



PGS

HERITAGE

***HERITAGE IMPACT ASSESSMENT FOR THE PROPOSED ASH DAM
SEEPAGE DRAINS AT DUVHA POWER STATION, EMALAHLENI
MUNICIPALITY, MPUMALANGA***

Phase 1 – Heritage Impact Assessment

Issue Date - 31 May 2019

Revision No. - ver 0.2

Project No. - 240 HIA

Declaration of Independence

The report has been compiled by PGS Heritage (Pty) Ltd, an appointed Heritage Specialist for Nema Consulting for the proposed Ash Dam Seepage Drains at Duvha Power Station. 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.

I, Wouter Fourie, declare that –

General declaration:

- I act as the independent archaeological specialist 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 archaeological 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 of an archaeological specialist 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;*

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ACKNOWLEDGEMENT OF RECEIPT

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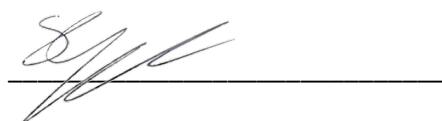
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Date -	31 May 2019		
Document Title -	Heritage Impact Assessment for the Proposed Ash Dam Seepage Drains at Duvha Power Station, Emalahleni Municipality, Mpumalanga		
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Reviewed	Samantha Gerber		Environmental Consultant

EXECUTIVE SUMMARY

PGS Heritage (Pty) Ltd (PGS) was appointed by Nemai Consulting to undertake a Heritage Impact Assessment (HIA) that forms part of the Basic Assessment Report (BA) for the proposed development of Ash Dam Seepage Drains at Duvha Power Station, Emalahleni Municipality, Mpumalanga.

No heritage sites were identified inside the study area. However, two heritage sites were identified just outside the boundary of one of the study areas. These include the remains of a demolished farmstead, most likely of recent to modern date (**DUV 001** of Low heritage significance), and a burial ground, consisting of 11 graves, (**DUV 002** of High heritage significance).

The identified burial ground is rated as having High/Medium heritage significance as well as being Generally Protected A (GP.A). Mitigation measures and permits are therefore required before it may be affected or moved/destroyed, thus this site is considered as a “no go” area until further mitigation is implemented.

A preliminary investigation based on the SAHRIS palaeosensitivity map identified the presence of geological deposits of both Low and Very High palaeontological sensitivity underlying the location of the four proposed drains. Therefore, a detailed desktop assessment by a professional palaeontologist would be required at the EIA level. This will confirm the initial sensitivity assessment and recommend specific mitigation measures to be undertaken during design and before construction. A finds management protocol may need to be developed for the construction activities.

Provided that the recommended mitigation measures are followed, it is considered that the proposed development will have a LOW impact on heritage resources and therefore the development can proceed.

Extent of mitigation

Mitigation will be required for **DUV 002** (burial grounds)

- Demarcate the site as a “no go” area, with a 20-meter buffer and a fence.
- It is also recommended that the Environmental Control Officer (ECO) monitor construction at this location.
- If the graves will be disturbed in any way during construction or operation, and a buffer is not possible, a grave relocation process will need to take place.

Mitigation may be required for the geological formations rated as Very High Sensitivity which underlies a portion of the study area. This would be confirmed by the required desktop PIA study.

This report has been compiled taking into account the National Environmental Management Act (NEMA) Appendix 6 requirements for specialist reports as indicated in the table below.

NEMA Regulations (2014, amended 2017) - Appendix 6	Relevant section in report
Details of the specialist who prepared the report	Page 2 of Report – Contact details and company
The expertise of that person to compile a specialist report including a curriculum vitae	Section 1.2 – refer to Appendix B
A declaration that the person is independent in a form as may be specified by the competent authority	Page 2 of the report
An indication of the scope of, and the purpose for which, the report was prepared	Section 1.1
The date and season of the site investigation and the relevance of the season to the outcome of the assessment	Section 5
A description of the methodology adopted in preparing the report or carrying out the specialised process	Section 3
The specific identified sensitivity of the site related to the activity and its associated structures and infrastructure	Section 3.2, 4.1- 4.2
An identification of any areas to be avoided, including buffers	Section 4.1
A map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	Section 5 – Figure 15, 16, 17 and 18
A description of any assumptions made and any uncertainties or gaps in knowledge;	Section 1.3
A description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives, on the environment	Section 5
Any mitigation measures for inclusion in the EMPr	Section 6
Any conditions for inclusion in the environmental authorisation	Section 6
Any monitoring requirements for inclusion in the EMPr or environmental authorisation	Section 9
A reasoned opinion as to whether the proposed activity or portions thereof should be authorised and	Section 6
If the opinion is that the proposed activity or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan	
A description of any consultation process that was undertaken during the course of carrying out the study	Not applicable. A public consultation process was handled as part of the EIA and EMP process.
A summary and copies if any comments that were received during any consultation process	Not applicable. To date no comments regarding heritage resources that require input from a specialist have been raised.
Any other information requested by the competent authority.	Not applicable.

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1 INTRODUCTION

PGS Heritage (Pty) Ltd (PGS) was appointed by Nemai Consulting to undertake a Heritage Impact Assessment (HIA) that forms part of the Basic Assessment Report (BA) for the development of the Proposed Seepage Interceptions Drains at Duvha Power Station, Emalahleni Municipality, Mpumalanga.

No heritage sites¹ were identified inside the study area. However, two heritage sites were identified just outside the boundary of one of the study areas (Ash Dam servitude). These include the remains of a demolished farmstead, most likely of recent to modern date (DUV001 of Low heritage significance), and a burial ground, consisting of 11 visible graves, (DUV002 of High heritage significance).

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 and as a result help determine if the proposed layout is viable. The HIA aims to inform the BA in the development of a comprehensive Environmental Management Plan (EMP) to assist the developer in managing the discovered heritage resources in a responsible manner, in order to protect, preserve, and develop the heritage resources within the framework provided by the National Heritage Resources Act of 1999 (Act 25 of 1999) (NHRA).

1.2 Specialist Qualifications

This HIA was compiled by PGS Heritage (PGS).

The staff at PGS has a combined experience of nearly 80 years in the heritage consulting industry. PGS and its staff have extensive experience in managing HIA processes and will only undertake heritage assessment work where they have the relevant expertise and experience to undertake that work competently.

¹ *Heritage site as used in this report refers to a place/locality where a heritage resource occurs and not a declared heritage site as contemplated by s2 of the NHRA: "s2(xviii) heritage site" means a place declared to be a national heritage site by SAHRA or a place declared to be a provincial heritage site by a provincial heritage resources authority.*

Jennifer Kitto, co-author, has 17 years' experience in the heritage sector, a large part of which involved working for a government department responsible for administering the National Heritage Resources Act, No 25 of 1999. She is therefore well-versed in the legislative requirements of heritage management. She holds a BA in Archaeology and Social Anthropology and a BA (Hons) in Social Anthropology.

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

Refer to **Appendix B** for CV's.

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 development area. Various factors account for this, including the subterranean nature of some archaeological sites. 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, which also applies to graves and burial grounds. 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.

It should be noted that access to certain areas of the study area (specifically the Ash Dam servitude area) was hampered by dense vegetation, viz. stands of black wattle and blue gum trees.

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

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

- i. GNR 982 of 2014 (Government Gazette 38282) promulgated under the (NEMA):
 - a. Basic Assessment Report (BAR) – Regulations 19 and 23
 - b. Environmental Scoping Report (ESR) – Regulation 21
 - c. Environmental Impacts Report (EIR) – Regulation 23
 - d. Environmental Management Programme (EMPr) – Regulations 19 and 23
- ii. NHRA:
 - a. Protection of Heritage Resources – Sections 34 to 36; and
 - b. Heritage Resources Management – Section 38
- iii. MPRDA Regulations of 2014:
 - a. Environmental reports to be compiled for application of mining right – Regulation 48
 - b. Contents of scoping report– Regulation 49
 - c. Contents of environmental impact assessment report – Regulation 50
 - d. Environmental management programme – Regulations 51
 - e. Environmental management plan – Regulation 52
- iv. The Regulations relating to the Management of Human Remains (GNR 363 of 2013 in Government Gazette 36473) promulgated under the National Health Act (Act No. 61 of 2003)
 - a. Exhumation and Reburial of Human Remains - Regulations 26, 27 and 28

The NHRA stipulates that cultural heritage resources may not be disturbed without authorization from the relevant heritage authority, and that an HIA will be required if a development triggers any of the development types listed in s38 of the NHRA. Section 34-36 further stipulates the protections afforded to structures older than 60 years, archaeological, palaeontological, meteorites, graves and burial grounds, as well as the process to be followed if these resources need to be disturbed.

NEMA 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 addition, the NEMA (No 107 of 1998) and the GNR 982 (Government Gazette 38282, 14 December 2014) state that, “the objective of an environmental impact assessment process is to, ... identify the

location of the development footprint within the preferred site ... focussing on the geographical, physical, biological, social, economic, cultural and heritage aspects of the environment” (GNR 982, Appendix 3(2)(c), emphasis added). 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 HIA report is compiled.

1.5 Terminology and Abbreviations

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 a 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.

Earlier Stone Age

The archaeology of the Stone Age, between 400 000 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.

Holocene

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

Later 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 1800s, associated with people who carried out iron working and farming activities such as herding and agriculture.

