

Phase 1 Cultural Heritage Impact Assessment:

**THE PROPOSED CONSTRUCTION OF THE MEYERSDAL RESERVOIR
OVERFLOW PIPELINE, CITY OF JOHANNESBURG METROPOLITAN
MUNICIPALITY, GAUTENG PROVINCE**

Prepared for:

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Declaration:

I, J.A. van Schalkwyk, declare that:

- I am suitably qualified and accredited to act as independent specialist in this application.
- I do not have any financial or personal interest in the proposed development, nor its developers or any of their subsidiaries, apart from the provision of heritage assessment and management services, for which a fair numeration is charged.
- The work was conducted in an objective manner and any circumstances that might have compromised this have been reported.



J A van Schalkwyk
Heritage Consultant
November 2017



EXECUTIVE SUMMARY**Phase 1 Cultural Heritage Impact Assessment:
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Rand Water proposes to construct a new overflow pipeline at the water reservoir in Meyersdal, Ekurhuleni, Gauteng Province. Randwater has appointed Envirolution Consulting (Pty) Ltd to undertake an Environmental Impact Assessment (EIA) Process and compile an Environmental Management Programme (EMPr) for the proposed overflow pipeline.

In accordance with Section 38 of the NHRA, an independent heritage consultant was appointed by *Envirolution* to conduct a cultural heritage assessment to determine if the proposed development of the overflow pipeline would have an impact on any sites, features or objects of cultural heritage significance.

The cultural landscape qualities of the region essentially consist of two components. The first is a rural area in which the human occupation is made up of a pre-colonial (Stone Age and Iron Age) occupation and a much later colonial (farmer) component. The second component is an urban one consisting of a number of towns, most of which developed during the last 150 years or less, which, over time also gave rise to an industrial (mining) component.

Identified heritage sites

- (8.3.2.1 – 8.3.2.3) A number of stone walled structures probably dating to the Late Iron Age.
 - These features have Medium local significance – Grade IV-A

Impact assessment

Impact analysis of cultural heritage resources under threat of the proposed development, is based on the present understanding of the development:

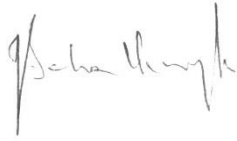
- (8.3.2.1 – 8.3.2.3) A number of stone walled structures dating to the Late Iron Age.
 - Impact = the significance weighting for the impact on the identified sites is rated as **medium**.
 - Mitigation: A watching brief must be agreed upon to monitor the significant areas, i.e. close to the reservoir boundary fence, during construction of the pipeline.

Reasoned opinion as to whether the proposed activity should be authorised:

- From a heritage point of view, it is recommended that the proposed development be allowed to continue on acceptance of the proposed mitigation measures.

Conditions for inclusion in the environmental authorisation:

- A watching brief must also be agreed upon to monitor the significant areas, i.e. close to the reservoir boundary fence, during construction.
- Should archaeological sites or graves be exposed in other areas during construction work, it must immediately be reported to a heritage practitioner so that an investigation and evaluation of the finds can be made.

A handwritten signature in black ink, appearing to read 'J A van Schalkwyk'. The signature is written in a cursive style with a large initial 'J' and 'A'.

J A van Schalkwyk
Heritage Consultant
November 2017

TECHNICAL SUMMARY

Project description	
Description	Construction of an reservoir overflow pipeline
Project name	Meyersdal Reservoir Overflow Pipeline

Applicant
Rand Water

Environmental assessors
Envirolution Consulting
Mr D Govender

Property details																			
Province	Gauteng																		
Magisterial district	Johannesburg																		
District municipality	City of Johannesburg																		
Topo-cadastral map	2628AC																		
Farm name	Klipriviersberg 106-IR																		
Closest town	Meyersdal																		
Coordinates	End/Bend points (approximate)																		
	<table border="1" style="width: 100%; text-align: center;"> <thead> <tr> <th>No</th> <th>Latitude</th> <th>Longitude</th> <th>No</th> <th>Latitude</th> <th>Longitude</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>-26.28518</td> <td>28.09162</td> <td>2</td> <td>-26.28511</td> <td>28.09081</td> </tr> <tr> <td>3</td> <td>-26.28337</td> <td>28.09082</td> <td>4</td> <td>-26.28435</td> <td>28.08743</td> </tr> </tbody> </table>	No	Latitude	Longitude	No	Latitude	Longitude	1	-26.28518	28.09162	2	-26.28511	28.09081	3	-26.28337	28.09082	4	-26.28435	28.08743
No	Latitude	Longitude	No	Latitude	Longitude														
1	-26.28518	28.09162	2	-26.28511	28.09081														
3	-26.28337	28.09082	4	-26.28435	28.08743														

