



NEW PROPOSED GIYANI 35 ML RESERVOIR, GIYANI, LIMPOPO PROVINCE

Phase 1 – Heritage Impact Assessment

Issue Date - 29 February 2015
Revision No. - 2
Project No. 121HIA

Declaration of Independence

The report has been compiled by PGS Heritage, an appointed Heritage Specialist for Environmental Impact Management Services (Pty) Ltd. 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

HERITAGE CONSULTANT - PGS Heritage

CONTACT PERSON - W Fourie
Tel - +27 (0) 12 332 5305
Email - wouter@pgsheritage.co.za


SIGNATURE - _____

ACKNOWLEDGEMENT OF RECEIPT

CLIENT - Environmental Impact Management Services (Pty) Ltd (EIMS)

CONTACT PERSON - Bongani Khupe
T: (011) 789-7170
E: bongani@eims.co.za

SIGNATURE - _____

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Control	Name	Signature	Designation
Author	W. Fourie		Heritage Specialists/ Principal Investigator
Reviewed	B Khupe		EIMS

EXECUTIVE SUMMARY

PGS Heritage (PGS) was appointed by Environmental Impact Management Services (Pty) Ltd (EIMS) to undertake a Heritage Impact Assessment (HIA) that forms part of the Basic Environmental Impact Report (BAR) for the new proposed Giyani 35 MI reservoir, Giyani, Limpopo Province.

The following section provides a summary of the project locality, scope, heritage resources, envisaged impacts and recommendations.

1 SITE NAME

New proposed Giyani 35 MI reservoir, Giyani, Limpopo Province.

2 LOCATION

The proposed reservoir (coordinates - E30.76464,S23.27101) is situated just south of the Hudson Ntsanwisi Dam 6 kilometres north east of Giyani, in the Greater Giyani Municipality of the Limpopo Province (Figure 1).

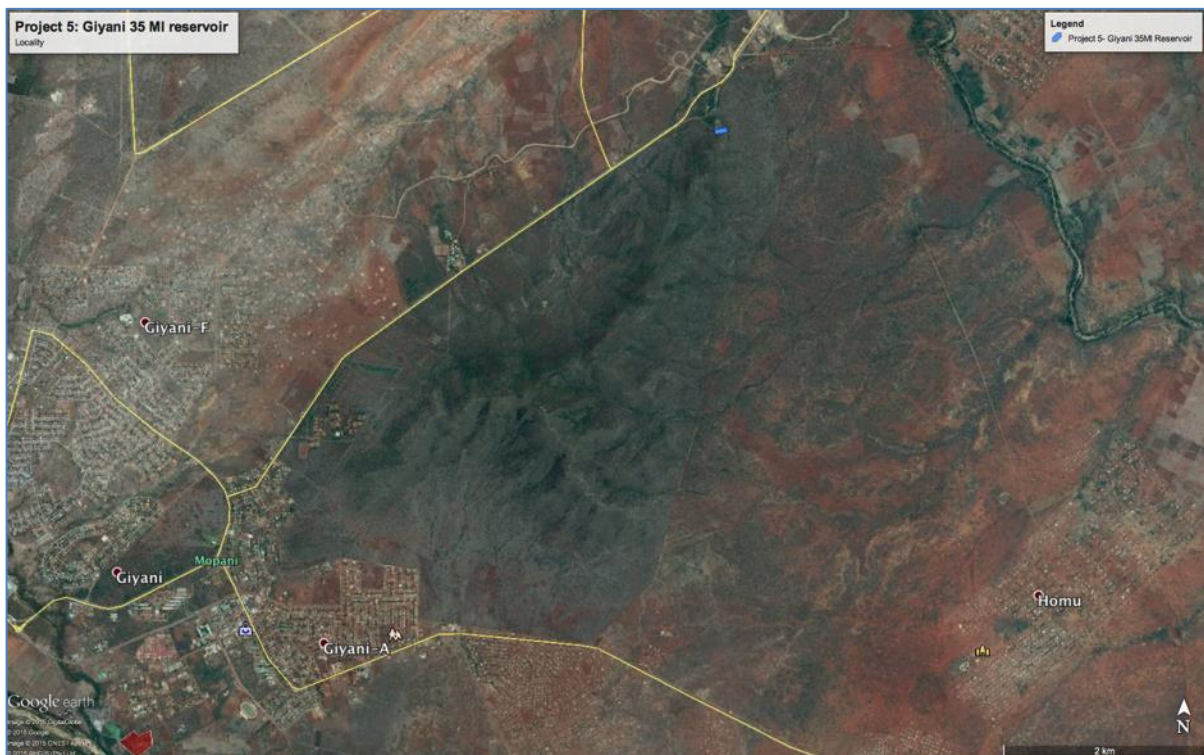


Figure 1 – Study area locality

3 DESCRIPTION OF PROPOSED DEVELOPMENT

As part of the larger Giyani water supply project a new 35 Ml reservoir (Figure 3) is planned to augment the existing water reservoirs situated on Mangombe hill just south of the Hudson Ntsanwisi dam. The additional storage will ensure water security in an area already under water supply strain.

4 HERITAGE RESOURCES IDENTIFIED

None

5 ANTICIPATED IMPACTS ON HERITAGE RESOURCES

None

6 RECOMMENDATIONS

The field work component of the study confirmed that no heritage resources occur within the development area and thus no impact is foreseen on heritage resources.

This development will not negatively affect palaeontological heritage. If in the extremely unlikely event, that fossils are exposed in younger alluvial deposits in the process of development activities, a qualified palaeontologist must be contacted to assess the exposure for fossils so that the necessary rescue operations are implemented.

The overall impact of the development on heritage resources is seen as low and there is no reason why the new proposed Giyani 35 Ml reservoir cannot be approved.

7 AUTHOR/S AND DATE



Wouter Fourie

Accredited Professional Archaeologist
(ASAPA)

Accredited Professional Heritage Practitioner
(APHP)



Marko Hutten (Field assessment)

Accredited Professional Archaeologist
(ASAPA)

Date: 2 December 2015



Jessica Angel (Archival research)

Accredited Professional Archaeologist
(ASAPA)

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

NEMA Regs (2014) - Appendix 6	Relevant section in report
Details of the specialist who prepared the report	Page i 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 3.1
The specific identified sensitivity of the site related to the activity and its associated structures and infrastructure	Section 5.1
An identification of any areas to be avoided, including buffers	Section 5.1
A map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	Section 2.3, 5.1
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 6.1
Any mitigation measures for inclusion in the EMPr	Section 7
Any conditions for inclusion in the environmental authorisation	Section 7
Any monitoring requirements for inclusion in the EMPr or environmental authorisation	NA
A reasoned opinion as to whether the proposed activity or portions thereof should be authorised and	Section 7
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 not comments regarding heritage resources that require input from a specialist have been raised.
Any other information requested by the competent authority.	Not applicable.