Middle Stone Age

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

Palaeontology

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

Abbreviations	Description
AIA	Archaeological Impact Assessment
ASAPA	Association of Southern African Professional Archaeologists
CRM	Cultural Resource Management
DEA	Department of Environmental Affairs
EIA practitioner	Environmental Impact Assessment Practitioner
EIA	Environmental Impact Assessment
ESA	Earlier Stone Age
GPS	Global Positioning System
HIA	Heritage Impact Assessment
I&AP	Interested & Affected Party
LSA	Later 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
ROD	Record of Decision
SADC	Southern African Development Community
SAHRA	South African Heritage Resources Agency

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

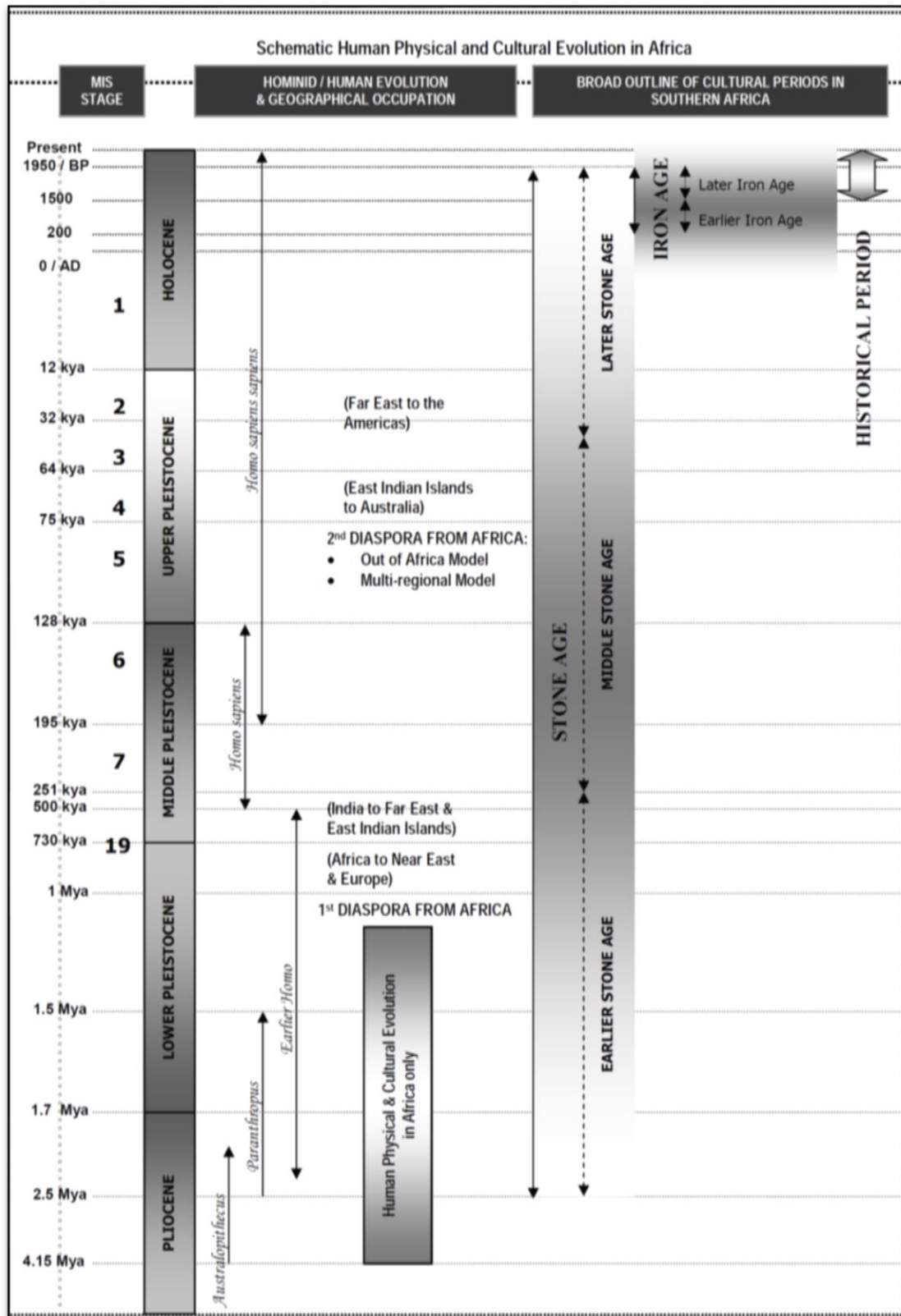


Figure 1: Human and Cultural Timeline in Africa (Morris, 2008).

2 TECHNICAL DETAILS OF THE PROJECT

2.1 Project Description

Duvha Power Station is a coal-fired power plant operated by Eskom Holdings SOC (Ltd) in Witbank, Mpumalanga Province. Nema Consulting has been appointed as the Independent Environmental Assessment Practitioner (EAP) to conduct the Environmental Authorisation (EA) and Water Use License for the Duvha ash dam seepage interception drains, located in the Duvha Power Station.

Duvha Power Station has been in operation for a period of 36 years. Duvha produces wet ash that gets pumped to the ash dam which is located 1.7km east of the Witbank Dam. The settled water is then decanted to the low-level ash water return dam (LLAWRD) from where it gets pumped back to the station to produce more wet ash slurry. The Power Station ash dam is experiencing seepage water which is polluting the ground water towards the Witbank dam and mitigation measures have to be taken to prevent the continuous ground water seepage. A multi-disciplinary concept design to prevent seepage water is to be carried out to support the Basic Assessment and Water Use Licence Application Processes as the drain would be within 500m of wetlands. Construction of the seepage interception drains at the various dams are necessary as the Department of Environmental Affairs instructed Eskom to mitigate and prevent the ground water pollution.

In order to limit groundwater seepage from the existing large Ash Dam, as well as the high-level ash water return dam (HLAWRD) and LLAWRD, it is proposed to construct cut-off interceptor drains along sections of the perimeter of each of these dams and to convey the intercepted water to designated discharge points (**Figure 2, Figure 3** and Figure 4).

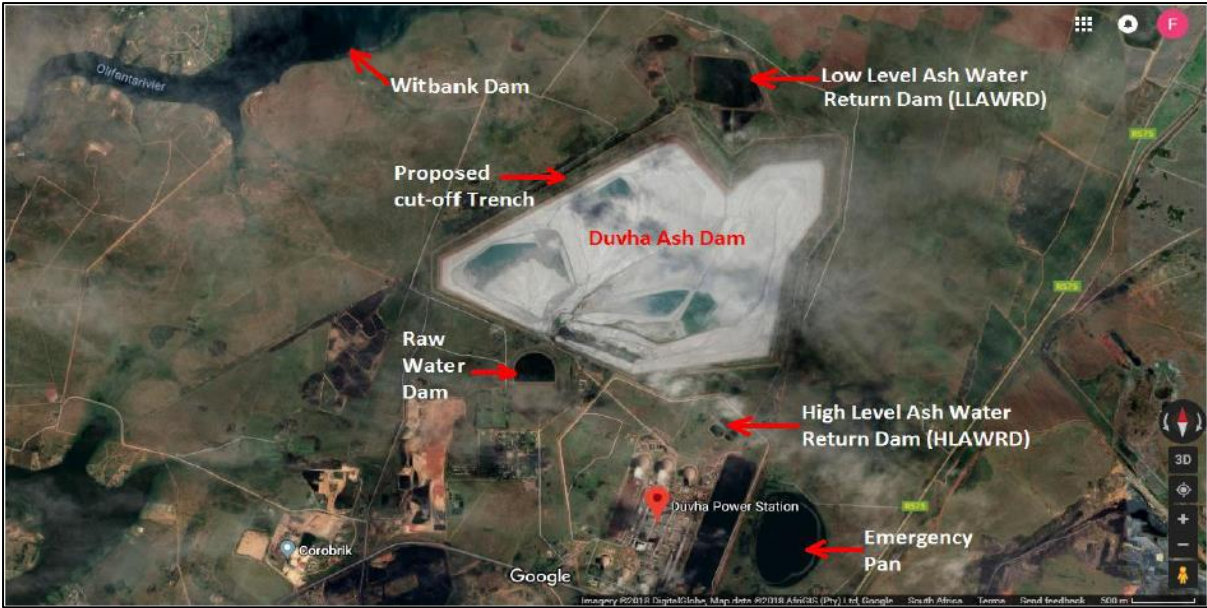


Figure 2: Duvha Power Station (Site Layout), showing the location of the affected return water dams in relation to the Ash Dam (Map provided by Nemaï Consulting, 2019)



Figure 3: Google Earth image showing the proposed servitude footprint areas for the seepage interception drains (yellow, green, blue and pink polygons) (Map provided by Nemaï Consulting, 2017).

Duvha Ash Dam Seepage Interceptor Drain Design

The design and construction of the ash dam Seepage Interception Drain will require the following design assumptions:

- Length of trench $L = 2400\text{m}$
- Length of Channel to daylight = 2000m
- Depth of trench $D = 8.0\text{m}$
- Manning pipe coefficient roughness $n = 0.018$

Design Approach

Four possible options were evaluated:

- Option 1 - Provision of an HDPE Class C Liner on top of Duvha's Ash Dam;
- Option 2 - Open Cut-off Trench;
- Option 3 - Closed Subsoil Cut-off Drain; and
- Option 4 - Do nothing

The closed subsoil cut-off drain is deemed the best option as Option 1 is unacceptable from a station availability point of view and Option 3 is therefore used for the Concept Design.

The design approach is to excavate an open trench down to bedrock and place a drain pipe on the bedrock with an HDPE cut-off curtain on the downstream side to intercept and drain the water. The trench will be backfilled with an open channel on the final surface to drain the stormwater. Two HDPE subsoil drainpipes just above the bedrock will be used, an upper slotted drain pipe and a larger lower unslotted pipe to lead the water away. The pipes will be led into manholes spaced at 200m intervals where the upper pipe's flow will fall by gravity into the lower pipe of the next segment.