Development criteria in terms of Section 38(1) of the NHR Act	Yes/No
Construction of road, wall, power line, pipeline, canal or other linear form of development or barrier exceeding 300m in length	Yes
Construction of bridge or similar structure exceeding 50m in length	No
Development exceeding 5000 sq m	No
Development involving three or more existing erven or subdivisions	No
Development involving three or more erven or divisions that have been consolidated within past five years	No
Rezoning of site exceeding 10 000 sq m	No
Any other development category, public open space, squares, parks, recreation grounds	No

Land use	
Previous land use	Farming
Current land use	Eco Estate

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GLOSSARY OF TERMS AND ABBREVIATIONS

TERMS

Stone Age: The first and longest part of human history is the Stone Age, which began with the appearance of early humans between 3-2 million years ago. Stone Age people were hunters, gatherers and scavengers who did not live in permanently settled communities. Their stone tools preserve well and are found in most places in South Africa and elsewhere.

Early Stone Age	2 000 000 - 150 000 Before Present
Middle Stone Age	150 000 - 30 000 BP
Later Stone Age	30 000 - until c. AD 200

Iron Age: Period covering the last 1800 years, when new people brought a new way of life to southern Africa. They established settled villages, cultivated domestic crops such as sorghum, millet and beans, and they herded cattle as well as sheep and goats. As they produced their own iron tools, archaeologists call this the Iron Age.

Early Iron Age	AD 200 - AD 900
Middle Iron Age	AD 900 - AD 1300
Later Iron Age	AD 1300 - AD 1830

Historical Period: Since the arrival of the white settlers - c. AD 1840 - in this part of the country.

Cumulative impacts: "Cumulative Impact", in relation to an activity, means the past, current and reasonably foreseeable future impact of an activity, considered together with the impact of activities associated with that activity, that in itself may not be significant, but may become significant when added to existing and reasonably foreseeable impacts eventuating from similar or diverse activities.

Mitigation, means to anticipate and prevent negative impacts and risks, then to minimise them, rehabilitate or repair impacts to the extent feasible.

ABBREVIATIONS

ADRC	Archaeological Data Recording Centre
ASAPA	Association of Southern African Professional Archaeologists
CS-G	Chief Surveyor-General
EIA	Early Iron Age
ESA	Early Stone Age
LIA	Late Iron Age
LSA	Later Stone Age
HIA	Heritage Impact Assessment
MSA	Middle Stone Age
NASA	National Archives of South Africa
NHRA	National Heritage Resources Act
PHRA	Provincial Heritage Resources Agency
SAHRA	South African Heritage Resources Agency

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1. INTRODUCTION

Rand Water proposes to construct a new overflow pipeline at the water reservoir in Meyersdal, Ekurhuleni, Gauteng Province. Randwater has appointed Envirolution Consulting (Pty) Ltd to undertake an Environmental Impact Assessment (EIA) Process and compile an Environmental Management Programme (EMPr) for the proposed overflow pipeline.

South Africa's heritage resources, also described as the 'national estate', comprise a wide range of sites, features, objects and beliefs. However, according to Section 27(18) of the National Heritage Resources Act (NHRA), No. 25 of 1999, no person may destroy, damage, deface, excavate, alter, remove from its original position, subdivide or change the planning status of any heritage site without a permit issued by the heritage resources authority responsible for the protection of such site.

In accordance with Section 38 of the NHRA, an independent heritage consultant was appointed by *Envirolution* to conduct a cultural heritage assessment to determine if the proposed development of the overflow pipeline would have an impact on any sites, features or objects of cultural heritage significance.

