainage channels for clean and dirty water.
- Ash Water Return Dams.
- Construction of the New Ash Disposal Facility including its lining.
- Pipelines for transportation of wet ash and water to and from the ash disposal facility
- Pumping capacity
- Sanitation services and Offices

The New Ash Disposal Facility should be located at a suitable position which should take into consideration the pumping constraints of the current ash plant, the location of the current Ash Water Return high level dams and be the least cost solution within the constraints of the environmental law and regulations. The boundary of the scope is from the ash pump, including ash lines to the proposed ash deposition sites and the ash water return pump and pipelines until the connection to the existing High Level AWR Dams.

### 3 ASSESSMENT METHODOLOGY

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

#### 3.1 Methodology for Assessing Heritage Site significance

This HSR report was compiled by PGS Heritage (PGS) for the proposed Arnot Ash Disposal Facility (ADF) 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 relies greatly on the Heritage Background Research.

Step II – Physical Survey: A physical survey was conducted on foot through the proposed project area by a qualified archaeologist (January 2017), 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, the assessment of resources in terms of the HIA 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 - <10/50m<sup>2</sup>
  - Medium - 10-50/50m<sup>2</sup>
  - High - >50/50m<sup>2</sup>
- 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 development activity 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 SAHRA (2006) and approved by the 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 impact assessment methodology is guided by the requirements of the NEMA EIA Regulations (2010). The broad approach to the significance rating methodology is to determine the environmental risk (ER) by considering the consequence (C) of each impact (comprising Nature, Extent, Duration, Magnitude, and Reversibility) and relate this to the probability/likelihood (P) of the impact occurring. This determines the environmental risk. In addition other factors, including cumulative impacts, public concern, and potential for irreplaceable loss of resources, are used to determine a prioritisation factor (PF) which is applied to the ER to determine the overall significance (S). Please note that the impact assessment must apply to the identified Sub Station alternatives as well as the identified Transmission line routes.

#### Determination of Environmental Risk:

The significance (S) of an impact is determined by applying a prioritisation factor (PF) to the environmental risk (ER).

The environmental risk is dependent on the consequence (C) of the particular impact and the probability (P) of the impact occurring. Consequence is determined through the consideration of the Nature (N), Extent (E), Duration (D), Magnitude (M), and reversibility (R) applicable to the specific impact.

For the purpose of this methodology the consequence of the impact is represented by:

$$C = (E+D+M+R) \times N$$

4

Each individual aspect in the determination of the consequence is represented by a rating scale as defined in Table 4.

Table 4: Criteria for Determining Impact Consequence

Aspect	Score	Definition
Nature	- 1	Likely to result in a negative/ detrimental impact
	+1	Likely to result in a positive/ beneficial impact
Extent	1	Activity (i.e. limited to the area applicable to the specific activity)
	2	Site (i.e. within the development property boundary),
	3	Local (i.e. the area within 5 km of the site),
	4	Regional (i.e. extends between 5 and 50 km from the site)
	5	Provincial / National (i.e. extends beyond 50 km from the site)
Duration	1	Immediate (<1 year)
	2	Short term (1-5 years),
	3	Medium term (6-15 years),
	4	Long term (the impact will cease after the operational life span of the project),
	5	Permanent (no mitigation measure of natural process will reduce the impact after construction).
Magnitude/ Intensity	1	Minor (where the impact affects the environment in such a way that natural, cultural and social functions and processes are not affected),
	2	Low (where the impact affects the environment in such a way that natural, cultural and social functions and processes are slightly affected),
	3	Moderate (where the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way),
	4	High (where natural, cultural or social functions or processes are altered to the extent that it will temporarily cease), or
	5	Very high / don't know (where natural, cultural or social functions or processes are altered to the extent that it will permanently cease).
Reversibility	1	Impact is reversible without any time and cost.
	2	Impact is reversible without incurring significant time and cost.

Aspect	Score	Definition
	3	Impact is reversible only by incurring significant time and cost.
	4	Impact is reversible only by incurring prohibitively high time and cost.
	5	Irreversible Impact

Once the C has been determined the ER is determined in accordance with the standard risk assessment relationship by multiplying the C and the P. Probability is rated/scored as per Table 5.

Table 5: Probability Scoring

Probability	Score	Description
	1	Improbable (the possibility of the impact materialising is very low as a result of design, historic experience, or implementation of adequate corrective actions; <25%),
	2	Low probability (there is a possibility that the impact will occur; >25% and <50%),
	3	Medium probability (the impact may occur; >50% and <75%),
	4	High probability (it is most likely that the impact will occur- > 75% probability), or
	5	Definite (the impact will occur),

The result is a qualitative representation of relative ER associated with the impact. ER is therefore calculated as follows:

$$ER = C \times P$$

Table 6: Determination of Environmental Risk

<b>Consequence</b>	5	5	10	15	20	25
	4	4	8	12	16	20
	3	3	6	9	12	15
	2	2	4	6	8	10
	1	1	2	3	4	5
		1	2	3	4	5
	<b>Probability</b>					

The outcome of the environmental risk assessment will result in a range of scores, ranging from 1 through to 25. These ER scores are then grouped into respective classes as described in Table 7.

Table 7: Significance Classes

Environmental Risk Score	
Value	Description

< 9	Low (i.e. where this impact is unlikely to be a significant environmental risk),
≥9; <17	Medium (i.e. where the impact could have a significant environmental risk),
≥ 17	High (i.e. where the impact will have a significant environmental risk).

The impact ER will be determined for each impact without relevant management and mitigation measures (pre-mitigation), as well as post implementation of relevant management and mitigation measures (post-mitigation). This allows for a prediction in the degree to which the impact can be managed/mitigated.

### 3.2.1 Impact Prioritisation:

In accordance with the requirements of Regulation 31 (2)(l) of the EIA Regulations (GNR 543), and further to the assessment criteria presented in the Section above it is necessary to assess each potentially significant impact in terms of:

- Cumulative impacts; and
- The degree to which the impact may cause irreplaceable loss of resources.

In addition it is important that the public opinion and sentiment regarding a prospective development and consequent potential impacts is considered in the decision making process.

In an effort to ensure that these factors are considered, an impact prioritisation factor (PF) will be applied to each impact ER (post-mitigation). This prioritisation factor does not aim to detract from the risk ratings but rather to focus the attention of the decision-making authority on the higher priority/significance issues and impacts. The PF will be applied to the ER score based on the assumption that relevant suggested management/mitigation impacts are implemented.