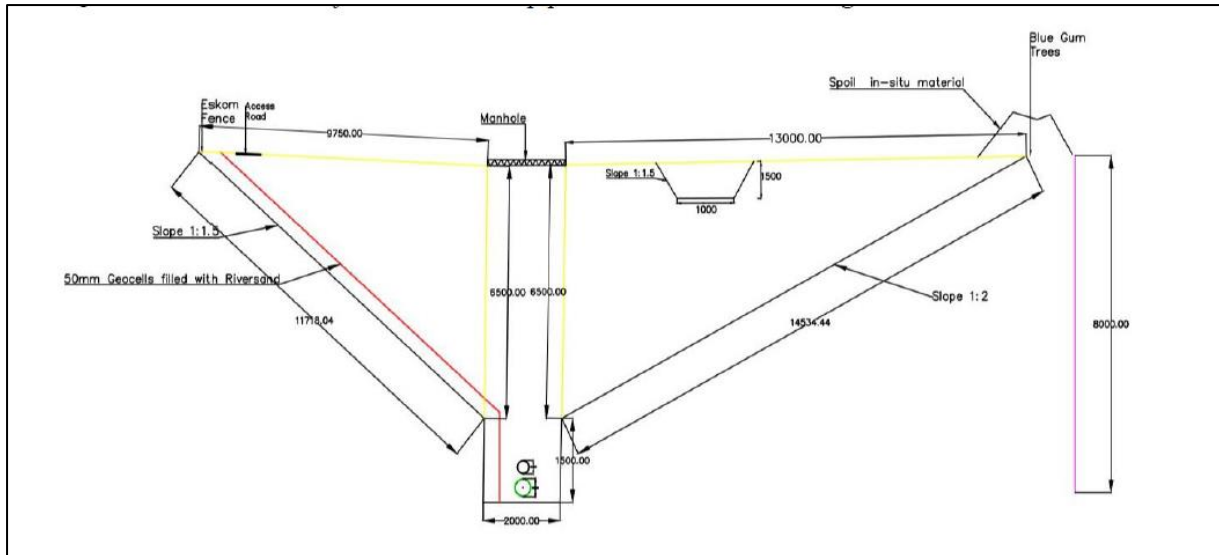


Figure 4: Conceptual design of seepage interceptor drain (from Nemaï 2019)

2.2 Site Description

The Duvha Power Station is located roughly 13 km south-east of Witbank, between the R544 and the R575 roads. The proposed seepage drains will be constructed in the servitude areas around the ash dam and the three associated return water dams located around the Duvha Power Station. The study area therefore consists of the servitude areas around each of the affected dams: the Ash Dam (yellow polygon), the Low-level Water Return Dam (green polygon), the High-level Water Return dam (pink polygon) and the Raw Water Dam (blue polygon) (**Figure 3**). The servitude area for all four dams, as well as the area between the dams, has been disturbed previously by the construction of the dams and related infrastructure such as pipelines roads and ditches/drainage channels.

The general area surrounding the Duvha Power Station consists of the following: slightly to moderately undulating plains of degraded grassland (Moist Sandy Highveld Grassland), with wetlands, pans and rivers. The Witbank Dam is located 1,7km north-west of the study area. The surrounding land use includes mines and quarries and commercial cultivated land, interspersed with a few small villages associated with these mines and well-developed road and rail infrastructure (**Figure 5 to Figure 11**).

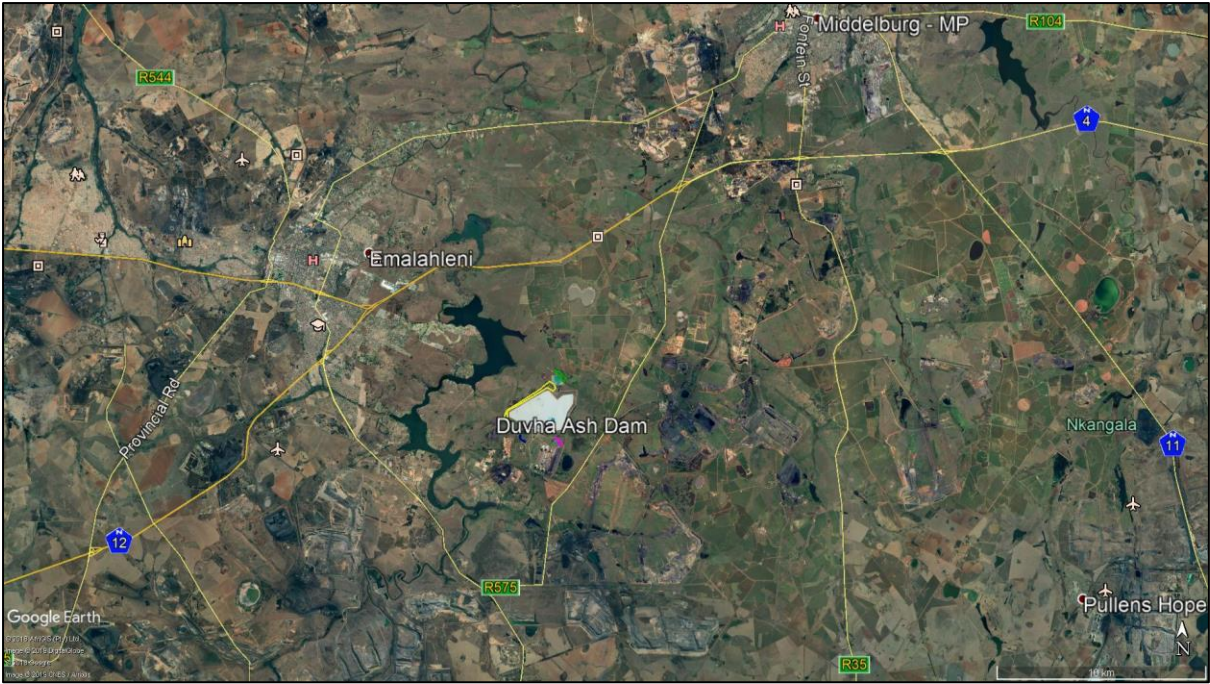


Figure 5: Regional Location of Duvha Ash Dam



Figure 6: View of Ash Dam from outside the servitude north-western boundary



Figure 7: View of vlei at south-west end of the Ash Dam servitude



Figure 8: View of road and ditch in servitude of Ash Dam



Figure 9: View of road and pipeline running along Low-level Water Return Dam servitude



Figure 10: View from top of Raw Water Dam, inside the servitude area, towards the road



Figure 11: View of High-level Water Return Dam servitude, showing pipeline and ditch

3 ASSESSMENT METHODOLOGY

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

3.1 Methodology for Assessing Heritage Site Significance

The applicable maps, tables and figures are included, as stipulated in NHRA and NEMA. The HIA process consists 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 predominantly by vehicle and on foot through the four study areas by an experienced team of two staff, which 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 the identified heritage sites is 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 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 –

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 1: Site significance classification standards as prescribed by SAHRA.

FIELD RATING		GRADE	SIGNIFICANCE	RECOMMENDED MITIGATION
National (NS)	Significance	Grade 1		Conservation; National Site nomination
Provincial (PS)	Significance	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 (GP.A)	A		High / Medium Significance	Mitigation before destruction
Generally Protected (GP.B)	B		Medium Significance	Recording before destruction
Generally Protected (GP.A)	C		Low Significance	Destruction

3.2 Methodology for Impact Assessment

In order to ensure uniformity, a standard impact assessment methodology has been utilised so that a wide range of impacts can be compared. The impact assessment methodology makes provision for the assessment of impacts against the following criteria:

- Significance;
- Spatial scale;
- Temporal scale;
- Probability; and
- Degree of certainty.

A combined quantitative and qualitative methodology was used to describe impacts for each of the above-mentioned assessment criteria. A summarised explanation of each of the qualitative descriptors along with the equivalent quantitative rating scale for each of the above-mentioned criteria is given in *Table 2*.

Table 2: Impact Assessment Criteria

CRITERIA	CATEGORIES	EXPLANATION
Overall nature	Negative	Negative impact on affected biophysical or human environment.
	Positive	Benefit to the affected biophysical or human environment.
Type	Direct	Are caused by the action and occur at the same time and place.
	Indirect or Secondary	Are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable. May include growth inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems.
Spatial Extent over which impact may be experienced	Cumulative	Is the impact on the environment, which results from the incremental impact of the action when added to other past, present and reasonably foreseeable future actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.
	Site	Immediate area of activity incorporating a 50m zone which extends from the edge of the affected area.
Duration of impact	Local	Area up to and/or within 10km of the 'Site' as defined above.
	Regional	Entire community, drainage basin, landscape etc.
	National	South Africa.
	Short-term	Impact would last for the duration of activities such as land clearing, land preparation, fertilising, weeding, pruning and thinning. Quickly reversible.
Severity	Medium-term	Impact would after the project activity such as harvesting. Reversible over time.
	Long-term	Impact would continue beyond harvesting/ extraction of the trees.
	Permanent	Impact would continue beyond decommissioning.
	Low, Medium, High Negative	Based on separately described categories examining whether the impact is destructive or benign, whether it destroys the impacted environment, alters its functioning or slightly alters the environment itself.
Low, Medium, High Positive		
Reversibility	Completely Reversible	The impact can be completely reversed with the implementation of correct mitigation and rehabilitation measures.
	Partly Reversible	The impact can be partly reversed providing mitigation measures are implemented and rehabilitation measures are undertaken

Irreplaceable Loss	Irreversible	The impact cannot be reversed, regardless of the mitigation or rehabilitation measures.
	Resource will not be lost	The resource will not be lost or destroyed provided mitigation and rehabilitation measures are implemented.
	Resource may be partly destroyed	Partial loss or destruction of the resource will occur even though all management and mitigation measures are implemented.
	Resource cannot be replaced	The resource cannot be replaced no matter which management or mitigation measures are implemented.
Probability of occurrence	Unlikely	<40% probability.
	Possible	40% probability.
	Probable	>70% probability.
	Definite	>90% probability.
Mitigation Potential [i.e. the ability to manage or mitigate an impact given the necessary resources and feasibility of application.]	High or Completely Mitigable	<p>Relatively easy and cheap to manage. Specialist expertise or equipment is generally not required.</p> <p>The nature of the impact is understood and may be mitigated through the implementation of a management plan or through ‘good housekeeping’. Regular monitoring needs to be undertaken to ensure that any negative consequences remain within acceptable limits.</p> <p>The significance of the impact after mitigation is likely to be low or negligible.</p>
	Moderate or Partially Mitigable	<p>Management of this impact requires a higher level of expertise and resources to maintain impacts within acceptable levels. Such mitigation can be tied up in the design of the Project.</p> <p>The significance of the impacts after mitigation is likely to be low to moderate.</p> <p>May not be possible to mitigate the impact entirely, with a residual impact(s) resulting.</p>
	Low or Unmitigable	<p>Will not be possible to mitigate this impact entirely regardless of the expertise and resources applied.</p> <p>The potential to manage the impact may be beyond the scope of the Project.</p> <p>Management of this impact is not likely to result in a measurable change in the level of significance.</p>
Impact Significance	Negligible	-
	Low	Largely of HIGH mitigation potential, <u>after</u> considering the other criteria.
	Moderate	Largely of MODERATE or partial mitigation potential <u>after</u> considering the other criteria.
	Substantial	Largely of LOW mitigation potential <u>after</u> considering the other criteria.