This report forms part of the Environmental Impact Assessment (EIA) as required by the EIA Regulations in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998) as amended and is intended for submission to the South African Heritage Resources Agency (SAHRA).

2. TERMS OF REFERENCE

The aim of a full HIA investigation is to provide an informed heritage-related opinion about the proposed development by an appropriate heritage specialist. The objectives are to identify heritage resources (involving site inspections, existing heritage data and additional heritage specialists if necessary); assess their significances; assess alternatives in order to promote heritage conservation issues; and to assess the acceptability of the proposed development from a heritage perspective.

The result of this investigation is a heritage impact assessment report indicating the presence/ absence of heritage resources and how to manage them in the context of the proposed development.

Depending on SAHRA's acceptance of this report, the developer will receive permission to proceed with the proposed development, on condition of successful implementation of proposed mitigation measures.

2.1 Scope of work

The aim of this study is to determine if any sites, features or objects of cultural heritage significance occur within the boundaries of the area where the overflow pipeline is to be developed. This includes:

- Conducting a desk-top investigation of the area;

- A visit to the proposed development site,

The objectives were to:

- Identify possible archaeological, cultural and historic sites within the proposed development areas;
- Evaluate the potential impacts of construction, operation and maintenance of the proposed development on archaeological, cultural and historical resources;
- Recommend mitigation measures to ameliorate any negative impacts on areas of archaeological, cultural or historical importance.

2.2 Limitations

The investigation has been influenced by the following factors:

- It is assumed that the description of the proposed project, provided by the client, is accurate.
- No subsurface investigation (i.e. excavations or sampling) were undertaken, since a permit from SAHRA is required for such activities.
- It is assumed that the public consultation process undertaken as part of the Environmental Impact Assessment (EIA) is sufficient and that it does not have to be repeated as part of the heritage impact assessment.
- The unpredictability of buried archaeological remains.
- This report does not consider the palaeontological potential of the site.

3. LEGISLATIVE FRAMEWORK

The HIA is governed by national legislation and standards and International Best Practise. These include:

- South African Legislation
 - National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA) – see Appendix 4 for more detail on this Act
 - Mineral and Petroleum Resources Development Act, 2002 (Act No. 22 of 2002) (MPRDA);
 - National Environmental Management Act 1998 (Act No. 107 of 1998) (NEMA); and
 - National Water Act, 1998 (Act No. 36 of 1998) (NWA).
- Standards and Regulations
 - South African Heritage Resources Agency (SAHRA) Minimum Standards;
 - Association of Southern African Professional Archaeologists (ASAPA) Constitution and Code of Ethics;
 - Anthropological Association of Southern Africa Constitution and Code of Ethics.
- International Best Practise and Guidelines
 - ICOMOS Standards (Guidance on Heritage Impact Assessments for Cultural World Heritage Properties); and
 - The UNESCO Convention concerning the Protection of the World Cultural and Natural Heritage (1972).

4. HERITAGE RESOURCES

4.1 The National Estate

The NHRA (No. 25 of 1999) defines the heritage resources of South Africa which are of cultural significance or other special value for the present community and for future generations that must be considered part of the national estate to include:

- places, buildings, structures and equipment of cultural significance;
- places to which oral traditions are attached or which are associated with living heritage;
- historical settlements and townscapes;
- landscapes and natural features of cultural significance;
- geological sites of scientific or cultural importance;
- archaeological and palaeontological sites;
- graves and burial grounds, including-
 - ancestral graves;
 - royal graves and graves of traditional leaders;
 - graves of victims of conflict;
 - graves of individuals designated by the Minister by notice in the Gazette;
 - historical graves and cemeteries; and
 - other human remains which are not covered in terms of the Human Tissue Act, 1983 (Act No. 65 of 1983);
- sites of significance relating to the history of slavery in South Africa;
- movable objects, including-
 - objects recovered from the soil or waters of South Africa, including archaeological and palaeontological objects and material, meteorites and rare geological specimens;
 - objects to which oral traditions are attached or which are associated with living heritage;
 - ethnographic art and objects;
 - military objects;
 - objects of decorative or fine art;
 - objects of scientific or technological interest; and
 - books, records, documents, photographic positives and negatives, graphic, film or video material 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).