*Table 8: Criteria for Determining Prioritisation*

<b>Public response (PR)</b>	Low (1)	Issue not raised in public response.
	Medium (2)	Issue has received a meaningful and justifiable public response.
	High (3)	Issue has received an intense meaningful and justifiable public response.
<b>Cumulative Impact (CI)</b>	Low (1)	Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is unlikely that the impact will result in spatial and temporal cumulative change.
	Medium (2)	Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is probable that the impact will result in spatial and temporal cumulative change.

<b>Irreplaceable loss of resources (LR)</b>	High (3)	Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is highly probable/definite that the impact will result in spatial and temporal cumulative change.
	Low (1)	Where the impact is unlikely to result in irreplaceable loss of resources.
	Medium (2)	Where the impact may result in the irreplaceable loss (cannot be replaced or substituted) of resources but the value (services and/or functions) of these resources is limited.
	High (3)	Where the impact may result in the irreplaceable loss of resources of high value (services and/or functions).

The value for the final impact priority is represented as a single consolidated priority, determined as the sum of each individual criteria represented in Table 11. The impact priority is therefore determined as follows:

**Priority = PR + CI + LR**

The result is a priority score which ranges from 3 to 9 and a consequent PF ranging from 1 to 2 (Refer to Table 9).

*Table 9: Determination of Prioritisation Factor*

Priority	Ranking	Prioritisation Factor
3	Low	1
4	Medium	1.17
5	Medium	1.33
6	Medium	1.5
7	Medium	1.67
8	Medium	1.83
9	High	2

In order to determine the final impact significance the PF is multiplied by the ER of the post mitigation scoring. The ultimate aim of the PF is to be able to increase the post mitigation environmental risk rating by a full ranking class, if all the priority attributes are high (i.e. if an impact comes out with a medium environmental risk after the conventional impact rating, but there is significant cumulative impact potential, significant public response, and significant potential for irreplaceable loss of resources, then the net result would be to upscale the impact to a high significance).

*Table 10: Final Environmental Significance Rating*

<b>Environmental Significance Rating</b>
------------------------------------------



Value	Description
< 10	Low (i.e. where this impact would not have a direct influence on the decision to develop in the area),
≥10 <20	Medium (i.e. where the impact could influence the decision to develop in the area),
≥ 20	High (i.e. where the impact must have an influence on the decision process to develop in the area).

**Annexure A** contains the plan of study for the HIA report to be compiled during the EIA phase.

## 4 HERITAGE BACKGROUND

The high level archival research focused on available information sources that were used to compile a general background history of the study area and surrounds.

### 4.1 Archival/historical maps

Historical topographic maps were available for utilisation in the screening and scoping:

- Topographical map 2629BB – First edition 1966. The aerial photography on which the map was based dates to 1956 and its survey work was undertaken in 1966. It was drawn in 1967 by the Trigonometrical Survey Office.
- Topographical map 2529DD – First edition 1967 The aerial photography on which the map was based dates to 1964 and its survey work was undertaken in 1967. It was drawn in 1968 by the Trigonometrical Survey Office.
- Topographical map 2529DC – First edition 1967 The aerial photography on which the map was based dates to 1964 and its survey work was undertaken in 1967. It was drawn in 1968 by the Trigonometrical Survey Office.

#### 4.1.1 Topographical Maps 2629BB, 2529DD, 2529DC (First Editions)

The maps were utilised to identify structures that could possibly be older than 60 years and thus protected under Section 34 and 35 of the NHRA. Many of the structures identified are farmsteads and “huts”. As discussed in the historical background of the area further on in this report, there is a dense cultural history in Mpumalanga and many of these huts are remains from the Iron Age.

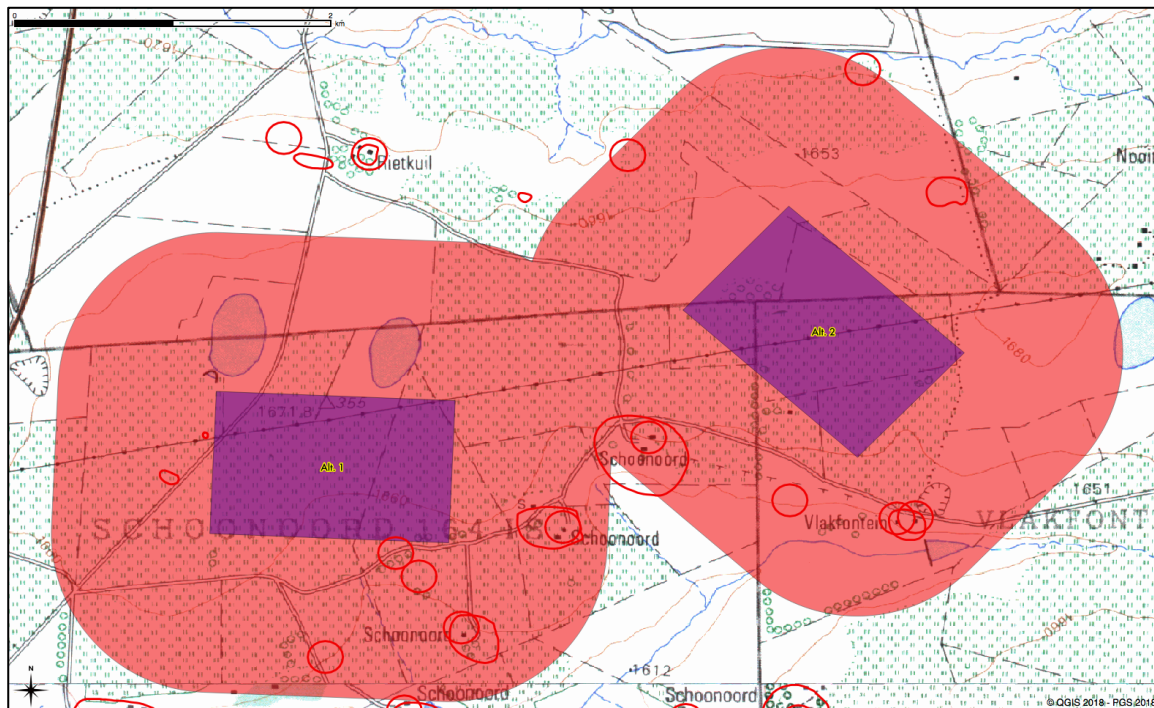


Figure 3 - Section of topographical map 2529DD showing alternative sites Alt1 and Alt2. Possible heritage features circled in red.