4 ARCHIVAL AND DESKTOP RESEARCH FINDINGS

4.1 Archival findings

The aim of the archival background research is to identify possible heritage resources that could be encountered during fieldwork, as summarised in **Table 3**.

Table 3: Summary of History of the study area

DATE	DESCRIPTION
2.5 million to 250 000 years ago	<p>The Earlier Stone Age is the first and oldest phase identified in South Africa’s archaeological history and comprises two technological phases. The earliest of these is known as Oldowan and is associated with crude flakes and hammer stones. It dates to approximately 2 million years ago. The second technological phase is the Acheulian and this comprises more refined and better made stone artefacts, such as the cleaver and bifacial hand axe. The Acheulian dates back to approximately 1.5 million years ago (Fourie, 2008). No information with regard to ESA sites from the surrounding area could be found. However, it seems likely for such sites to exist here.</p>
250 000 to 40 000 years ago	<p>The Middle Stone Age is the second oldest phase identified in South Africa’s archaeological history. This phase is associated with flakes, points and blades manufactured by means of the so-called ‘prepared core’ technique. Middle Stone Age sites may occur along rivers and streams but none have been identified in the study area and their occurrence is difficult to predict. (De Jong, 2010). No information with regard to MSA sites from the surrounding area could be found. However, it seems likely for such sites to exist here.</p>
40 000 years ago – AD 400	<p>The Later Stone Age is the third archaeological phase identified and is associated with an abundance of very small artefacts known as microliths. Late Stone Age (LSA) people had even more advanced technology than the MSA people and therefore succeeded in occupying even more diverse habitats. Some sites are known to occur in the general region. These vary from sealed (i.e. cave) sites, located to the north and south of the study area, to open sites in the Magaliesberg. Also, for the first time we get evidence of people’s activities derived from material other than stone tools. Ostrich eggshell beads, ground bone arrowheads, small bored stones and wood fragments with incised markings are traditionally linked with the LSA. (Van Schalkwyk a, 2006)</p> <p>There appears to be a gap in the Mpumalanga LSA record between 9 000 BP and 5 000 BP. This may have to do with the general lack of Stone Age research in the province, but it also encompasses a period of rapid warming and major climate fluctuation, which may have forced people to seek out more protected and viable environments in this area.</p> <p>The Mpumalanga Stone Age record becomes visible again in the mid-Holocene at the farm Honingklip (HKLP) near Badplaas in the Carolina District. Here two LSA sites were found on opposite sides of a bend in the Nhlazatshe</p>

DATE	DESCRIPTION
	<p>River, about 1km west of its confluence with the Teespruit. The HKLP sites are in the foothills of the Drakensberg, where the climate is warmer than the Highveld but cooler than the Lowveld (Delius (ed), 2006).</p> <p>No information with regard to LSA sites from the surrounding area could be found. However, it seems likely for such sites to exist here.</p>
AD400-AD1100	<p>Early Iron Age</p> <p>Early in the first millennium AD, there seems to be a significant change in the archaeological record of the greater part of eastern and southern Africa lying between the equator and Natal. This change is marked by the appearance of a characteristic ceramic style that belongs to a single stylistic tradition. These Early Iron Age people practised a mixed farming economy and had the technology to work metals like iron and copper.</p> <p>The expansion of early farmers, who, among other things, cultivated crops, raised livestock, mined ore and smelted metals, occurred in this area between AD 400 and AD 1100. Dates from Early Iron Age sites indicate that by the beginning of the 5th century AD Bantu-speaking farmers had migrated down the eastern lowlands and settled in the Mpumalanga Lowveld. Subsequently, farmers continued to move into and between the Lowveld and Highveld of Mpumalanga until the 12th century. These Early Iron Age sites tend to be found in similar locations. Sites were found within 100m of water, either on a riverbank or at the confluence of streams. The close proximity to streams meant that the sites were often located on alluvial fans. The nutrient rich alluvial soils would have been favoured for agriculture. The availability of floodplains and naturally wetter soils would have been important for the practice of dryland farming. This may have been particularly so during the Early Iron Age, when climate reconstruction for the interior of South Africa suggests decreased rainfall between AD 900 and AD 1100 and again after AD 1450 (Delius, 2006).</p>
AD 1500-AD 1700	<p>While there is some evidence that the Early Iron Age continued into the 15th century in the Lowveld, on the escarpment it had ended by AD1100. The Highveld, particularly around Lydenburg, Badfontein, Sekhukhuneland, Roosenekal, and Steelpoort, became active again from the 15th century onwards. This later phase, termed the Late Iron Age (LIA), was accompanied by extensive stonewalled settlements (Delius, 2006).</p>
AD 1700 – AD 1840	<p>The Buispoort facies of the Moloko branch of the Urewe Ceramic Tradition is the first association of the study area’s surroundings with the Iron Age. It is most likely dated to between AD 1700 and AD 1840. The key features on the decorated ceramics include rim notching, broadly incised chevrons and white bands, all with red ochre (Huffman, 2007).</p>
AD 1821 – AD 1823	<p>After leaving present-day KwaZulu-Natal the Khumalo Ndebele (more commonly known as the Matabele) of Mzilikazi migrated through the general vicinity of the study area under discussion before reaching the central reaches of the Vaal River in the vicinity of Heidelberg in 1823 (www.mk.org.za).</p>

DATE	DESCRIPTION
	<p>Two different settlement types have been associated with the Khumalo Ndebele. The first of these is known as Type B walling and was found at Ngabeni in the Babanango area of KwaZulu-Natal. These walls stood in the open without any military or defensive considerations and comprised an inner circle of linked cattle enclosures (Huffman, 2007). The second settlement type associated with the Khumalo Ndebele is known as Doornspruit, and comprises a layout which from the air has the appearance of a 'beaded necklace'. This layout comprises long scalloped walls (which mark the back of the residential area) which closely surround a complex core which in turn comprises a number of stone circles. The structures from the centre of the settlement can be interpreted as kitchen areas and enclosures for keeping small stock.</p> <p>It is important to note that the Doornspruit settlement type is associated with the later settlements of the Khumalo Ndebele in areas such as the Magaliesberg Mountains and Marico and represent a settlement under the influence of the Sotho with whom the Khumalo Ndebele intermarried. The Type B settlement is associated with the early Khumalo Ndebele settlements and conforms more to the typical Zulu form of settlement. As the Khumalo Ndebele passed through the general vicinity of the study areas shortly after leaving Kwazulu-Natal, one can assume that their settlements here would have conformed more to the Type B than the Doornspruit type of settlement. It must be stressed however that no published information could be found which indicates the presence of Type B sites in the general vicinity of the study area.</p> <p>No iron age sites objects or features have been identified in the study area (Van Schalkwyk, 2006).</p>
1836	The first Voortrekker parties crossed over the Vaal River (Bergh, 1999).
1850s – 1860s	<p>This period saw the early establishment of farms by white farmers in the general vicinity of the study area. This said, the archival study has shown that all the farms within the study area were formally inspected by the government of the Zuid-Afrikaansche Republiek during February 1868. Of course, this does not necessarily mean that before this date no farms had already been settled and farmed on, simply that during February 1868 the farms were officially proclaimed and registered with government. The permanent settlement of white farmers in the general vicinity of the study area would have resulted in the proclamation of individual farms and the establishment of permanent farmsteads. Features that can typically be associated with early farming history of the area include farm dwellings, sheds, rectangular stone kraals, canals, farm labourer accommodation and cemeteries.</p> <p>Although it is possible that a few heritage sites associated with the very first establishment of white farmers from the study area and surroundings would likely still exist, this would be few in number due to their age as well as the destruction of farmsteads by the British forces during the South African War in accordance with the so-called 'scorched earth' policy. The other sites often associated with these early farms are graves and cemeteries for both white farmers and black farm labourers. These sites are often all that remains of the farmstead of the mid to late 19th century.</p>

DATE	DESCRIPTION
1872 - 1894	<p>By 1872, the study area now fell within the district of Middelburg (Bergh, 1999). During this same year the general surroundings of the study area was visited by a geologist from Eastern Europe Woolf Harris. He visited the general vicinity of the study area in 1872 and identified coal in the Van Dyksdrift area. He is believed to have started the Maggie's Mine the following year (Falconer, 1990).</p> <p>During this period, a number of small coal mining operations were started in the general vicinity, but as no railway line connected this area with the coal markets further to the west, it proved a difficult commercial undertaking. By 1889 there were four coal mines in the Witbank area, namely Brugspruit Adit, Maggie's Mine, Steenkoolspruit and Douglas (Falconer, 1990).</p>
20 October 1894	<p>On this day the railway line between Pretoria and Delagoa Bay (present-day Maputo) was completed near Balmoral located roughly 32km north-west of the study area.</p> <p>This event was very significant for the study area and surroundings as the completion of the line meant that the vast deposits of coal known to have existed in this area since the mid-19th century could now be commercially mined (Bulpin, 1989) and easily transported to the Witwatersrand gold mines and the populated centres of Pretoria and Johannesburg where they were most required.</p>
1899 - 1902	<p>The Second South African War (1899-1902) took place during this time. Although no evidence for battles or skirmishes within the study areas during the South African War could be found. However, the Middelburg and the Balmoral Boer refugee camps were established in the general vicinity of the Witbank area.</p>
	<p>Middelburg concentration camp was the largest camp in the Transvaal system, reaching over 7,000 inmates at one point, and the reports of Dr Kendal Franks and the Ladies Committee suggest that it was very badly run. Dr Franks was critical of the layout of the camp and complained that the administration was 'lax', while the Ladies Committee thought it 'one of the most unsatisfactory we have seen'.¹ An intake of over 3,000 in May 1901 brought in desperately impoverished and debilitated people, which precipitated disease.</p> <p>By the time the first report was submitted in May 1901, there were already over 7,000 inmates in Middelburg camp, with more than 3,000 arriving in that month alone. Many Boers were from the poorest and most fever-stricken districts of the Transvaal, and commonly known amongst their fellow countrymen as "Mapochers". The new arrivals were often so destitute that some families had only one blanket amongst them, hundreds of children were without shoes and some girls had only one garment. In addition, many were ill with malaria. Apart from the Boer women and children, men who had voluntarily surrendered and had taken the oath of neutrality, were also</p>