4.2 Cultural significance

In the NHRA, Section 2 (vi), it is stated that “cultural significance” means aesthetic, architectural, historical, scientific, social, spiritual, linguistic or technological value or significance. This is determined in relation to a site or feature’s uniqueness, condition of preservation and research potential.

According to Section 3(3) of the NHRA, a place or object is to be considered part of the national estate if it has cultural significance or other special value because of

- its importance in the community, or pattern of South Africa's history;
- its possession of uncommon, rare or endangered aspects of South Africa's natural or cultural heritage;
- its potential to yield information that will contribute to an understanding of South Africa's natural or cultural heritage;
- its importance in demonstrating the principal characteristics of a particular class of South Africa's natural or cultural places or objects;
- its importance in exhibiting particular aesthetic characteristics valued by a community or cultural group;
- its importance in demonstrating a high degree of creative or technical achievement at a particular period;

- its strong or special association with a particular community or cultural group for social, cultural or spiritual reasons;
- its strong or special association with the life or work of a person, group or organisation of importance in the history of South Africa; and
- sites of significance relating to the history of slavery in South Africa.

A matrix was developed whereby the above criteria were applied for the determination of the significance of each identified site (see Appendix 3). This allowed some form of control over the application of similar values for similar identified sites.

5. STUDY APPROACH AND METHODOLOGY

5.1 Extent of the Study

This survey and impact assessment covers the area as presented in Section 7 below and illustrated in Figures 2 & 3.

5.2 Methodology

5.2.1.1 Survey of the literature

A survey of the relevant literature was conducted with the aim of reviewing the previous research done and determining the potential of the area. In this regard, various anthropological, archaeological and historical sources were consulted – see list of references in Section 11.

- Information on events, sites and features in the larger region were obtained from these sources.

5.2.1.2 Data bases

The *Heritage Atlas Database*, various SAHRA databases, the *Environmental Potential Atlas*, the *Chief Surveyor General* and the *National Archives of South Africa* were consulted.

- Database surveys produced a number of sites located in the larger region of the proposed development.

5.2.1.3 Other sources

Aerial photographs and topocadastral and other maps were also studied - see the list of references below.

- Information of a very general nature were obtained from these sources

5.2.1.4 Interviews

- None possible.

The results of the above investigation are summarised in Table 1 below – see list of references in Section 11.

Table 1: Pre-Feasibility Assessment

Category	Period	Probability	Reference
Early hominin	Pliocene – Lower Pleistocene		
	Early hominin	None	

Stone Age	Lower Pleistocene – Holocene		
	Early Stone Age	Low	Heritage Database
	Middle Stone Age	Low	Heritage Database
	Later Stone Age	None	
	Rock Art	None	
Iron Age	Holocene		
	Early Iron Age	None	
	Middle Iron Age	None	
	Late Iron Age	High	Huffman (2000); Huffman & Lathy (1997); Mason (1969, 1986); Van Schalkwyk & Pelser (1999)
Colonial period	Holocene		
	Contact period	Low	
	Recent history	Medium	Van Schalkwyk & Pelser (1999)
	Industrial heritage	Low	Heritage Database

5.2.2 Field survey

The field survey was done according to generally accepted archaeological practices, and was aimed at locating all possible sites, objects and structures. The area that had to be investigated was identified by the *Envirovolution* by means of maps and .kml files indicating the development area. This was loaded onto a HP device and used in Google Earth during the field survey to access the areas.

The site was visited on 26 October 2017. The site was investigated by walking the alignment of the proposed pipeline route – see Fig. 1 below.