CONTENTS	Page
EXECUTIVE SUMMARY	
1 SITE NAME	IV
2 LOCATION	IV
3 DESCRIPTION OF PROPOSED DEVELOPMENT	V
4 HERITAGE RESOURCES IDENTIFIED	V
5 ANTICIPATED IMPACTS ON HERITAGE RESOURCES	V
6 RECOMMENDATIONS	V
7 AUTHOR/S AND DATE	VI
 REPORT	
1 INTRODUCTION	1
1.1 Scope of the Study	1
1.2 Specialist Qualifications	1
1.3 Assumptions and Limitations	2
1.4 Legislative Context	2
1.5 Terminology and Abbreviations	3
2 TECHNICAL DETAILS OF THE PROJECT	8
2.1 Site Location	8
2.2 Project Motivation	8
2.3 Site Description	9
3 ASSESSMENT METHODOLOGY	10
3.1 Methodology for Assessing Heritage Site Significance	10
3.2 Methodology for Impact Assessment	Error! Bookmark not defined.
3.2.1 Nature of the impact	Error! Bookmark not defined.
3.2.2 Extent of the impact	Error! Bookmark not defined.
3.2.3 Duration of the impact	Error! Bookmark not defined.
3.2.4 Potential intensity of the impact	Error! Bookmark not defined.
3.2.5 Likelihood of the impact	Error! Bookmark not defined.
3.2.6 Cumulative Impacts	Error! Bookmark not defined.
3.2.7 Significance Assessment	Error! Bookmark not defined.
4 ARCHIVAL AND DESKTOP RESEARCH FINDINGS	17
4.1 Archival findings	17

4.1.1	Previous Studies	17
4.1.2	Cartographic Evidence	Error! Bookmark not defined.
4.1.3	Archaeological & Historical Sequence	20
5	FIELD WORK FINDINGS	24
6	IMPACT ASSESSMENT	24
6.1	Status Quo and “No Go” option	24
6.1.1	Status Quo	24
6.1.2	“No go” Option	24
6.2	Project Impact	24
7	CONCLUSIONS AND RECOMMENDATIONS	25
7.1	General	25
8	PREPARERS	26
9	REFERENCES	26

List of Appendices

- A Legislative Requirements – Terminology and Assessment Criteria
- B Project team CV’s

List of Figures

Figure 1 – Study area locality	iv
Figure 2 - Human and Cultural Time line in Africa (Morris, 2009).....	7
Figure 3 – Study area locality	8
Figure 4 – proposed reservoir site.....	9
Figure 6 – Steep slope and dense vegetation	9
Figure 7 – Nature reserve fence	10
Figure 8 – Steep slope – view from access road.....	9
<i>Figure 10 - An excerpt of an 1893 map of the “Zoutpansberg Goudvelden” with the study area indicated within the circle (courtesy of Mr. Charles Leach).....</i>	Error! Bookmark not defined.
Figure 11 – Tracklog of field assessment	Error! Bookmark not defined.

1 INTRODUCTION

PGS Heritage (PGS) was appointed by Environmental Impact Management Services (Pty) Ltd (EIMS) to undertake a Heritage Impact Assessment (HIA) that forms part of the Basic Environmental Impact Report (BAR) for the new proposed Giyani 35 Ml reservoir, Giyani, Limpopo Province.

1.1 Scope of the Study

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

1.2 Specialist Qualifications

This Heritage Impact Assessment (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.

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).

Jessica Angel, holds a Masters degree in Archaeology and is registered as a Professional Archaeologist with the Association of Southern African Professional Archaeologists (ASAPA).

Marko Hutten, heritage specialist and project archaeologist, has 15 years of experience in the industry and is registered with the Association of Southern African Professional Archaeologists (ASAPA) as a Professional Archaeologist and is accredited as a Field Director.

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. This applies to graves and cemeteries as well. In the event that any graves or burial places are located during the development, the procedures and requirements pertaining to graves and burials will apply as set out below.

1.4 Legislative Context

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

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

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

- i) GNR 982 (Government Gazette 38282, 14 December 2014) promulgated under the National Environmental Management Act (NEMA) Act 107 of 1998
 - a) Basic Assessment Report (BAR) – Regulations 19 and 23
 - b) Environmental Scoping Report (ESR) – Regulation 21
 - c) Environmental Impacts Assessment (EIA) – Regulation 23
 - d) Environmental Management Programme (EMPr) – Regulations 19 and 23
- ii) National Heritage Resources Act (NHRA) Act 25 of 1999
 - a) Protection of Heritage Resources – Sections 34 to 36; and
 - b) Heritage Resources Management – Section 38
- iii) Minerals and Petroleum Resources Development Act (MPRDA) Act 28 of 2002

a) Section 39(3)

The NHRA (Act 25 of 1999) stipulates that cultural heritage resources may not be disturbed without authorization from the relevant heritage authority. Section 34(1) of the NHRA (Act 25 of 1999) states that “no person may alter or demolish any structure or part of a structure which is older than 60 years without a permit issued by the relevant provincial heritage resources authority...” 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 and 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

Early Stone Age

The archaeology of the Stone Age, between 400 000 and 2500 000 years ago.

Fossil

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

Heritage

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

Heritage resources

This means any place or object of cultural significance.

Holocene

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

Late Stone Age

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

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 30-300 000 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	Early Stone Age
GPS	Global Positioning System
HIA	Heritage Impact Assessment
I&AP	Interested & Affected Party
LSA	Late Stone Age
LIA	Late Iron Age
LIHRA	Limpopo heritage Resources Authority
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.