DATE	DESCRIPTION
	<p>drafted into Middelburg camp from Cape Town and Ladysmith. Not surprisingly, tents and provisions ran out, as did cooking utensils and bedding. During September and October 1901 Middelburg camp was gradually reduced in size and the camp itself was concentrated and moved to a new site on the banks of the Oliphants River. After the end of the war, repatriation was a slow and methodical process but, by December 1902 there were still 600 people in camp. One reason for the delays was the fact that Middelburg was used as a depot for families returning from Natal. The camp was finally closed in January 1903 (http://www2.lib.uct.ac.za/mss/bccd/Histories/Middelburg/).</p>
<p>1880s-1914</p>	<p>Witbank</p> <p>Originally the early residents of Witbank area were mainly stock farmers as there was no market for agricultural produce. Crops were restricted to the needs of the local families. Early travellers in the area, such as Thomas Baines, as far back as 1872 mentioned the coal used by local residents as fuel. Evidence has also been found that at first the African people, and later the Voortrekkers, mined coal from the outcrop, especially in the riverbeds, and transported it by ox-wagon to the Witwatersrand.</p> <p>Actual systematic mining at Witbank only started in 1896 when Samuel Stanford, together with the Neumann Group, established the company Witbank Colliery Limited, and sank the first shaft on the farm Witbank. Earlier the farm was generally known as Swartbosch although the official name was Leraatsfontein. It was given the name Witbank because it was not so cumbersome and because of the large quartz rock which, in the words of Thomas Baines, "loomed like a wagon tent in the distance." The town Witbank was laid out in 1903 by Witbank Colliery Limited and in the same year Samuel Stanford erected the first wood and iron building, consisting of a shop and hotel. Witbank Colliery Limited controlled the town until 9 April 1906 when a health committee was appointed. On 13 May 1910 a village council was elected and on the 8 November 1914 the town was granted municipal status. The mining of coal did not initially result in a population increase. But with the advent of the railway line between Pretoria and Lourenco Marques (now Maputo) the mining industry was firmly placed on an economic basis, and thereafter the population increased considerably (http://global.britannica.com/EBchecked/topic/646020/Witbank).</p>
<p>1975-1984</p>	<p>During the seventies the demand for electricity in South Africa increased at an average of nine percent per year. In response to this demand, ESKOM had to virtually double its generating capacity. Against this background, construction of Duvha power station started in November 1975 on a farm called Speekfontein just outside Witbank. Duvha was one of South Africa's largest fossil fired power stations, and was often referred to as the "flagship" of the ESKOM fleet. The combined generating capacity of the six units is 3 600 MW, enough power to supply a city three times the size of Johannesburg with electricity. The availability of coal and water makes this area ideally suited for the establishment of power stations. When Duvha was completed the smokestacks were the tallest freestanding concrete structures in the Southern Hemisphere each 300 metres tall (July 1992). Unit 1 went into commercial</p>

DATE	DESCRIPTION
	service on 18 August 1980, Unit 2 on 1 October 1980, Unit 3 on 16 September 1981, Unit 4 on 1 July 1982, Unit 5 on 31 March 1983 and Unit 6 on 22 February 1984 (http://www.eskom.co.za/sites/heritage/Pages/Duvha.aspx).

4.2 Cartographic findings

Topographical maps obtained from the Directorate: Surveys and Mapping in Cape Town were used to compile a historic layering of the study area. Overlays of the maps were made on Google Earth.

4.2.1 First Edition Sheet 1:50 000 2529CD 1954 Middelburg (Transvaal)

This map sheet was based on aerial photography carried out in 1948, was surveyed in 1954 and drawn in 1958 by the Trigonometrical Survey Office. The sheet was printed in 1959 by the Government Printer of South Africa. This map indicates an absence of heritage features in the immediate vicinity of most of the four dam servitude areas. However, a couple of African homesteads (huts) are depicted just on the edge of the Ash Dam servitude and the Low-level Dam servitude. A 'native' compound is also depicted in the area where the Ash Dam is located (**Figure 12**).

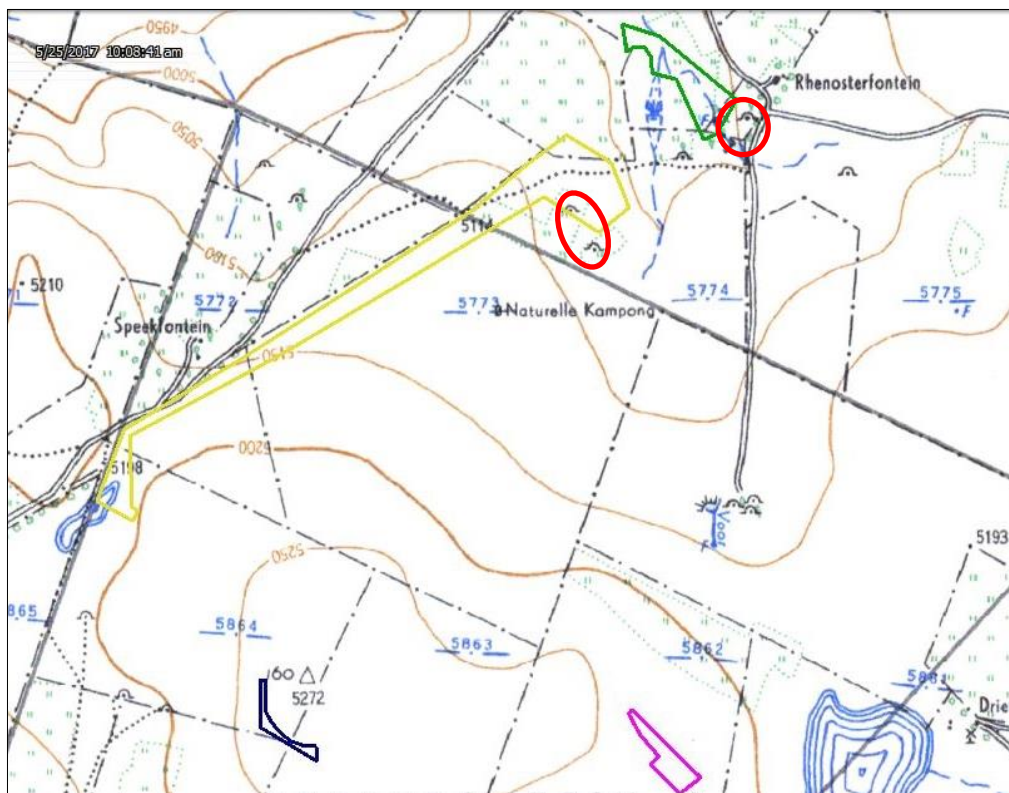


Figure 12: View of an enlarged section of the First Edition 2529 CD-Sheet showing the four dam servitude areas (coloured polygons).

4.2.2 Second Edition Sheet 1:50 000 2529CD Middelburg (Transvaal) 1974

This map sheet was printed by the Government Printer and published by the Chief Directorate: Surveys and Land Information in 1974. This map (**Figure 13**) indicates that the area covered by the four dam servitude study areas depicts several buildings in the immediate vicinity of the servitude study area for the Ash dam (yellow polygon). No heritage sites are indicated in the servitude study areas for the three other dams (green, pink and blue polygons). The buildings indicated will be at least 43 years old. Some structures are also depicted just outside the servitude areas.