## 4.2 Aspects of the area's history

### 4.2.1 Previous Heritage Studies in area

A search on the South African Heritage Resources Information System (SAHRIS) has identified Heritage Impact Assessments conducted in and around the study area:

- A Heritage Impact Assessment (HIA) study for the proposed New Optimum Colliery on the farm Schoonoord 164IS in the Mpumalanga Province of South Africa - Pistorius, J. C. C. (2004), this assessment located historical structures, graveyards, and remains dating from the relatively recent past.
- Heritage Impact Scoping Report for the Planned Hendrina-Marathon Power line, Mpumalanga Province – J van Schalkwyk (2007)
- AIA Northern Coal Portion 15 and 16 of the farm Weltevreden 381 JT, Belfast, Mpumalanga- Fourie, W (2008). This assessment located no heritage features
- Arnot Colliery Mine Project of Exxaro On Portions 4 and 5 of the farm Mooifontein 448 JS and Portions 3 And 4 of the farm Tweefontein 458 JS , District Middelburg, Mpumalanga - Fourie, W (2009). This assessment located 7 cemeteries, one occupied homestead with associated infrastructure dating between 1900 and 1930 and three homestead remains
- Phase 1 Archaeological Impact Assessment for Enpact Environmental Consultants concerning the proposed Elandshoek township development on portions 2 and 6 of the farm Lindenau 303 JT and portion 2 of Berlin 466 JT, Mpumalanga Province – JP Cilliers

(2010) this assessment located, two cemeteries, a Black Concentration Camp, and the existence of war graves.

- A report on a heritage assessment for the proposed Arnot-Gumeni 400 kv powerline project, in the Middelburg/Belfast area, Mpumalanga Province – Pelsler, A.(2012). This assessment located stone walled Iron Age sites, possible Stone Age sites, historical homesteads/farmsteads, historical Anglo-Boer War (1899-1902) battlefield sites and others, as well as graveyards and cemeteries.
- Exxaro Paardeplaats Project Heritage Impact Assessment Report – Kitto, J (2012) this assessment located, 22 heritage structures, 7 cemeteries and 3 areas with historical mining shafts
- A phase I Heritage Impact Assessment (HIA) study for the consolidated Environmental Management Programme report (consolidated EMPR) for Arnot Coal on the eastern highveld in the Mpumalanga Province - - Pistorius, J. C. C. (2014) this assessment located Historical farmstead complexes consisting of various structures, Individual historical structures such as houses, wagon sheds, rondavels, etc. and graveyards and graves, some of which can be classified as historical as they are older than sixty years.
- Proposed expansion of existing mining area into portion re of the farm Roetz 210 IS, Jagtlust Colliery, near Carolina, Albert Luthuli Local Municipality, Gert Sibande District Municipality, Mpumalanga Province – Kitto, J (2015) this assessment located Historical structures and graves.
- A revised phase I Heritage Impact Assessment (HIA) study for the proposed Rietvlei open cast coal mining operation between Middelburg, Belfast and Stofberg in the Mpumalanga province of South Africa. - Pistorius, J. C. C. (2014) This assessment located 5 graveyards
- Heritage Assessment - The Kwagga North Project, Optimum Coal, Arnot, Mpumalanga – Fourie, W (2016), this assessment located 29 cemeteries with a total of approximately 350 graves, 6 farmsteads and one quarry site.

#### 4.2.2 *Archaeological Background*

The province of Mpumalanga is known to be rich in archaeological sites that tell the story of humans and their predecessors in the region going back some 1,7 million years (Delius & Hay, 2009). The pre-colonial period is divided broadly into the Stone Age and the Iron Age (*Refer to Error! Reference source not found. for a visual representation of the human time line*).

The Stone Age refers to the earliest people of South Africa who relied mainly on stone for their tools and were hunter-gatherers. This period is divided into the Earlier, Middle and Later Stone Age:

- *Earlier Stone Age*: The period from  $\pm 2.5$  million yrs. -  $\pm 250\ 000$  yrs. ago. Acheulean stone tools are dominant.
- *Middle Stone Age*: Various stone tool industries in SA dating from  $\pm 250\ 000$  yrs. – 40 000 yrs. before present.

- *Later Stone Age:* The period from ± 40 000 yrs. before present to the period of contact with either Iron Age farmers or European colonists. (Delius & Hay, 2009; Morris, 2008)

The Iron Age as a whole represents the spread of Bantu speaking people whose way of life was pastoral-agricultural and includes both the Pre-Historic and Historic periods. As indicated by the name, this period is distinguished by the knowledge of extraction and use of various metals, mainly iron. Similarly to the Stone Age, it can also be divided into three periods:

- *The Early Iron Age:* Most of the first millennium AD.
- *The Middle Iron Age:* 10th to 13th centuries AD
- *The Late Iron Age:* 14th century to colonial period. (Delius & Hay, 2009; Morris, 2008)

The archaeological literature does not contain much information on the Stone Age archaeology of this area, since this period has not been researched extensively in Mpumalanga (Esterhuysen & Smith, 2007). However, it is clear from the general archaeological record that the larger Mpumalanga region has been inhabited by humans since Earlier Stone Age (ESA) times. Although no Stone Age sites are known from the immediate vicinity of the study area, there are some sites recorded in the greater region (Esterhuysen & Smith, 2007). Examples of such sites are noted below.

### **Stone Age Sites**

An Earlier Stone Age site is located at Maleoskop near Groblersdal. Concentrations of ESA stone tools were found in erosion gullies along the Rietspruit (Esterhuysen & Smith, 2007). Evidence for the Middle Stone Age (MSA) period has been excavated from Bushman Rock Shelter, situated on the farm Klipfonteinhoek in the Ohrigstad District. The MSA layers indicated that the cave was visited repeatedly over a long period, between approximately 40 000 years ago and 27.000 Before Present (Esterhuysen & Smith, 2007). Two Later Stone Age (LSA) sites were found at the farm Honingklip near Badplaas in the Carolina District, (Esterhuysen & Smith, 2007).

### **Iron Age Sites**

#### Early Iron Age

Early farming communities moved into the Mpumalanga area around AD 500. These early farmers used metal tools and pottery and lived in fairly permanent agricultural villages. The most well-known EIA site in the area is the Lydenburg Heads site in the Sterkstroom Valley.