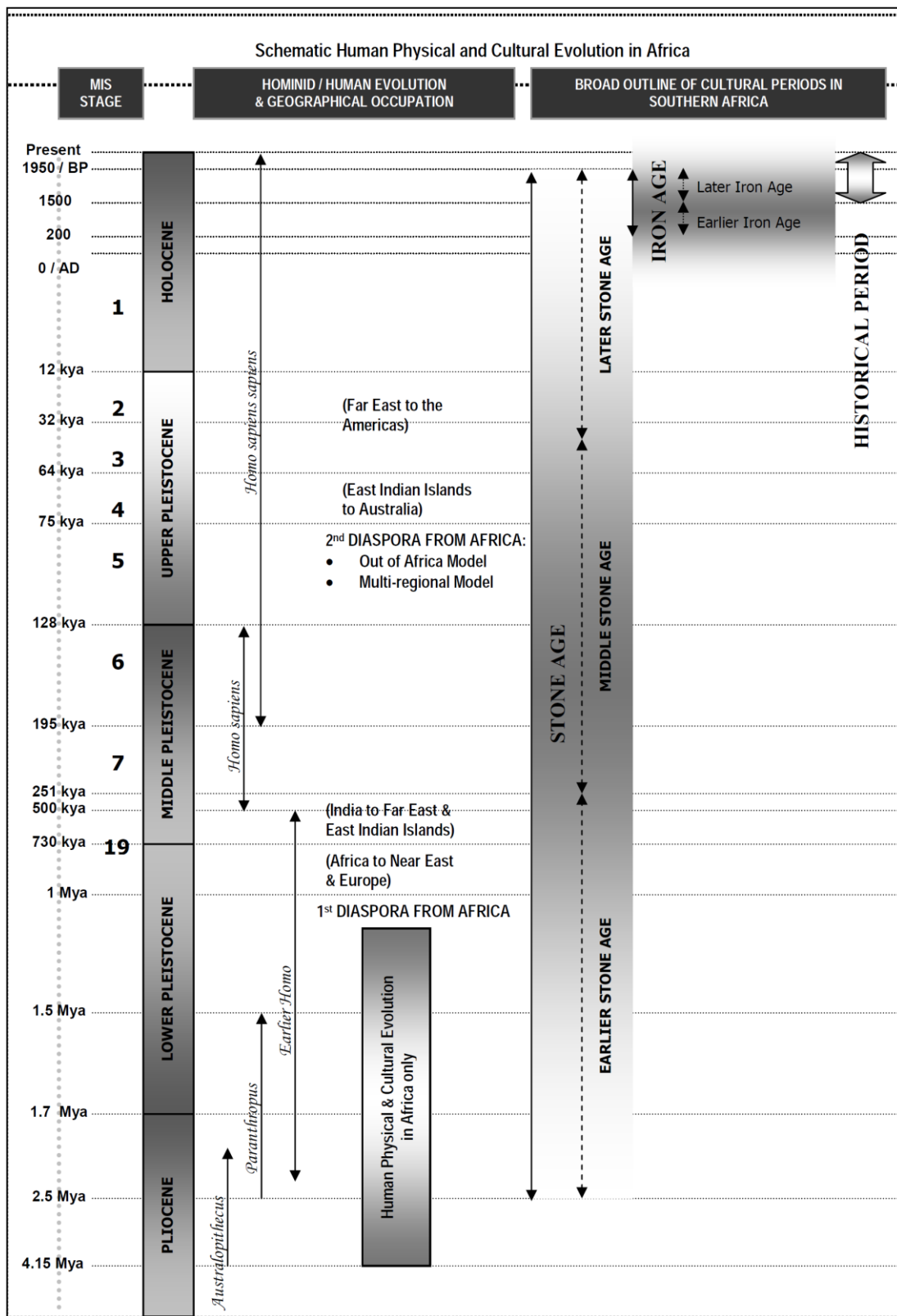


Figure 2 - Human and Cultural Time line in Africa (Morris, 2009).

2 TECHNICAL DETAILS OF THE PROJECT

2.1 Site Location

The proposed reservoir (coordinates - E30.76464,S23.27101) is situated just south of the Hudson Ntsanwisi Dam 6 kilometres north east of Giyani, in the Greater Giyani Municipality of the Limpopo Province (Figure 3 and Figure 4).

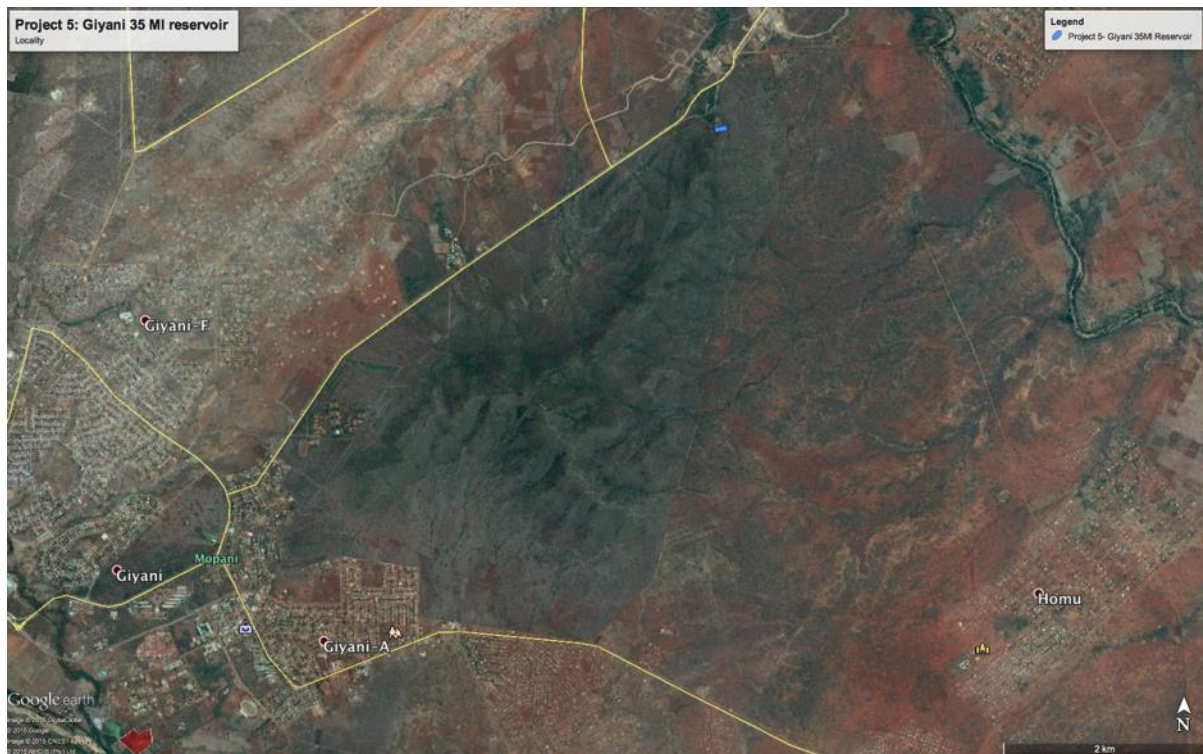


Figure 3 – Study area locality

2.2 Project Motivation

As part of the larger Giyani water supply project a new 35 MI reservoir (Figure 4) is planned to augment the existing water reservoirs situated on Mangombe hill just south of the Hudson Ntsanwisi dam. The additional storage will ensure water security in an area already under water supply strain.