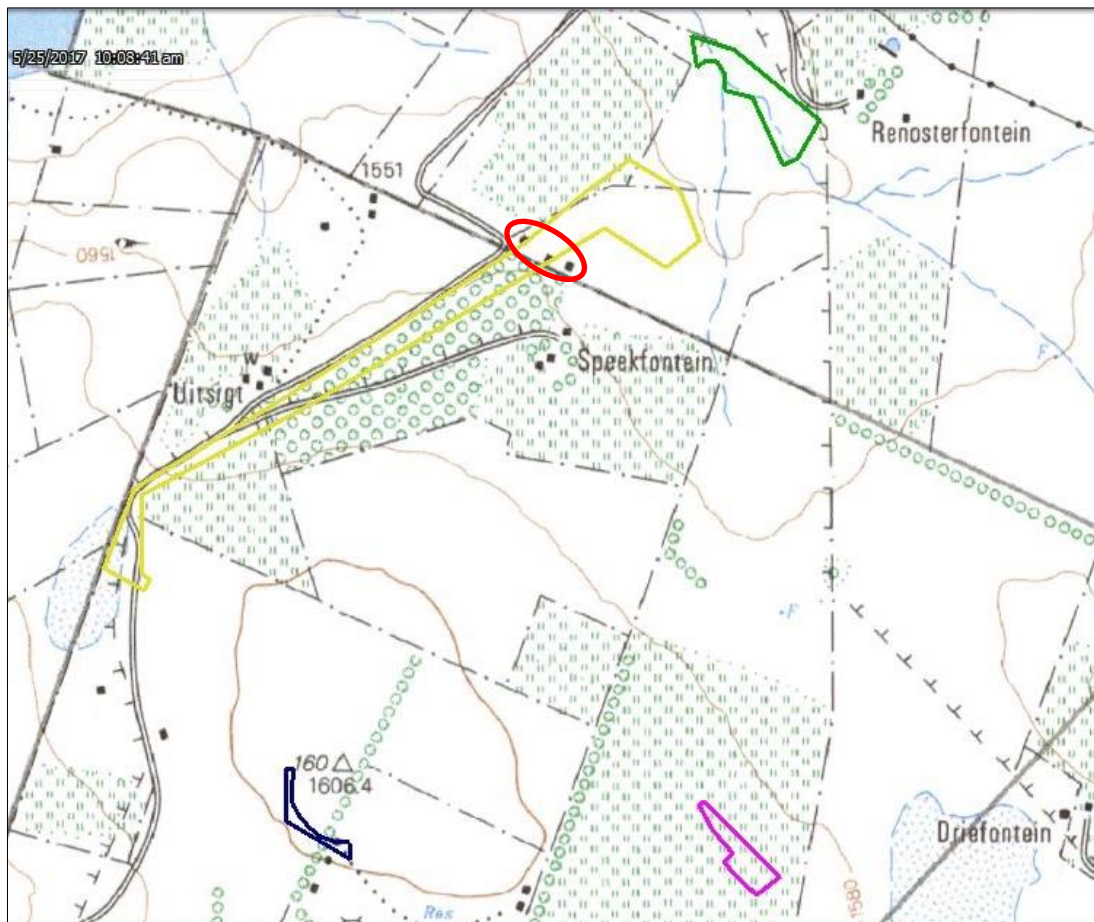


Figure 13: View of an enlarged section of the Second Edition 1:50 000 2529CD Sheet showing the presence of several buildings (red circle) in the immediate vicinity of the servitude study area for the Ash Dam (yellow polygon). Some structures are depicted just outside the servitude areas.

4.2.3 Third Edition Sheet 1:50 000 2529CD Middelburg (Transvaal) 1996

This map sheet was published by the Chief Directorate: Surveys and Land Information and printed by CTP Book printers in 1998.

This map (**Figure 14**) depicts most of the structures and features comprising the existing Duvha Power Station, including the Ash Dam and the water return dams, as well as various structures associated with the power station. Therefore they were constructed before 1996.



Figure 14: View of an enlarged section of the Third Edition 1:50 000 2529CD Sheet overlaid on Google Earth. Most of the structures and features comprising the Duvha Power Station, including the Ash Dam and the water return dams, are depicted; i.e. they were constructed before 1996.

4.3 Previous Archaeological and Heritage Research Studies Undertaken within the Study Area

A search of the SA Heritage Resources Information System (SAHRIS) database identified a number of HIA reports for the study area and general surrounding region. These reports confirm that a variety of heritage resources from different archaeological and historical periods have been identified previously

within the study area and surrounding region. The details of the heritage resources identified in the different reports are provided below, in ascending order:

- **Phase 1 Archaeological Survey of the Impunzi Division of Duiker Mining – Witbank/Ogies Area. Matakoma and CRM Africa in association. (2000)**

The Impunzi Division was developing a new EMP of which the archaeological assessment was one component. Twenty-three sites of cultural and archaeological significance were identified. Seven of these sites were located outside of any development area and included two Middle Stone Age, one Late Stone Age, two Late Iron Age sites, and an historic homestead, while 16 were burial grounds which contained approximately 380 graves in total.

- **Eskom Transmission Line - Duvha (Witbank) To Janus (Mecklenburg): Cultural Heritage Scoping Report. For Environmental Impact Management Services by National Cultural History Museum (van Schalkwyk, 2003)**

The report states that the assessment was not a final evaluation of either of the two proposed routes, but only an evaluation, based on existing information and a short field visit, to determine which of the two routes would be the preferred option. Therefore, the report only identified the types of heritage resources to be expected to occur in the general vicinity of the two routes. Stone tools are found over most of the two routes, especially on the escarpment and down on the lower laying areas. Iron Age sites also occur over the whole of the route. These sites date to the Early and Late Iron Age. A few stone walled sites are known in the northern section of the proposed development.

- **A Heritage Impact Assessment (HIA) Study for the EMP amendment for the Douglas Colliery in the Mpumalanga Province of South Africa. Prepared for Pulles Howard and De Lange. (Pistorius, 2004)**

The study was commissioned to identify heritage resources in the mining area of the Douglas Colliery due to the proposed expansion of mining activities. A total of 23 heritage sites were identified: one historical house, six historical graveyards, nine remains dating from the relatively recent past and seven closed mine shafts.

- **A Report on a Cultural Resources Survey on the Farms Kleinkopje 15 IS and Steenkoolspruit 18 IS, Douglas Collieries, Emalaheni District Mpumalanga Province. (Pelser & Vollenhoven, 2008)**

Archaetnos cc was requested by DMO Projects, BHP Billiton Energy Coal SA to conduct a cultural resources survey in the area known as Douglas Collieries as part of the Douglas Mine Optimization Project. The areas that were investigated included a number of grave sites that were previously identified and where graves were relocated from, as well as areas not previously surveyed. Mining operations are being extended and this survey functioned as a measure to ensure that no further graves or other cultural heritage sites that could exist in the area would be negatively impacted by the developments.

The fieldwork undertaken revealed these included a possible grave, two farm labourer sites and a Late Iron Age (LIA) stone walled settlement.

- **Heritage Impact Report: ATCOM East Expansion of the Impunzi Colliery, on Portions of the Farms Steenkoolspruit 18 IS, Van Dyksdrift 19 IS and Kromfontein 30 IS, Emalaheni, Mpumalanga Province. For Jones and Wagener Consulting Engineers. (Fourie, 2012)**

PGS Heritage & Grave Relocation Consultants (PGS) was appointed by Jones and Wagener Consulting Engineers to undertake a Heritage Impact Assessment (HIA) that forms part of the Environmental Impact Assessment (EIA) and Environmental Management Plan (EMP) for the ATCOM East expansion of the Impunzi Colliery, on portions of the farms Steenkoolspruit 18 IS, Van Dyksdrift 19 IS and Kromfontein 30 IS, Emalaheni, Mpumalanga Province.

The field work identified a total of 33 heritage structures and 11 cemeteries, of which two of the cemeteries were already part of a grave relocation process, at the time of writing the report.

- **Proposed Construction of Ash Disposal Facility for Kusile Power Station, Mpumalanga and Gauteng Provinces – Heritage Impact Assessment (Fourie, 2013)**

PGS Heritage was appointed by Zitholele Consulting to undertake a Heritage Impact Assessment (HIA) that forms part of the Environmental Impact Assessment (EIA) for the proposed Ash Disposal Facility associated with the Kusile Power Station, which is located between the N4 and N12 highways, just before Witbank, in the Nkangala District Municipality, Mpumalanga.

The field work for the survey identified a total of 2 heritage structures and 4 cemeteries on Site A and 6 heritage structures and 5 cemeteries on Site B.

- **Cultural Heritage Impact Assessment for the Proposed Development of the Bravo 5 By-Pass Power Line, Duvha Power Station, Mpumalanga Province. (Van Schalkwyk, 2016)**

This survey was for the proposed construction of a 400 kV by-pass line, Bravo 5, approximately 10km in length, on the Bravo-Vulcan (Witbank) line to bypass Duvha Power Station. This development was largely to take place inside the existing Duvha Power Station property. No sites, features or objects of cultural significance were identified in the development area.

5 PALAEOLOGY

A basic palaeontological sensitivity for the study area was determined using the palaeosensitivity map on the SAHRIS database (South African Heritage Resources Information System) (<http://www.sahra.org.za/sahris/map/palaeo>). As can be seen in **Figure 15** and **Figure 16**, most of the area affected by the proposed drainage footprints (Ash Dam - yellow polygon and the Low-level Water Return Dam - green polygon) occurs in geology where the palaeontological sensitivity is assessed as being of Low sensitivity (coloured blue). However, the two southern drainage footprints (Raw Water Dam - blue polygon and High-level Water Return dam - pink polygon) are located in an area where the palaeontological sensitivity is assessed as being of Very High sensitivity (coloured red). Although the area has been previously disturbed by the construction of the power station, including the dams, at least a desktop palaeontological impact study (PIA) will be required for the study area.