#### Late Iron Age

Late Farmer societies developed extensive stone settlements around Lydenburg, Badfontein, Sekhukhuneland, Roosenekal and Steelpoort (Delius & Hay, 2009). The greater Belfast area specifically, is known for its large complexes of LIA stonewalling. Although there was some early research on the stone ruins in the general region of the then-named eastern Transvaal, systematic

investigation of the ruins only began in the last decade (Collett, 1982). Evers (1975) and Mason (1968) both undertook surveys of aerial photographs of the general area and identified a vast number of such settlements between Lydenburg and Machadodorp. Evers noted that settlements are not evenly distributed over the area, largely for topographical reasons (1975). These settlements typically consisted of three interrelated elements: homesteads, with cattle kraals surrounded by enclosures for human habitation; stone-edged paths or roadways, probably for movement of cattle; and stone terraces, for agricultural cultivation. Most of the homesteads were built in symmetrical patterns, some of which were reproduced in rock engravings found close to these settlements (Delius and Hay; 2009).

With regard to dating, the beginning of the Late Iron Age in this region is obscure. At the time of Evers' article there were no sites known that were intermediate in age between the Early Iron Age sites and the later stone-walled sites. However, since elsewhere in the then-named Transvaal and Orange Free State, stone-walled building appeared to start around A.D. 1450-1500, this was thought to be true in this region as well (Evers, 1975).

#### Rock Engravings

An article by Maggs (1995), explains that these agriculturist engravings are mainly dominated by depictions of ground plans representing the shape of settlements people built and lived in. Virtually all known engraved sites are in the vicinity of Late Iron Age settlements and it is now known that such engravings are much more common than was previously thought. Fieldwork in several such regions has produced many formerly unrecorded sites within the limited areas searched. Therefore, Maggs recommended that future fieldwork on the stone-built settlements should incorporate an examination of neighbouring rock outcrops for possible engravings (*ibid*). Maggs' article highlights that such images may represent abstract or symbolic spatial arrangements reflecting the cosmology of the society that made them. He uses an example taken from the Pedi, a northern Sotho group linked geographically and culturally with the Mpumalanga engravings. Within this system, social and religious structure was, and among many rural communities still is, clearly inseparable. Each member literally knows their place within the homestead according to their age, sex and status (*ibid*).

#### 4.2.3 *The South African (Anglo-Boer) War*

The area between Witbank and Ermelo major military activity during the latter part of the South African War. The occupation of Pretoria on 5 June 1900, saw the retreat of Boer forces towards the eastern Transvaal (Mpumalanga) and the intensification of the guerrilla warfare activities. Seeking to bring an end to the conflict the British started an advance of the Boer forces from the west (Pretoria) and the south (Ermelo). In April 1901, one of the British Columns under Major-General F.W. Kitchener started with a push from Lydenburg towards the south over the Delagoa-Pretoria rail line in an attempt to capture the Boer forces under the command of General Ben Viljoen.

Between April and August of 1900 numerous skirmishes and engagements took place between British forces (predominantly associated with the Western Australian 5<sup>th</sup> and 6<sup>th</sup> Contingents) and retreating Boer commandos. The movement of the British Column can be tracked through the following dates and places:

- Middelburg to Rondebosch on 12 May 1901;
- Boshmansspruit – Australian Mounted Infantry as part the British forces charge Boers on 14 May 1901; (1km north of study area)
- Battle of Brakpan – 16 May 1901; (2km south of study area)
- Wilmansrust engagement – 12 June 1901 (30 km south west of study area)
- Middelkraal British field hospital – (35km south west of study area)

<http://www.thefreelibrary.com/The+action+at+Brakpan.-a0123162112>

### 4.3 Findings of the Heritage Screening

The findings can be compiled as follows and have been combined to produce a heritage sensitivity map for the project (**Error! Reference source not found.** and *Figure 5*).

#### 4.3.1 Heritage

The sensitivity maps were produced by overlying:

- Satellite Imagery;
- Current Topographical Maps;
- First edition Topographical Maps dating from the 1960's

This enabled the identification of possible heritage sensitive areas that included:

- Dwellings
- Clusters of dwellings (homesteads and farmsteads);
- Archaeological Sensitive areas (based on historical descriptions);
- Structures/Buildings

By superimposition and analysis it was possible to rate these structure/areas according to age and thus their level of protection under the NHRA. Note that these structures refer to possible tangible heritage sites as listed in *Table 11*.

*Table 11 - Tangible heritage site in the study area*

Name	Description	Legislative protection
Archaeology - Iron Age Sites	Older than 100 years	NHRA Sect 3 and 35
Architectural Structures	Possibly older than 60 years	NHRA Sect 3 and 34