Figure 4 – proposed reservoir site

2.3 Site Description

The Giyani 35 MI reservoir is planned on the eastern slope of the Mangombe foot hills. Two existing reservoirs are situated in the western slope of the same hill. The site is extremely steep and construction will require a cut and fill of the slope to accommodate the new proposed reservoir.



Figure 5 – Steep slope and dense vegetation



Figure 7 – Steep slope – view from access road



Figure 6 – Nature reserve fence

3 ASSESSMENT METHODOLOGY

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

3.1 Methodology for Assessing Heritage Site Significance

This Heritage Impact Assessment (HIA) report was compiled by PGS Heritage (PGS) for the new proposed Giyani 35 MI reservoir, Giyani, Limpopo Province.

The applicable maps, tables and figures are included, as stipulated in the NHRA (no 25 of 1999) and the National Environmental Management Act (NEMA) (no 107 of 1998). The HIA process consisted of three steps -

Step I – Literature Review - The background information to the field survey relies greatly on the Heritage Background Research.

Step II – Physical Survey - A physical survey was conducted predominantly by vehicle along the proposed Gonubie Main Road Development area by a qualified archaeologist, 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 identified heritage sites are 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 Significance (NS)	Grade 1		Conservation; National Site nomination
Provincial Significance (PS)	Grade 2		Conservation; Provincial Site nomination
Local Significance (LS)	Grade 3A	High Significance	Conservation; Mitigation not advised
Local Significance (LS)	Grade 3B	High Significance	Mitigation (Part of site should be retained)
Generally Protected A (GP.A)	Grade 4A	High / Medium Significance	Mitigation before destruction
Generally Protected B (GP.B)	Grade 4B	Medium Significance	Recording before destruction
Generally Protected C (GP.A)	Grade 4C	Low Significance	Destruction

3.2 Methodology for Impact Assessment

The impact assessment methodology is guided by the requirements of the NEMA EIA Regulations (2014). The broad approach to the significance rating methodology is to determine the environmental risk (ER) by considering the consequence (C) of each impact (comprising Nature, Extent, Duration, Magnitude, and Reversibility) and relate this to the probability/likelihood (P) of the impact occurring. This determines the environmental risk. In addition other factors, including cumulative impacts, public concern, and potential for irreplaceable loss of resources, are used to determine a prioritisation factor (PF) which is applied to the ER to determine the overall significance (S). Please note that the impact assessment must apply to the identified Sub Station alternatives as well as the identified Transmission line routes.

3.2.1 Determination of Environmental Risk

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

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

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

$$C = \left(\frac{E + D + M + R}{4} \right) \times N$$

Each individual aspect in the determination of the consequence is represented by a rating scale as defined in Table 2.

Table 2 - Criteria for Determining Impact Consequence

Aspect	Score	Definition
Nature	- 1	Likely to result in a negative/ detrimental impact
	+1	Likely to result in a positive/ beneficial impact
Extent	1	Activity (i.e. limited to the area applicable to the specific activity)
	2	Site (i.e. within the development property boundary),
	3	Local (i.e. the area within 5 km of the site),
	4	Regional (i.e. extends between 5 and 50 km from the site
	5	Provincial / National (i.e. extends beyond 50 km from the site)
Duration	1	Immediate (<1 year)

Aspect	Score	Definition
	2	Short term (1-5 years),
	3	Medium term (6-15 years),
	4	Long term (the impact will cease after the operational life span of the project),
	5	Permanent (no mitigation measure of natural process will reduce the impact after construction).
Magnitude / Intensity	1	Minor (where the impact affects the environment in such a way that natural, cultural and social functions and processes are not affected),
	2	Low (where the impact affects the environment in such a way that natural, cultural and social functions and processes are slightly affected),
	3	Moderate (where the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way),
	4	High (where natural, cultural or social functions or processes are altered to the extent that it will temporarily cease), or
	5	Very high / don't know (where natural, cultural or social functions or processes are altered to the extent that it will permanently cease).
Reversibility	1	Impact is reversible without any time and cost.
	2	Impact is reversible without incurring significant time and cost.
	3	Impact is reversible only by incurring significant time and cost.
	4	Impact is reversible only by incurring prohibitively high time and cost.
	5	Irreversible Impact

Once the C has been determined the ER is determined in accordance with the standard risk assessment relationship by multiplying the C and the P. Probability is rated/scored as per Table 3.

Table 3 - Probability Scoring

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

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

$$ER = C \times P$$

Table 4 - Determination of Environmental Risk

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

The outcome of the environmental risk assessment will result in a range of scores, ranging from 1 through to 25. These ER scores are then grouped into respective classes as described in Table 5.

Table 5 - Significance Classes

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

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

3.2.2 Impact Prioritisation

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

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

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

In an effort to ensure that these factors are considered, an impact prioritisation factor (PF) will be applied to each impact ER (post-mitigation). This prioritisation factor does not aim to detract from

the risk ratings but rather to focus the attention of the decision-making authority on the higher priority/significance issues and impacts. The PF will be applied to the ER score based on the assumption that relevant suggested management/mitigation impacts are implemented.

Table 6 - Criteria for Determining Prioritisation

Public response (PR)	Low (1)	Issue not raised in public response.
	Medium (2)	Issue has received a meaningful and justifiable public response.
	High (3)	Issue has received an intense meaningful and justifiable public response.
Cumulative Impact (CI)	Low (1)	Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is unlikely that the impact will result in spatial and temporal cumulative change.
	Medium (2)	Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is probable that the impact will result in spatial and temporal cumulative change.
	High (3)	Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is highly probable/definite that the impact will result in spatial and temporal cumulative change.
Irreplaceable loss of resources (LR)	Low (1)	Where the impact is unlikely to result in irreplaceable loss of resources.
	Medium (2)	Where the impact may result in the irreplaceable loss (cannot be replaced or substituted) of resources but the value (services and/or functions) of these resources is limited.
	High (3)	Where the impact may result in the irreplaceable loss of resources of high value (services and/or functions).

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

$$\text{Priority} = \text{PR} + \text{CI} + \text{LR}$$

The result is a priority score which ranges from 3 to 9 and a consequent PF ranging from 1 to 2 (Refer to Table 7).