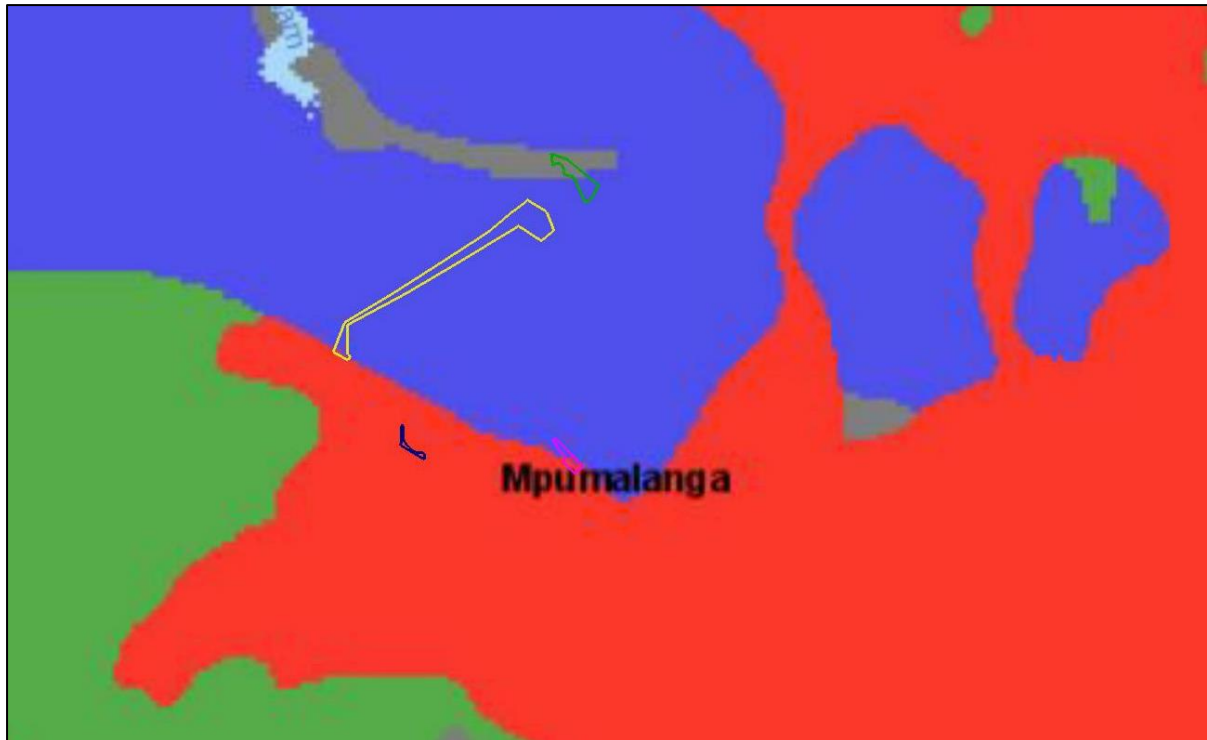


Figure 15: Overlay of the individual drainage footprints on the palaeosensitivity map from the SAHRIS database. Most of the area is coloured blue, which is rated as Low sensitivity, but the two southern water return dams are located over an area coloured red, which is rated as Very High sensitivity.

Colour	Sensitivity	Required Action
RED	VERY HIGH	field assessment and protocol for finds is required
ORANGE/YELLOW	HIGH	desktop study is required and based on the outcome of the desktop study, a field assessment is likely
GREEN	MODERATE	desktop study is required
BLUE	LOW	no palaeontological studies are required however a protocol for finds is required
GREY	INSIGNIFICANT/ZERO	no palaeontological studies are required
WHITE/CLEAR	UNKNOWN	these areas will require a minimum of a desktop study. As more information comes to light, SAHRA will continue to populate the map.

Figure 16: SAHRIS palaeosensitivity ratings table

6 FIELD WORK FINDINGS

Due to the nature of cultural remains, with the majority of artefacts occurring below the surface, a controlled-exclusive surface survey was conducted over a period of one day, on foot and by vehicle, by a heritage specialist and field assistant from PGS. The fieldwork was conducted on the 25th May 2017.

The track logs (in blue) for the survey are indicated on the map below. The study area comprises the servitude areas around the four dams as indicated in **Figure 17**.



Figure 17: General Map indicating track logs and heritage sites identified from the fieldwork undertaken



Figure 18: Track log and heritage sites for Ash Dam servitude



Figure 19: Track log for Low-level Water Return Dam servitude



Figure 20: Track log for Raw Water dam servitude



Figure 21: Tracklog for High-level Water Return dam servitude

6.1 Heritage Findings

No heritage sites were identified within the four servitudes comprising the proposed development area. However, two heritage sites were identified just outside the boundary of the servitude for the Ash Dam.

6.2 Sites Identified

6.2.1 DUV 001

GPS Coordinates: -25.935692°; 29.326526°

Site Description

The demolished remains of four separate buildings occur at this location. The buildings seem to have been constructed of modern materials and are probably the remains of a recent farmstead. The boundary wall is stone and cement. The foundation is modern brick. The estimated extent is approximately 75m in diameter. The site is located just outside the north-west boundary of the Ash Dam servitude study area, approximately 100m away.



Figure 22: View of DUV001, showing the foundation of one of the buildings



Figure 23: DUV001, showing boundary wall and remains of structure outside the wall



Figure 24: General view of DUV001, showing the dense vegetation growing over the site

Site Significance:

The identified site **DUV 001** is deemed to be of **Low heritage significance** and is rated as **Generally Protected C (GP.C)**. No mitigation measures or permits are therefore required before the site can be affected, moved or destroyed.

6.2.2 DUV 002:

GPS Coordinates: -25.931079°; 29.336059°

Site Description:

A small formal fenced burial ground is located here. It consists of approximately 11 visible graves, some of which have inscribed headstones. The area where the graves are located is heavily overgrown with thick long grass and it was difficult to determine exactly how many graves are present. The graves are oriented east to west. Several graves have headstones with inscriptions that contain names and dates for the 1970s-1980s. Names include Mandla Geelbooi Masilela (d.1989), Dereke Wessel (d. 1980), Konny Amos Skhosana (d. 1974), and George (d. 1976). The burial ground is located just outside the boundary of the Ash Dam servitude study area, approximately 13m away.



Figure 25: View of DUV002, burial ground, looking towards the Ash Dam servitude



Figure 26: DUV002, View looking north-west



Figure 27: Masilela headstone, dated 1989

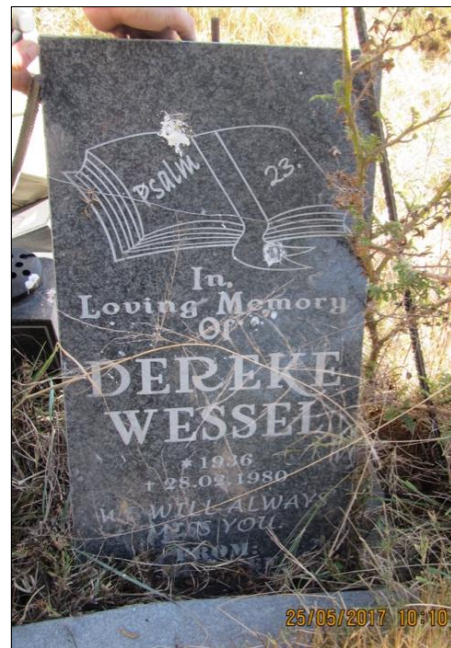


Figure 28: Wessel headstone, dated 1980



Figure 29: Skhosana headstone, dated 1974



Figure 30: George headstone, dated 1976

Site Significance:

The identified site DUV 002 is deemed to be of **High heritage significance** and is rated as **Generally Protected A (GP.A)**. Mitigation measures and permits are therefore required before the site may be affected, moved or destroyed.

Please refer to Section 9 for the required mitigation measures.

7 OVERALL IMPACT EVALUATION

The study has identified that the proposed project activities could have an indirect impact on the two identified heritage resources located just outside the boundary of the servitude for the Ash Dam area, however all the envisaged impacts on heritage resources, can be mitigated. The study has identified that the proposed project activities could have a High to Medium impact on the heritage resource site DUV002 (burial ground). The study has also identified a possible direct impact on underlying geology identified on the SAHRIS sensitivity map as being of Very High palaeontological sensitivity. This will need to be confirmed by at least a desktop PIA study.

7.1 Status Quo and “No Go” Areas

7.1.1 Status Quo

No heritage sites were identified inside the study area. However, two heritage sites were identified just outside the boundary of the Ash Dam servitude study area. These include the remains of a demolished farmstead, most likely of recent to modern date (DUV001 of Low heritage significance), and a burial ground, consisting of 11 visible graves, (DUV002 of High heritage significance).

7.1.2 “No go” Areas

The burial ground (DUV002) rated as having **High heritage Significance** as well as being **Generally Protected A (GP.A)** and is deemed as a “no-go area” without the implementation of mitigation. Mitigation measures and permits are required before this site may be affected or moved/destroyed; thus, this site is considered a “no go” area until further mitigation is implemented.

7.2 Project Impact (Unmitigated)

During the construction, impacts may occur to Heritage resources as identified for the project. These impacts could occur as a result of construction activities such as topsoil stripping, excavations and vegetation clearing.

The combined weighted project impact to the Heritage resources (prior to mitigation) will possibly be of a moderate to high negative significance. The impact will be permanent and is in all likelihood going to happen. The impact risk class is thus **moderate to high**.

However, the implementation of the recommended mitigation measures will minimise the impacts and reduce the overall impacts to **low**.

7.3 Cumulative Impact

The baseline impacts are considered to be moderate for Heritage resources, and additional project impacts (if no mitigation measures are implemented) will increase the significance of the existing baseline impacts, where the cumulative unmitigated impact will probably be of a moderate to high significance. The impact is going to happen and will be of short term in nature, therefore the impact risk class will be Moderate to High. However, with the implementation of the recommended management and mitigation measures this risk class can be minimized to a Low rating.

8 SUMMARY IMPACT ASSESSMENT TABLE

POTENTIAL IMPACTS (in order of impact as described in Impact Matrix)	ASPECT (refer to Impact Matrix)	Nature	Type	Extent	Duration	Severity	Reversibility	Irreplaceable Loss	Probability	MITIGATION POTENTIAL	IMPACT SIGNIFICANCE		MITIGATION MEASURES
											Without Mitigation	With Mitigation	
CONSTRUCTION PHASE													
Impact on historical structures	Heritage Resources	Negative	Indirect	Site	Permanent	Low	Irreversible	Resource cannot be replaced	Unlikely	High	Low	Low	Refer to Section 9
Impact on burial grounds	Heritage Resource	Negative	Indirect	Local	Permanent	High negative	Irreversible	Resource cannot be replaced	Possible	Moderate or Partially Mitigatable	High	Low	Refer to Section 9 and 9

POTENTIAL IMPACTS (in order of impact as described in Impact Matrix)	ASPECT (refer to Impact Matrix)	Nature	Type	Extent	Duration	Severity	Reversibility	Irreplaceable Loss	Probability	MITIGATION POTENTIAL	IMPACT SIGNIFICANCE		MITIGATION MEASURES
											Without Mitigation	With Mitigation	
Impact on palaeontology (based on SAHRIS palaeosensitivity map at least a desktop PIA study is required to assess the impact)											Requires PIA	Requires PIA	NB: A desktop PIA by a professional palaeontologist is required to confirm the SAHRIS palaeosensitivity ratings

Note: these ratings are based on the SAHRIS palaeosensitivity map and will require confirmation by a professional palaeontologist undertaking at least a desktop PIA study.