Cemeteries	Graves	NHRA Sect 3 and 36 and MP Graves Act
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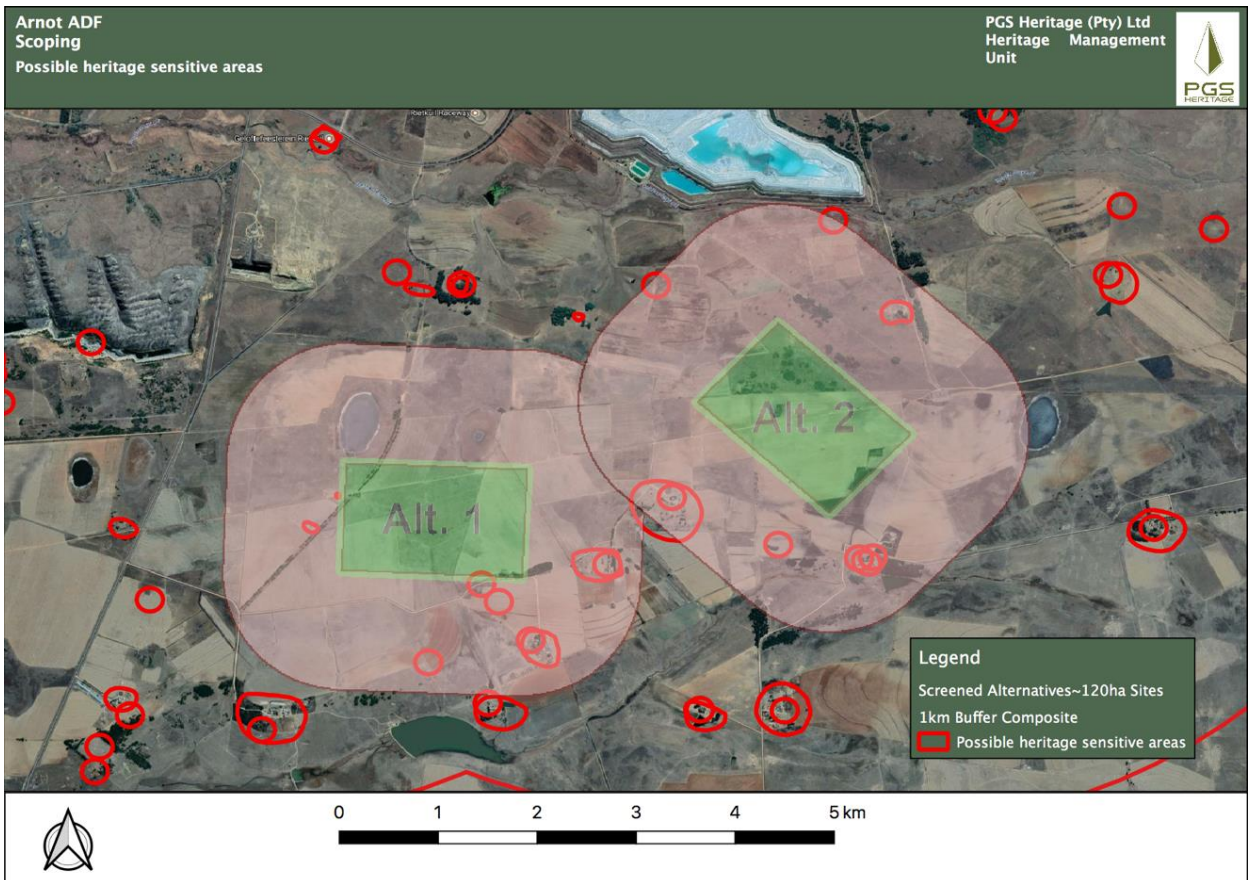


Figure 4 –Heritage sensitivity map. Identified structures with a 100m buffer are depicted.

Objects depicted include Buildings, homesteads, farmsteads, kraals and possible graves. Observation of the previous heritage reports has shown that graves are in abundance in the surrounding areas and especially near farmsteads. This factor needs to be held in consideration regarding any of the alternatives.

#### 4.3.2 Palaeontological Heritage

The sensitivity maps were produced by overlying:

- Palaeontological sensitivity maps from the SAHRIS database.



Figure 5 – Palaeontological Heritage Sensitivity map. As can be viewed, most of the area is highly sensitive.

#### 4.4 Fieldwork findings

##### 4.4.1 Methodology

A controlled exclusive survey was conducted 18-20 January 2017 as part of the Scoping assessment. **Figure 6** provides tracklogged data of field work as well as areas to be covered during the EIA phase.

During the heritage study 6 heritage resources were identified of which will require further mitigation work if any construction activity is planned in their vicinity (**Figure 7**).

All structure identified was logged with handheld GPS and documented with digital camera.



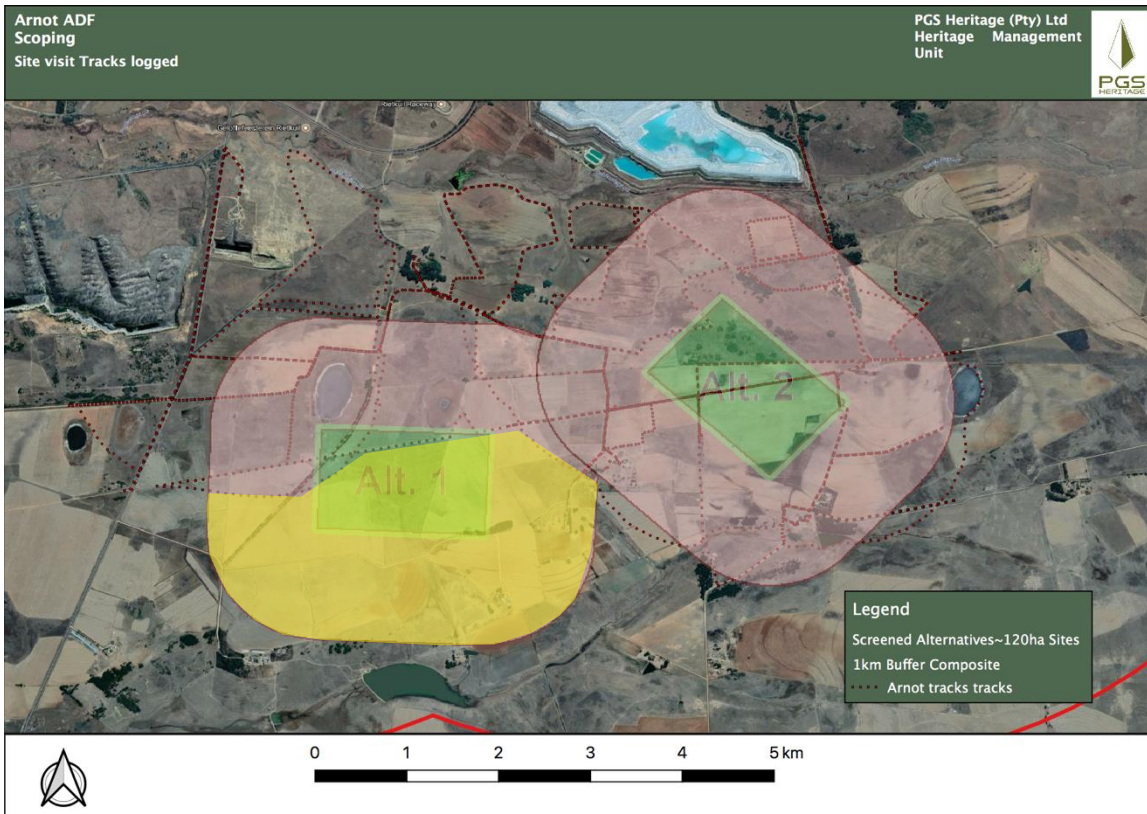


Figure 6 - Survey track logs (Area to be covered in EIA phase of study in yellow)