Table 7 - Determination of Prioritisation Factor

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

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

Table 8 - Final Environmental Significance Rating

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

4 ARCHIVAL AND DESKTOP RESEARCH FINDINGS

4.1 Archival findings

The examination of heritage databases, historical data and cartographic resources represents a critical additional tool for locating and identifying heritage resources and in determining the historical and cultural context of the study area. Therefore, an internet literature search was conducted and relevant archaeological and historical texts were also consulted. Relevant topographic maps and satellite imagery were studied.

4.1.1 Previous Studies

Researching the SAHRA APM Report Mapping Project records and the SAHRIS online database (<http://www.sahra.org.za/sahris>), it was determined that very few archaeological studies had been performed in the vicinity of study area. Previous studies listed for the area in the APM Report Mapping Project included a number of surveys within the wider vicinity which are listed in chronological order below:

- Roodt, H. 1999. **Phase 1 Archaeological Impact Assessment Vodacom Mast Mckechnie, Giyani Northern Province**. An unpublished report by R & R Cultural Resource Consultants on file at SAHRA as 1999-SAHRA-0069.
- Gaigher, S. 2000. **Preliminary Archaeological Impact Assessment - Mckechnie Vodacom Mast – Giyani**. An unpublished report by Archaeo-Info on file at SAHRA as 2000-SAHRA-0027.
- Van Schalkwyk, J.A. 2001a. **Archaeological Investigation of Iron Smelting Site Mut 41, in the Nandoni Dam, Thohoyandou District, Northern Province**. An unpublished report by the National Cultural History Museum on file at SAHRA as 2001-SAHRA-0006.
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Researching the SAHRIS online database (<http://www.sahra.org.za/sahris>) further studies were identified in the wider vicinity of the study area:

- SAHRIS case number 605. **Draft Basic Assessment Report for the Construction of a 35km 132 KV Powerline from Mbahe Substation to Mhinga Substation in Thohoyandou, within the Thulamela Local Municipality of the Limpopo Province, South Africa.**
- SAHRIS case number 1289. **Proposed 997.81m 22kV Overhead Powerline near Ka-Dinga, Poles MBM47/26/30, MBM47/26/38, Thulamela Local Municipality, Limpopo.**
- SAHRIS case number 1291. **Proposed 20.450km 22kV Bolubedu Lebaka powerline, BDL1 - 228, Greater Letaba, Limpopo.**
- SAHRIS case number 1294. **Proposed Construction of a 17981M Thomo TXT feeder split Powerline in the Greater Giyani Local municipality in Limpopo province.**
- SAHRIS case number 1517. **Consultation in terms of Section 40 of the Mineral and Petroleum Resources Development Act 2002, (Act 28 of 2002) for the approval of an Environmental Management Plan in respect of the farm Shamfana Village (unsurveyed) 891 LT situated in the Magisterial District of Letaba: Limpompo Region.**
- SAHRIS case number 1555. **Consultation of Closure Certificate application in terms of Section 43 of the Mineral and Petroleum Resources Development Act 2002, (Act 28 of 2002) in respect of the borrow pits for upgrading (from gravel to tar) of road D3180 from Modjadji-Mokwakwaila-Bambeni-Nkomo, situated in the Magisterial District of Mopani.**
- SAHRIS case number 2262. **Consultation in terms of Section 40 of the Mineral and Petroleum Resources Development Act 2002, (Act 28 of 2002) for the approval of an Environmental Management Plan for mining permit in respect of the farm Kirsten 212 LR, situated in the Magisterial District of Malamulele, Limpompo Region.**

Despite the large number of studies consulted in the wider vicinity of the study area, very little heritage information was available. A number of studies located no heritage resources (e.g. Van Schalkwyk 2006; Murimbika 2006; Gaigher & Hutten 2007; Munyai & Roodt 2008; Murimbika 2008) while some studies located only grave sites (e.g. Roodt 2002; SAHRIS case number 605) requiring avoidance or relocation. Some reports accessed on the SAHRIS website were found to be incomplete versions (Van Schalkwyk 2001b; Van Schalkwyk 2001c) while some studies had no documentation available (SAHRIS case number 1289; SAHRIS case number 1291; SAHRIS case number 1294) and some were environmental assessments with no relevant heritage information included (e.g. SAHRIS case number 1517; SAHRIS case number 1555).

In a survey of a small hill some 30 kilometres to the north east of the current study area, Roodt (1999), located a significant settlement and metal working site of the Letaba tradition and

recommended that an alternative development site be chosen. In a survey of the same area, Gaigher (2000), repeated the conclusion that the development could not go ahead pending a Phase 2 assessment. The importance of the area for historical metal working is further highlighted by the findings of other reports which found sites with substantial metal-working, including those focussing on the documentation of sites now covered by the Nandoni Dam some 30 kilometres to the north west (e.g. Van Schalkwyk 2001a) as well as to the south west (e.g. Roodt 2002).

One study consulted was for re-opening of gold mining operations on the historical Golden Osprey and Madonsi mines some 20 kilometres east of the current study area. The report provides some details as to the remaining infrastructure of the Madonsi Mine (opened in 1935 and closed in 1968 during which period an estimated 2.5 tonnes of gold was recovered; re-opened in 1982 with some 550 kg of gold recovered between 1987 and 1991) including damaged historic buildings (some considered worth renovating), ten main shafts and two main tailings dumps (SAHRIS case number 2262).

4.1.2 Archaeological & Historical Sequence

The historical background and timeframe of the study area and other areas in Southern Africa can be divided into the Stone Age, Iron Age and Historical period.

Stone Age sites

The Stone Age is divided into the Early; Middle and Late Stone Age. The *Early Stone Age* (ESA) includes the period from 2.5 million years B.P. to 250 000 years B.P. and is associated with Australopithecines and early *Homo* species who practiced stone tool industries such as the Oldowan and Acheullian. The *Middle Stone Age* (MSA) covers various tool industries, for example the Howiesons Poort industry, in the period from 250 000 years B.P. to 25 000 years B.P. and is associated with archaic and modern *Homo sapiens*. The *Late Stone Age* (LSA) incorporates the period from 25 000 years B.P. up to the Iron Age and Historical Periods and contact between hunter-gatherers and Iron Age farmers or European colonists. This period is associated with modern humans and characterised by lithic tool industries such as Smithfield and Robberg.

To the south west of the study area excavations at Makapansgat attest to ESA occupation in the region, providing evidence of long occupation, initially by *Australopithecus africanus* from approximately 3.3 million years B.P. (Bergh 1999). The LSA is represented in the wider area by, for

example, the presence of San rock paintings and engravings in the Mohlapiitse River valley in the Wolkberg to the south-west of the study area (Changuion 2008). Studies in the Kruger National Park to the east have documented numerous Middle and Late Stone Age sites and it can be expected that all phases of the Stone Age are represented in the area (Pistorius 2007).