9 HERITAGE MANAGEMENT GUIDELINES

9.1 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 m² 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 m² 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 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 Heritage 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.

Possible finds include:

- a. Open air Stone Age scatters, disturbed during vegetation clearing. This will include stone tools.
 - b. Palaeontological deposits such as bone, and teeth in fluvial riverbank deposits.
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 are 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 need to be followed. This includes an extensive social consultation process.

Table 4: Roles and responsibilities of archaeological and heritage management when heritage resources are discovered during construction

ROLE	RESPONSIBILITY	IMPLEMENTATION
A responsible specialist needs to be allocated and should attend all relevant meetings, especially when changes in design are discussed, and liaise with SAHRA.	The client	Archaeologist and a competent archaeology support 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 support 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, when discovered.	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 the 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 (when discovered). The client with the specialist needs to agree on the scope and activities to be performed	The client	Environmental Consultancy and the Archaeologist
When a specialist/archaeologist has been appointed for mitigation work on discovered heritage resources, comprehensive feedback reports should be submitted to relevant authorities during each phase of development.	Client and Archaeologist	Archaeologist

9.2 All phases of the project

9.2.1 Archaeology

The project will encompass a range of activities during the construction phase, including ground clearance and establishment of construction camps area.

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 during 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 recognise any significant material being unearthed, and to make the correct judgment on which actions should be taken. In the event that possible heritage resources are identified a qualified archaeologist/palaeontologist must be contacted to evaluate the finds and make recommendations on the mitigation required.

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 graves or burial grounds, the project manager 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 monitoring programme.

In the case where archaeological material is identified during construction the following measures must be taken:

- Upon the accidental discovery of archaeological material, a buffer of at least 20 meters should be implemented.
- If archaeological material is accidentally discovered during construction, activities must cease in the area and a qualified archaeologist be contacted to evaluate the find. To remove the material, permits must be applied for from SAHRA under Section 35 of the NHRA.

9.2.2 Graves

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

- Upon the accidental discovery of graves, a buffer of at least 50 meters should be implemented.
- 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 permit must be applied for from SAHRA (Section 36 of the NHRA) and other relevant authorities (National Health Act and its regulations). The local South African Police Services must immediately be notified of the find.
- Where it is 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 notices 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. The whole process must be done by a reputable company that is well versed in relocations;
- ix. The exhumation 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.

9.2.3 Palaeontology

A preliminary investigation based on the SAHRIS palaeosensitivity map identified the presence of geological deposits of both Low and Very High palaeontological sensitivity underlying the location of the four proposed drains.

Due to the Very High palaeontological sensitivity identified by SAHRIS, a detailed desktop assessment by a professional palaeontologist would be required at the EIA level. This will confirm the initial sensitivity assessment and recommend specific mitigation measures to be undertaken during design and before construction. A finds management protocol may need to be developed for the construction activities.

10 CONCLUSIONS AND RECOMMENDATIONS

PGS Heritage (Pty) Ltd (PGS) was appointed by Nemai Consulting to undertake a Heritage Impact Assessment (HIA) that forms part of the Basic Assessment Report (BA) for the proposed development of the Proposed Seepage Interceptions Drains at Duvha Power Station, Emalahleni Municipality, Mpumalanga.

No heritage sites were identified inside the four servitude study areas. However, two heritage sites were identified just outside the boundary of Ash Dam servitude area. These include the remains of a demolished farmstead, most likely of recent to modern date (DUV001 of Low heritage significance), and a burial ground, consisting of 11 visible graves, (DUV002 of High heritage significance).

The study has identified that the proposed project activities could have an indirect impact on the identified heritage resources located just outside Ash Dam servitude area, however all the envisaged impacts on heritage resources can be mitigated. The study has identified that the proposed project activities will have a High to Medium impact on heritage resources.

As noted above, due to the Very High palaeontological sensitivity identified by SAHRIS a detailed desktop assessment by a professional palaeontologist would be required at the EIA level. This will confirm the initial sensitivity assessment and recommend specific mitigation measures to be undertaken during design and before construction. A finds management protocol may need to be developed for the construction activities.

Extent of mitigation

Mitigation will only be required for DUV 002 (burial ground):

- Demarcate the site as a “no go” area, with a 20m buffer and a fence.
- It is also recommended that the ECO monitor construction at this location.
- If the graves will be disturbed in any way during construction or operation, and a buffer is not possible, a grave relocation process will need to take place.

A detailed desktop assessment by a professional palaeontologist will recommend specific mitigation measures to be undertaken for palaeontological resources likely to be affected, before construction. A finds management protocol may need to be developed for the construction activities.

11 PREPARERS

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LEGISLATIVE REQUIREMENTS – TERMINOLOGY AND ASSESSMENT CRITERIA**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 paleontological 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 NHRA, 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 is 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 formal burial ground (such as ancestral graves in rural areas), are protected. The legislation protects the interests of communities that have an interest in the graves - they should be consulted before any disturbance takes place. The graves of victims of conflict and those associated with the liberation struggle are to 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 paleontological 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.

2 Graves and burial grounds

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 under 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 under 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 burial ground administered by a local authority.

Graves in the category located inside a formal burial ground administered 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 burial ground but is to be relocated to one, permission from the local authority is required and all regulations, laws and by-laws set by the burial ground authority must be adhered to.

CURRICULUM VITAE OF TEAM**WOUTER FOURIE****Professional Heritage Specialist and Professional Archaeologist and Director PGS Heritage****Summary of Experience**

Specialised expertise in Archaeological Mitigation and excavations, Cultural Resource Management and Heritage Impact Assessment Management, Archaeology, Anthropology, Applicable survey methods, Fieldwork and project management, Geographic Information Systems, including *inter alia* -

- Involvement in various grave relocation projects (some of which relocated up to 1000 graves) and grave “rescue” excavations in the various provinces of South Africa
- Involvement with various Heritage Impact Assessments, within South Africa, including -
 - Archaeological Walkdowns for various projects
 - Phase 2 Heritage Impact Assessments and EMPs for various projects
 - Heritage Impact Assessments for various projects
- Iron Age Mitigation Work for various projects, including archaeological excavations and monitoring
- Involvement with various Heritage Impact Assessments, outside South Africa, including -
 - Archaeological Studies in Democratic Republic of Congo
 - Heritage Impact Assessments in Mozambique, Botswana and DRC
 - Grave Relocation project in DRC

Key Qualifications

BA [Hons] (Cum laude) - Archaeology and Geography - 1997

BA - Archaeology, Geography and Anthropology – 1996

MPhil – Conservation of the Built Environment - Current

Professional Archaeologist - Association of Southern African Professional Archaeologists (ASAPA) - Professional Member

Accredited Professional Heritage Specialist – Association of Professional Heritage Practitioners (APHP)

CRM Accreditation (ASAPA) -

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

Key Work Experience

2003- current - Director – PGS Heritage (Pty) Ltd

2007 – 2008 - Project Manager – Matakoma-ARM, Heritage Contracts Unit, University of the Witwatersrand

2005-2007 - Director – Matakoma Heritage Consultants (Pty) Ltd

2000-2004 – CEO – Matakoma Consultants

1998-2000 - Environmental Coordinator – Randfontein Estates Limited. Randfontein, Gauteng

1997-1998 - Environmental Officer – Department of Minerals and Energy. Johannesburg, Gauteng

Worked on various heritage projects in the SADC region including, Botswana, Mozambique and the Democratic Republic of the Congo

JENNIFER KITTO
Professional Heritage Specialist

Summary of Experience

Public participation with regards to Heritage Impact Assessments, Cultural Resource Management and Heritage Impact Assessment Management, Historical and Archival Research, Applicable survey methods, Fieldwork and Project Management; whilst working, inter alia, on the following projects:

•Heritage Assessment Projects

- HIA Report, Dolos-Giraffe Substation, Hopefield-Bultfontein,
- HIA Report, Jagtlust Mine Extension, North-West Province
- HIA Report, Kolomela, Northern Cape
- HIA Report, Decontamination of AEL Detonator Campus, Modderfontein Factory, Modderfontein, City of Johannesburg Metropolitan Municipality, Gauteng
- HIA Report, Old Rand Leases Hostel redevelopment, Fleurhof Ext 10, Roodepoort, City of Johannesburg Metropolitan Municipality, Gauteng
- HIA Report, Watershed Substation, North-West Province
- HIA Report, Solid Waste Landfill Facility, Rhodes Village, Eastern Cape
- HIA Report, Rossouw
- Phase 2 mitigation report, Cass Farmstead, Optimum Colliery, Mpumalanga
- HIA Report, Kusile Ash Disposal Facility, Witbank, Mpumalanga
- Report on Rand Steam Laundries Background History, City of Johannesburg Metropolitan Municipality, Gauteng
- New Cemetery, Barkly East, Senqu Municipality, Eastern Cape (desktop/archival research for HIA report)
- Lady Slipper Country Estates, Nelson Mandela Metro Municipality, Eastern Cape (desktop/archival research for HIA report)
- Exxaro Resources Paardeplaats Project, Belfast, Mpumalanga (field survey and archival research for HIA report)
- Copperleaf Mixed Use Development, Farm Knoppieslaagte 385/Knopjeslaagte 140, Centurion, Gauteng (field survey and archival research for HIA report)
- Isundu-Mbewu Transmission Line Project, Pietermaritzburg, Kwazulu Natal (Initial Heritage Scan (survey) for Corridor 3 Alternative 1)

Key Qualifications

BA [Hons] – Social Anthropology- 1994/1995

BA - Archaeology and Anthropology – 1993

Technical Member- Association of Southern African Professional Archaeologists (ASAPA) -

Key Work Experience

2011 -2017: PGS Heritage (Pty) Ltd

2008-2011: SAHRA Burial Grounds and Graves Unit

1998 –2007: SAHRA Provincial Office: Gauteng