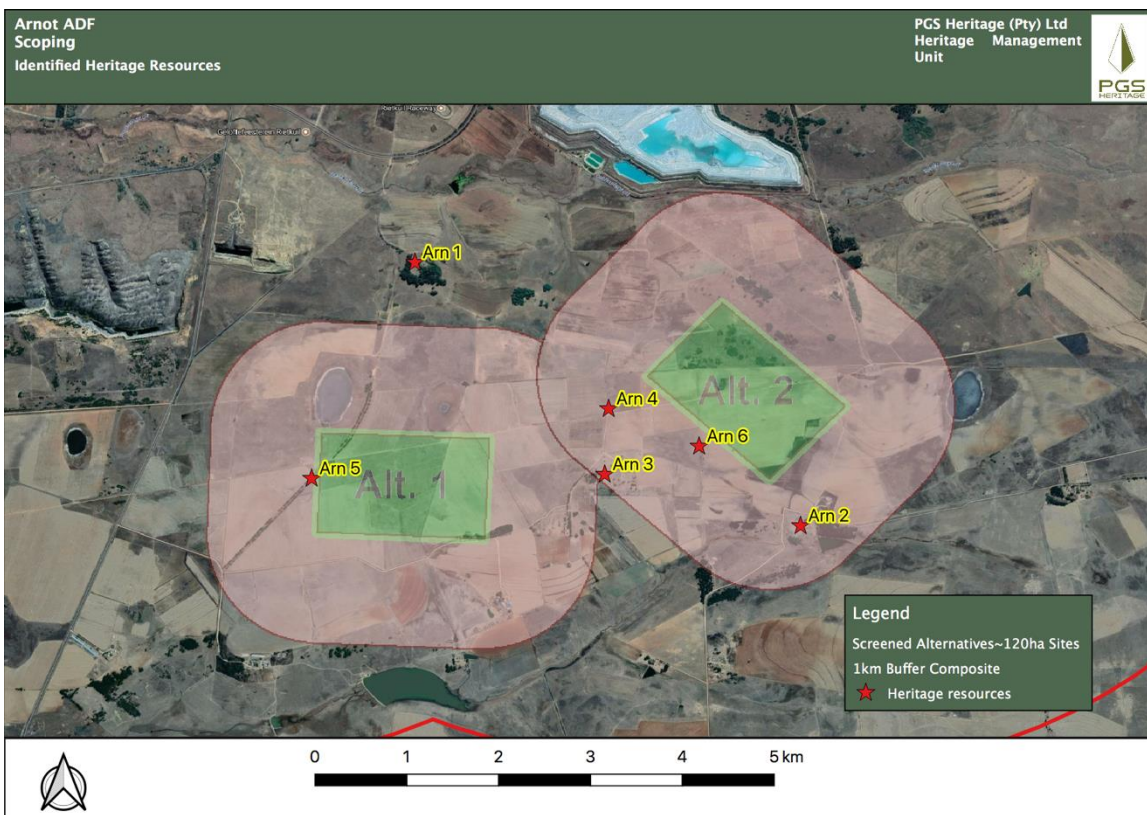


Figure 7 - Heritage Resources in the study area

These are commercial farms with their main focus on the production of maize. Large tracts of land are being ploughed and planted with maize and the areas in between is open grassland. These grasslands are also being harvested for their grass and numerous bales of grass are being collected as cattle feed. Some cattle are also being held amongst these grasslands. Most of the areas within the proposed alternative sites and their respective buffer zones have been ploughed and planted for several decades.

The study areas have several farm roads and tracks crossing them. Most of the maize fields are also fenced off to keep the grazing cattle out of the fields. A few windmills and water reservoirs form part of the farming infrastructure as well.



*Figure 8 - General view of the study area*



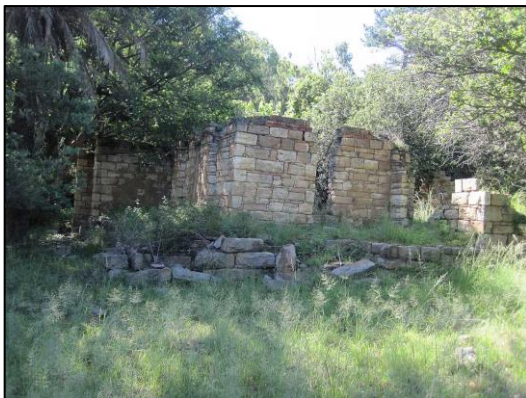
*Figure 9 - Ploughed maize fields*

#### 4.4.2 Site ARN 1

GPS: 25° 58' 12,8" S  
29° 47' 24,6" E

The remains of an old farmstead (**Figure 10**) and its associated buildings and features were identified at this location. A double grave was also identified here (**Figure 11**). These features were pointed out by Mr. Jaco Oosthuizen, son of one of the land owners, Mr. Koos Oosthuizen. The old farmstead and graves are not situated within the proposed alternative sites and their buffer areas and should therefore not be affected by the proposed development.

Site size: Approximately 50m x 80m.



*Figure 10 – Sandstone ruin associated with ARN1*



*Figure 11 – View of double grave at ARN1*

#### 4.4.3 Site ARN 2

GPS: 25° 59' 29,8" S  
29° 49' 17,3" E

The demolished remains of a farmstead were identified at this location (**Figure 12**). The farmstead was demolished recently and most of the windows, doors and other re-useable materials were removed from the site. This demolished structure is most probably not older than 60 years.

A stone walled kraal is situated approximately 50m to the east of the main house (**Figure 13**). This square kraal was built with sandstone blocks and measures approximately 20m x 20m in size. The walls measure approximately 1,2m high and approximately 0,5m wide. An entrance is situated on the north-western corner of the kraal. This kraal might possibly be older than 60 years.

A small building next to the kraal served as stables or as a small storeroom (**Figure 14**). This structure was also built with sandstone blocks, but the walls were later raised with bricks and cement. It has a sloping corrugated iron roof and two rooms with metal door frames as entrances. This structure might also be older than sixty years, although the raised brick and cement upper parts are more recent.

A large shed or storeroom is situated approximately 30m to the north of the stone walled kraal (**Figure 15**). It measures approximately 15m x 15m in size and has a corrugated iron pitched roof. The building was constructed with bricks and cement and the walls were plastered and painted. It has a dirt floor and additional rooms were added at the back to serve as storerooms. The building has metal doors and window frames as well as an external electrical system placed at the additional rooms at the back. This building is most probably not older than sixty years.