Iron Age

The Iron Age incorporates the arrival and settlement of Bantu speaking people and overlaps the Pre-Historic and Historical Periods. It can be divided into three phases. The *Early Iron Age* includes the majority of the first millennium A.D. and is characterised by traditions such as Happy Rest and Silver Leaves. The *Middle Iron Age* spans the 10th to the 13th Centuries A.D. and includes such well known cultures as those at K2 and Mapungubwe. The *Late Iron Age* is taken to stretch from the 14th Century up to the colonial period and includes traditions such as Icon and Letaba.

The Early Iron Age in the area is significantly represented by the site at Silver Leaves (near Tzaneen some 100 kilometres to the south west) which has provided the oldest evidence for grain cultivation in southern Africa and represents the earliest phase of the Kwale Branch in South Africa (Klapwijk & Huffman 1996). Despite its aridity and infertility, the Lowveld region also has a significant history of Middle- and Late Iron Age settlement which has been ascribed to its mineral wealth and the attraction of this to metal working communities and a number of studies have focussed on this region (e.g. Evers 1975; Evers & Van Der Merwe 1987). These and other studies recorded mining, smelting, soapstone factory and salt producing (for example the Early Iron Age Eiland salt producing site to the south (Evers 1981)) sites in the region, the oldest dating to the 10th Century. Evers (1982) recorded a village and nearby iron furnace both belonging to the Later Iron Age Letaba culture to the south west of the study area, within the Hans Merensky Nature Reserve, and others authors have described similar Late Iron Age villages in the area (e.g. Chatterton et al 1979). Studies near Phalaborwa to the south have shown it to be a major metal producing centre of copper and iron (with more than 50 metal working sites recorded) from at least the 10th Century with tin-bronze and brass appearing from the 17th Century onwards and many studies have focussed on this region, the technology and culture associated with the metal working and the associated trade (e.g. Van der Merwe & Scully 1971; Friede et. al. 1975; Miller *et al.* 2001; Pistorius 2007).

Historically the people in the vicinity of the study area include the “Venda culture complex” to the north and the Shangaan/Tsonga in the Low Veld including the study area. To the south west is found the “Lobedu culture complex” whose “most typical form is found among the Lobedu of Modjadji”

(Krige 1938). Since the 1600s the Balobedu have been settled around the escarpment to the south west of the study area and whose Rain Queen is historically famous amongst people as far away as Zululand and who is revered by neighbouring peoples including the Shangaan/Tsonga and the Venda (Krige & Krige 1943). For the past six generations the Balobedu have had female rulers, all bearing the dynastic title 'Modjadji', the Rain Queen and various researchers have traced the lineages of the people and their origin to one of the Rozwi states of Karanga (e.g Alpers 1970; Mashale 2009).

The Tsonga tribes were farming communities who settled in southern Mozambique from the 16th century. These tribes were disturbed in the early 1800's, during the rise of the Zulu nation under Shaka, by consecutive raiding Nguni-groups under leaderships of Zwangendaba, Nxaba and lastly Soshangana. Soshangana and his followers gathered various Tsonga groups under his control during the 1820's and they settled in the Limpopo valley in southern Mozambique. This was the start of the Gaza Empire and the Shangaan/Tsonga people in that region (Schapera, 1950; West, 1976). Soshangane named the Gaza Empire after his grandfather and he himself became known as Manukosi (Junod, 1912).

Many Tsonga groups fled from the raiding Nguni-groups during this period and crossed the Lebombo Mountains to the west and settled in the Low Veld and the eastern parts of the Limpopo Province. A large group of Tsonga people also followed the Portuguese trader Joao Albasini who settled at Goedewensch to the north-west of the study area (Junod, 1912; West, 1976).

After the death of Soshangana in 1858, more Tsonga groups moved to the Low Veld and Limpopo Province to avoid the violence between his two sons Muzila and Mawewe who disputed the chieftainship. Mawewe was first declared the new chief, but he was defeated in 1862 by Muzila who took over the chieftainship. Muzila's son, Ngungunyane succeeded him and he was involved in several clashes with the Colonial Portuguese Authorities. Ngungunyane was defeated by the Portuguese in 1895 and this spurred more Shangaan/Tsonga groups to move to the Low Veld and Limpopo Province (Junod, 1912; Schapera 1950; West, 1976).

These successive emigrational groups are the people who settled in and around the study area. The current, local chief for this area is *Hosi S. Y. Chauke* and he appointed one of his headmen, Mr. George Mabasa from Lombaard village, to deal with the project from the Royal family's side.

Historical Period

The beginning of the Historical Period overlaps the demise of the late Stone and Iron Ages and is characterised by the first written accounts of the region. The area has a long history of exploration and markedly the use of the Lowveld by big game hunters beginning in the 1840's and 1850's due to the abundance of game in this region. Early surveyors explored the area, discovering gold on the banks of the Olifants River, in the nearby Murchison Range and in the hills of the Klein Letaba River to the north (Jeppe 1893). One of South Africa's most famous pioneering geologists, Hans Merensky, is synonymous with the area, having prospected and detailed many of the regions rich mineral deposits (Machens 2009). The Hans Merensky Nature Reserve to the west commemorates his legacy. The 1870's and 1880's gold rush in the region included the rapid rise and fall of Leydsdorp to the south as well as smaller diggings such the Thabina River diggings to the south west which had a mining settlement of up to 100 diggers on its banks (Cartwright 1974).

The wider area is famous for the residence of the Modjadji Rain Queen of the Balobedu people, whose ethnography was described in some detail from the 1930s onwards by social anthropologists Eileen Jensen Krige and Jacob Daniell Krige (Krige & Krige 1943) and whose culture around rain-making continues to be a focus of such studies (e.g. Joubert 2011). The Rain queen affords protection to the adjacent population of Modjadji Cycads (*Encephalartos transvenosus*), a Provincial Heritage Site on the escarpment south west of the study area.

Other history of the wider area includes the 1895 war between Chief Makgoba and the ZAR, the 1889 establishment of the famous postal coach service from Pietersburg via Haenertsburg to Leydsdorp by Doel Zeederberg and the passage of the Anglo-Boer War including a clash between the Bushveldt Carbineers (BVC) and the Letaba Commando at W.H. Viljoen's farm Duiwelskloof (to the south west of the study area) in August 1901 (Woolmoore 2002). Two of the BVC and three of the Boer commando were killed in this action. Further away and to the south west the destruction of the last Long Tom guns took place near Haenertsburg in April 1901 (Changuion 2008).