Another building is situated approximately 5m to the north of the large shed. It was most probably used as a dairy where cows were milked and the milk was transferred to holding tanks. The structure was built with brick blocks and cement and had a sloping roof. The roof was removed from the structure. The large, elongated room at the back has two entrances for the cows to enter and exit. The front rooms were tiled and pipes were coming from the back room into the front rooms to transfer the milk. The building had external electrical and piping systems. This structure is most probably not older than 60 years.

Site size: Approximately 150m x 80m.



Figure 12 – Rubble from demolished house



Figure 13 – Cattle kraal



Figure 14 – Small store room



Figure 15 – Barn with milking shed

#### 4.4.4 Site ARN 3

GPS: 25° 59' 14,8" S  
29° 48' 20,1" E

Two graves were identified at this location (Figure 16). The graves were pointed out by Ms. Liezl Kotze, the wife of the previous land owner Mr. Lourens Kotze, who sold the property about three months ago.

The graves were placed next to each other and were orientated from west to east. They are situated under and next to a cluster of trees. The graves belong to the Groenewald family and date from 1937 and 1938 respectively (**Figure 17** and **Figure 18**). Both graves have coffin-shaped, cement dressings and inscribed cement headstones. They are most probably the graves of a mother and child. The graves were not maintained and are overgrown with grass and other vegetation.

Site size: Approximately 5m x 3m.



Figure 16 – Two grave situated under tree canopy



Figure 17 – Inscription on headstone 1

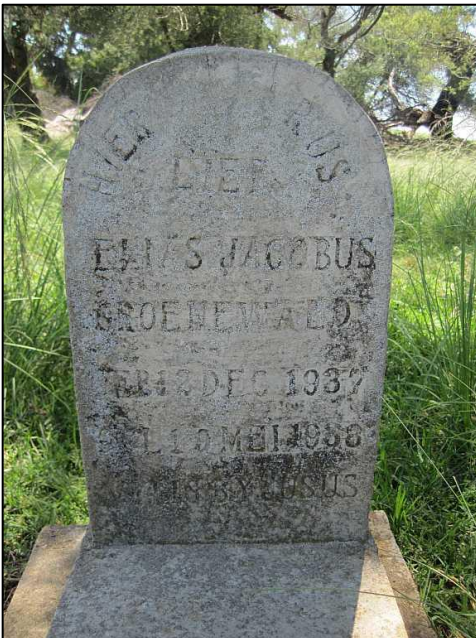


Figure 18 – Inscription on headstone 2

#### 4.4.5 Site ARN 4

GPS: 25° 58' 55,6" S  
29° 48' 21,2" E

Two graves were identified at this location. The graves are situated next to a windmill amongst some of the ploughed and planted maize fields (**Figure 19**). They were pointed out by Ms. Liezi Kotze, who has been staying on the farm for the last 30 years. She said the graves were there when they first moved on the farm and it was not known to whom they belonged.

The graves were placed next to each other and were orientated from west to east (**Figure 20**). They have oval-shaped mounds of packed rocks as dressings. The graves do not have any headstones and the deceased are unknown at this stage. The graves were not maintained and are overgrown with grass and other vegetation.

Site size: Approximately 5m x 3m.



*Figure 19 – Windpump indicating the position of the graves*



*Figure 20 – Graves in the foreground*

#### 4.4.6 Site ARN 5

GPS: 25° 59' 16,0" S  
29° 46' 54,4" E

A lane of oak trees was identified at this location (**Figure 21**). The oak trees line a gravel road on both sides and the lane of trees measures approximately 2km in length. The lane of trees seems to be randomly placed as it doesn't start or end at any particular significant point or feature. The age of these trees is not known.

Site size: Approximately 2km x 20m.



*Figure 21 – Lane of oak trees*

4.4.7 *Site ARN 6*

GPS: 25° 58' 06,6" S  
29° 48' 47,7" E

Two graves were identified at this location. The graves are situated next to a fence in an open field. Maize is grown on the other side of the fence.

The graves were placed next to each other and were orientated from west to east. They have oval-shaped mounds of packed rocks as dressings. The graves do not have any headstones and were not maintained and are overgrown with grass and other vegetation.

Site size: Approximately 5m x 3m.





Figure 22 – Two graves on fence line

## 5 IMPACT ASSESSMENT

Site name	Alternative Option
ARN1	Outside study area
ARN2	Alternative 2 buffer zone
ARN3	Alternative 2 buffer zone
ARN4	Alternative 2 buffer zone
ARN5	Alternative 1 buffer zone
ARN6	Alternative 2 buffer zone

### 5.1 Cemeteries and graves

The cemeteries (**ARN3-4 and 6**) could be directly impacted by the proposed construction activities of the ADF but area situated outside the proposed footprint areas and can be conserved with the necessary management measures. The cemeteries have high heritage significance and are given a Grade 3A significance rating in accordance with the system described in Section 3.1 of this document.

## 5.2 Structures

Only **ARN2** is situated inside the buffer area of Alternative 2 and should not be directly impacted by the development. The cluster that historically functioned as a single farmstead is protected under Section 34 of the NHRA and has a medium heritage significance and given a grading of Generally protected B.

The tree lane at **ARN5** is not grade as it has not heritage significance and no historical context.

## 5.3 Impact assessment tables

Implementing the impact assessment methodology as supplied by EIMS the following table provide a quantative assessment of the impacts of the project.