Palaeontology

The new reservoir is underlain by Archaean rocks of the Giyani Group, which are not known to host fossils.

This development will not negatively affect palaeontological heritage. If in the extremely unlikely event, that fossils are exposed in younger alluvial deposits in the process of development activities, a qualified palaeontologist must be contacted to assess the exposure for fossils so that the necessary rescue operations are implemented.

5 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 1 day by vehicle and on foot by an archaeologist from PGS. The fieldwork was conducted on the 15 February 2016. Although some of the site was inaccessible the general characteristic was found to be the same as the previous surveyed area just north of the new footprint areas.

The field work component of the study confirmed that no heritage resources occur within the development area and thus no impact is foreseen on heritage resources.

6 IMPACT ASSESSMENT

6.1 Status Quo and “No Go” option

6.1.1 Status Quo

No fatal flaws were identified from a cultural, historical, archaeological and paleontological perspective

6.1.2 “No go” Option

No such option is contemplated.

6.2 Project Impact

During the construction of the new reservoir the steep slope will be cut and filled but no impact on heritage resources is likely.

The combined weighted project impact to the heritage resources (prior to mitigation) is very low.

Table 9 – Impact assessment table

Impact Name	Destruction of subsurface heritage resources				
Alternative	None				
Phase	Operation				
Environmental Risk					
Attribute	Pre-mitigation	Post-mitigation	Attribute	Pre-mitigation	Post-mitigation
Nature of Impact	-1	-1	Magnitude of Impact	2	1
Extent of Impact	1	1	Reversibility of Impact	5	5
Duration of Impact	5	5	Probability	1	1
Environmental Risk (Pre-mitigation)					-3.25
Mitigation Measures					
In the event of any heritage resources are uncovered SAHRA should be contacted and a qualified archaeologist appointed to evaluate the finds and make appropriate recommendation on mitigation					
Environmental Risk (Post-mitigation)					-3.00
Degree of confidence in impact prediction:					High
Impact Prioritisation					
Public Response					1
<i>Low: Issue not raised in public responses</i>					
Cumulative Impacts					1
<i>Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is unlikely that the impact will result in spatial and temporal cumulative change.</i>					
Degree of potential irreplaceable loss of resources					2
<i>The impact may result in the irreplaceable loss (cannot be replaced or substituted) of resources but the value (services and/or functions) of these resources is limited.</i>					
Prioritisation Factor					1.17
Final Significance					-3.50

7 CONCLUSIONS AND RECOMMENDATIONS

The field work component of the study confirmed that no heritage resources occur within the development area and thus no impact is foreseen on heritage resources.

This development will not negatively affect palaeontological heritage. If in the extremely unlikely event, that fossils are exposed in younger alluvial deposits in the process of development activities, a qualified palaeontologist must be contacted to assess the exposure for fossils so that the necessary rescue operations are implemented.

7.1 General

The overall impact of the development on heritage resources is seen as low and there is no reason why the new proposed Giyani 35 MI reservoir cannot be approved.

8 PREPARERS

Wouter Fourie – Senior Heritage Specialist

Marko Hutten - Archaeologist

Jessica Angel – Archaeologist

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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 cemetery (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 cemeteries

Graves younger than 60 years fall under Section 2(1) of the Removal of Graves and Dead Bodies Ordinance (Ordinance no. 7 of 1925) as well as the Human Tissues Act (Act 65 of 1983) and are 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 cemetery administered by a local

authority. Graves in the category located inside a formal cemetery administrated by a local authority will also require the same authorisation as set out for graves younger than 60 years, over and above SAHRA authorisation.

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

APPENDIX B – CV'S 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

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 – Professional Grave Solutions (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

MARKO HUTTEN
Professional Archaeologist

Name: Marko Hutten
Profession: Archaeologist
Date of birth: 1971-06-24
Parent Firm: PGS Heritage a
Position at Firm: Freelance Archaeologist
Years with firm: 6
Years of experience: 18
Nationality: South African
HDI Status: White Male

EDUCATION:

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

Name of University or Institution : University of Pretoria
Degree obtained : BA [Hons]
Major subjects : Archaeology
Year : 1997

Professional Qualifications:

Professional Archaeologist - Association of Southern African Professional Archaeologists - Professional Member

CRM Accreditation:

- Field Director - Iron Age
- Field Director - Grave Relocation

Languages:

Afrikaans

English – Speaking (Good) Reading (Good), Writing (Good)

KEY QUALIFICATIONS

Archaeological mitigation and excavations, Social consultation on grave relocation projects, Cultural Resource Management and Heritage Impact Assessment Management, Historical and Archival Research, Archaeology, Anthropology, Applicable survey methods, Fieldwork and project management.

EXPERIENCE

Archaeological Impact Assessments

1998 – 2008

Performed 300+ Archaeological Impact Assessments (1st phase). Clients include:

- Vodacom
- Telkom
- Eskom
- Roads Agency of Limpopo (RAL)

- Department of Water Affairs and Forestry (DWAF)
- South African National Parks (SANParks)
- Impala Platinum
- Various Environmental Impact Assessment Companies such as: Naledzi Environmental Consultants; Tekplan Environmental; Lokisa Environmental Consulting

Grave Relocation Projects:

- Nandoni Dam Grave Relocation Project, ± 1000 graves, 2000/01 (Field Director)
- Tavistock Colliery Grave Relocation Project, ± 700 graves, 2002 (Field Director)
- Marula Platinum Grave Rescue Project, x 2 graves, 2003 (Field Director)
- Silverlakes Grave Relocation Project, x 5 graves, 2005 (Field Director)
- Bela-Bela (Outpost) Grave Relocation Project, x 80 graves, 2008 (Field Director)
- Potgieters Rus Platinum Mine Grave Relocation Project, x 16 graves, 2008 (Field Director)
- New Vaal Colliery Grave Relocation Project, x 1700 graves, 2007 (Field Director)
- Shakadza Road Upgrade Grave Rescue Project, x 1 grave, 2007 (Field Director)
- Mapungubwe Grave Repatriation Project 2007 (Field Supervisor)

Second Phase Investigations/Excavations:

(Including Site Stabilization and Rehabilitation)

- Nandoni Dam Archaeological Project 1998 (Field Supervisor)
- Nandoni Dam Archaeological Project 1998 – 1999 (Field Director)
- Mapungubwe Rehabilitation Project 2003 (Field Director)
- Schroda Rehabilitation Project 2006 (Field Director)
- K2 Rehabilitation Project 2006 (Field Director)
- Mapungubwe Rehabilitation Project 2006 (Field Director)
- Shakadza Rescue and Rehabilitation Project 2007 (Field Director)

2008-2011

Archaeological Impact Assessments (1st phase):

(Projects in conjunction with, in brackets):

- Premier Mine Heritage Survey 2008 (PGS)
- Gope Transmission Line Survey 2008 (Botswana– Archaeology Africa)
- Argent Siding Heritage Survey 2008 (Archaeology Africa)
- Morgenzon Pipe Line Heritage Survey 2008 (Archaeology Africa)
- Klipfontein Heritage Survey 2008 (PGS)
- Spitzkop Mine Heritage Survey 2008 (PGS)
- Elandsfontein Heritage Survey 2008 (PGS)
- Makobe Township Heritage Survey 2008
- Tswinga Township Heritage Survey 2008
- Mankweng Borrow Pits Heritage Survey 2008
- Knapdaar Heritage Survey 2008 (PGS)
- Hotazel Heritage Survey 2008 (PGS)
- Lisbon Township Heritage Survey 2009
- Koert Louw Heritage Survey 2009 (PGS)
- Knapdaar Heritage Survey 2009 (PGS)
- De Wittekrans Heritage Survey 2009 (PGS)
- Ga-Kgapane Township Heritage Survey 2009
- Guernsey Eco-estate Heritage Survey 2009
- De Deur Heritage Survey 2009 (PGS)
- Bultfontein Heritage Survey 2009 (PGS)
- Optimum Mine Heritage Survey 2009

- Gorkum Eco-Estate Heritage Survey 2009
- Planknek Pipe line Heritage Survey 2009
- Regorogile Ext. 9 Heritage Survey 2009
- Haddon Agricultural Heritage Survey 2009
- Jansenpark Residential Development Heritage Survey 2009
- Klein Kariba Residential Development Heritage Survey 2009
- Kangala Mine Heritage Survey 2009 (PGS)
- Hoedspruit Juice Factory Heritage Survey 2009
- Kameelfontein Heritage Survey 2009 (PGS)
- Leolo Township Heritage Survey 2010
- Rietpol Agricultural Development Heritage Survey 2010
- Lwamondo Mining Heritage Survey 2010
- VanderBijlpark Heritage Survey 2010 (PGS)
- Kongoni Mine Heritage Survey 2010 (PGS)
- Lehating Mine Heritage Survey 2010 (PGS)
- Donkerpoort Township Heritage Survey 2010
- Klerksdorp Township Heritage Survey 2010 (PGS)
- Boikarabelo Heritage Survey 2010 (PGS)
- Mountain View Township Heritage Survey 2010
- De Put Township Heritage Survey 2010
- Vygeboomfontein Eco-Estate Heritage Survey 2010
- Vuyani-Neptune Power Line Heritage Survey 2010 (PGS)
- Gamma-Kappa Power Line Heritage Survey 2010 (PGS)
- Olifants River Bridge Heritage Survey 2010
- Bon Accord Mine Heritage Survey 2010 (PGS)
- Olifants River Water Scheme Heritage Survey 2010 (PGS)
- Buffelskloof Mine Heritage Survey 2010 (Gem-Science)
- Vlakvarkfontein Mine Heritage Survey 2010 (Gem-Science)
- Spitskop Solar Park Heritage Survey 2011
- Geluksfontein farm Heritage Survey 2011
- Leeuwvallei Town Development Heritage Survey 2011
- De Aar Solar Park Heritage Survey 2011 (PGS)
- Onbekend Mine Heritage Survey 2011 (Gem-Science)
- Witkop Solar Park Heritage Survey 2011
- Bel-Bela Solar Park Heritage Survey 2011
- Delta Solar Park Heritage Survey 2011
- Madibeng Pipe Line Heritage Survey 2011 (PGS)
- Soutpan Solar Park Heritage Survey 2011
- Vlakvarkfontein Mine Heritage Survey 2011 (PGS)
- Vuwani & Valdezia Pipe Lines Heritage Survey 2011

JESSICA ANGEL
Professional Archaeologist

Personal Details

- **Name:** Jessica
- **Surname:** Angel
- **Identity Number:** 8312250052082
- **Date of Birth:** 25-12-1983
- **Citizenship:** South African
- **Gender:** Female
- **Marital Status:** Single
- **Languages Spoken:** English and Afrikaans

Education History

- **2002:** Matriculated from Northcliff High School with the following subjects: English, Afrikaans, Mathematics, Science, Biology and Art.
- **2005:** Completed BA at University of the Witwatersrand with Geography and Archaeology Majors.
- **2006:** Completed BSc Hons (Geography) at the University of the Witwatersrand with the following subjects: Environmental Management, Advanced Geographic Information Systems (GIS), Paleogeomorphology and Globalisation and Agro Food Restructuring.
- **2009 – 2013:** M.Sc Archaeology and Geography, with thesis title: *Mpumalanga Late Iron Age: Incorporating Geographic Information Systems (GIS) and Archaeological Data to Better Understand Spatial and Temporal Distribution of Past Societies.* (Graduated March 2014).

Employment History

Part time employment as a student:

- **2011:** Research Assistant: GIS work for Prof Karim Sadr. Duties include: Google Earth survey work and digitising.
- **2012-2013:** Basic internship at PGS. Duties include gaining familiarity with gathering relevant background data, field surveys, exhumations and report writing.
- **2013:** Heritage work at NGT. Background research, report writing and ground surveys.
- **2015 –** Archaeologist – PGS Heritage

Experience in the field of archaeology:

September 2012: First Phase Heritage Assessment. Belfast. Marko Hutten and Jennifer Kitto
August 2012: First Phase Heritage Assessment. Delareyville. Wouter Fourie. Stone Age survey
August 2012: Heritage Assessment. MP. Chris van Vuuren and Jennifer Kitto. Ndebele initiation site.
February 2013: Map survey. PTA East. Polka Birkholtz. Mapping Iron Age site.
February 2013: Grave Exhumation. Chlorkop. Marko Hutten
March 2013: First Phase Heritage Assessment. MP. Jennifer Kitto.
July 2013: Grave Exhumation. Mafikeng. Prof Maryna Steyn and Coen Nienaber.
November 2013: First Phase Heritage Assessment. Port Nolloth. Luke Verbant, Ursula Verbant.
January 2015 – June 2015: 10 Heritage Impact assessments and background research for PGS Heritage