<b>Impact Name</b>	<b>Destruction of graves (ARN3, 4 and 6)</b>				
<b>Alternative</b>	<b>Alternative 2</b>				
<b>Phase</b>	<b>Construction</b>				
<b>Environmental Risk</b>					
<b>Attribute</b>	<b>Pre-mitigation</b>	<b>Post-mitigation</b>	<b>Attribute</b>	<b>Pre-mitigation</b>	<b>Post-mitigation</b>
Nature of Impact	-1	-1	Magnitude of Impact	5	1
Extent of Impact	1	1	Reversibility of Impact	5	1
Duration of Impact	5	2	Probability	1	1
Environmental Risk (Pre-mitigation)					-4.00
Mitigation Measures					
1. <i>Demarcate the cemeteries inside the final development buffer as a no-go area during construction and include a 50 meter buffer around the cemetery</i>					
Environmental Risk (Post-mitigation)					-1.25
Degree of confidence in impact prediction:					High
<b>Impact Prioritisation</b>					
Public Response					1
<i>Low: Issue not raised in public responses</i>					
Cumulative Impacts					2
<i>Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is probable that the impact will result in spatial and temporal cumulative change.</i>					
Degree of potential irreplaceable loss of resources					3
<i>The impact may result in the irreplaceable loss of resources of high value (services and/or functions).</i>					
Prioritisation Factor					1.50
<b>Final Significance</b>					-1.88

<b>Impact Name</b>	<b>Destruction of farmstead (ARN2)</b>				
<b>Alternative</b>	<b>Alternative 2</b>				
<b>Phase</b>	<b>Construction</b>				
<b>Environmental Risk</b>					
<b>Attribute</b>	<b>Pre-mitigation</b>	<b>Post-mitigation</b>	<b>Attribute</b>	<b>Pre-mitigation</b>	<b>Post-mitigation</b>
Nature of Impact	-1	-1	Magnitude of Impact	5	1
Extent of Impact	1	1	Reversibility of Impact	5	1
Duration of Impact	5	2	Probability	1	1
Environmental Risk (Pre-mitigation)					-4.00
Mitigation Measures					
1. <i>Demarcate the site inside the final development buffer as a no-go area during construction and include a 50 meter buffer around the cemetery</i>					
Environmental Risk (Post-mitigation)					-1.25
Degree of confidence in impact prediction:					High
<b>Impact Prioritisation</b>					
Public Response					1
<i>Low: Issue not raised in public responses</i>					
Cumulative Impacts					2

<i>Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is probable that the impact will result in spatial and temporal cumulative change.</i>	
Degree of potential irreplaceable loss of resources	3
<i>The impact may result in the irreplaceable loss of resources of high value (services and/or functions).</i>	
Prioritisation Factor	1.50
<b>Final Significance</b>	<b>-1.88</b>

<b>Impact Name</b>	<b>Destruction of palaeontology</b>				
<b>Alternative</b>	<b>All Alternatives</b>				
<b>Phase</b>	<b>Construction</b>				
<b>Environmental Risk</b>					
<b>Attribute</b>	<b>Pre-mitigation</b>	<b>Post-mitigation</b>	<b>Attribute</b>	<b>Pre-mitigation</b>	<b>Post-mitigation</b>
Nature of Impact	-1	-1	Magnitude of Impact	5	1
Extent of Impact	1	1	Reversibility of Impact	5	1
Duration of Impact	5	2	Probability	3	1
Environmental Risk (Pre-mitigation)					<b>-12.00</b>
Mitigation Measures					
Environmental Risk (Post-mitigation)					<b>-1.25</b>
Degree of confidence in impact prediction:					High
<b>Impact Prioritisation</b>					
Public Response					1
<i>Low: Issue not raised in public responses</i>					
Cumulative Impacts					2
<i>Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is probable that the impact will result in spatial and temporal cumulative change.</i>					
Degree of potential irreplaceable loss of resources					3
<i>The impact may result in the irreplaceable loss of resources of high value (services and/or functions).</i>					
Prioritisation Factor					1.50
<b>Final Significance</b>					<b>-1.88</b>

## 6 OPTION PREFERENCE

The following table indicates the alternative options provided for analysis and assessment according to their preference based on the impact foreseen on heritage resources.

Table 12: Preference listing of alternatives

Site name	Preference	Rating
Alternative 1	Preferred (depending on final fieldwork during EIA)	1
Alternative 2	Preferred	1

## 7 CONCLUSIONS AND RECOMMENDATIONS

During the heritage study 6 heritage resource were identified of which 5 is situated within the buffer areas of the Alternatives 1 and 2.

### 7.1 Cemeteries and possible graves

The cemeteries (**ARN3-4 and 6**) could be directly impacted by the proposed construction activities of the ADF but area situated outside the proposed footprint areas and can be conserved with the necessary management measures. The cemeteries have high heritage significance and are given a Grade 3A significance rating in accordance with the system described in Section 3.1 of this document.

#### 7.1.1 Mitigation

Recommendations for management measures dependant on the spoil site selected and cemeteries affect will be as follow:

2. Demarcate the cemeteries inside the final development buffer as no-go areas during construction and include a 50 meter buffer around the cemetery

### 7.2 Heritage structures

Only **ARN2** is situated inside the buffer area of Alternative 2 and should not be directly impacted by the development. The cluster that historically functioned as a single farmstead is protected under Section 34 of the NHRA and has a medium heritage significance and given a grading of Generally protected B.

The tree lane at **ARN5** is not grade as it has not heritage significance and no historical context.

### 7.2.1 Mitigation

Recommended mitigation measures in the vent of spoil Area 2 selected is as follows:

2. Demarcate the site inside the final development buffer as no-go areas during construction and include a 50 meter buffer around the cemetery

### 7.3 Palaeontology

The palaeontological sensitivity of the area is rated as very high and will require a field assessment and finds protocol as part of the EIA report.

### 7.4 Impact rating

The overall impact on heritage resources is seen as low with the implementation of the recommended mitigation measures.

### 7.5 Alternative preferences

The following table indicates the alternative options provided for analysis and assessment according to their preference based on the impact foreseen on heritage resources.

Table 13: Preference listing of spoil areas

Site name	Preference	Rating
Alternative 1	Preferred (depending on final fieldwork during EIA)	1
Alternative 2	Preferred	1

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## ANNEXURE A – PLAN OF STUDY FOR EIA PHASE

The Heritage Impact Assessment (HIA) report to be compiled by PGS Heritage (PGS) for the proposed Arnot ADF will assess the heritage resources found on site. This report will contain the applicable maps, tables and figures 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 consists 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.
- Step II – Physical Survey: A physical survey was conducted on foot and by vehicle through the proposed project area by heritage specialists, aimed at locating and documenting sites falling within and adjacent to the proposed development footprint. – Completed during the Scoping Phase
- Step III – The final step involves 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),
  - a. Density of scatter (dispersed scatter)
  - b. Low - <10/50m<sup>2</sup>
  - c. Medium - 10-50/50m<sup>2</sup>
  - d. High - >50/50m<sup>2</sup>
- **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

### 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 14: Site significance classification standards as prescribed by SAHRA

<b>FIELD RATING</b>	<b>GRADE</b>	<b>SIGNIFICANCE</b>	<b>RECOMMENDED MITIGATION</b>
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