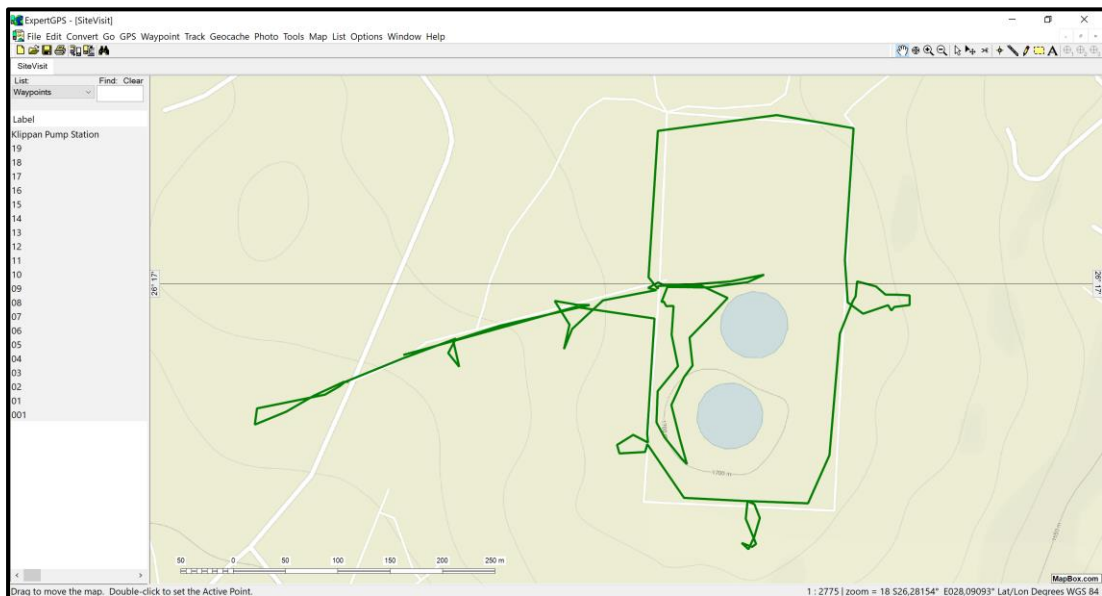


Fig. 1. Map indicating the track log of the field survey.

5.2.3 Documentation

All sites, objects and structures that are identified are documented according to the general minimum standards accepted by the archaeological profession. Coordinates of individual localities are determined by means of the *Global Positioning System* (GPS) and plotted on a

map. This information is added to the description in order to facilitate the identification of each locality.

The track log and identified sites were recorded by means of a Garmin Oregon 550 handheld GPS device. Photographic recording was done by means of a Canon EOS 550D digital camera.

Map datum used: Hartebeeshoek 94 (WGS84).

6. SITE SIGNIFICANCE AND ASSESSMENT

6.1 Heritage assessment criteria and grading

The National Heritage Resources Act, Act no. 25 of 1999, stipulates the assessment criteria and grading of heritage sites. The following grading categories are distinguished in Section 7 of the Act:

Table 2: Site Grading System.

SAHRA Cultural Heritage Site Significance			
Field Rating	Grade	Significance	Recommended Mitigation
National Significance	Grade I	High significance	Conservation by SAHRA, national site nomination, mention any relevant international ranking. No alteration whatsoever without permit from SAHRA
Provincial Significance	Grade II	High significance	Conservation by provincial heritage authority, provincial site nomination. No alteration whatsoever without permit from provincial heritage authority.
Local Significance	Grade III-A	High significance	Conservation by local authority, no alteration whatsoever without permit from provincial heritage authority. Mitigation as part of development process not advised.
Local Significance	Grade III-B	High significance	Conservation by local authority, no external alteration without permit from provincial heritage authority. Could be mitigated and (part) retained as heritage register site.
Generally Protected A	Grade IV-A	High/medium significance	Conservation by local authority. Site should be mitigated before destruction. Destruction permit required from provincial heritage authority.
Generally Protected B	Grade IV-B	Medium significance	Conservation by local authority. Site should be recorded before destruction. Destruction permit required from provincial heritage authority.
Generally Protected C	Grade IV-C	Low significance	Conservation by local authority. Site has been sufficiently recorded in the Phase 1 HIA. It requires no further recording before destruction. Destruction permit required from provincial heritage authority.

The occurrence of sites with a Grade I significance will demand that the development activities be drastically altered in order to retain these sites in their original state. For Grade II, III and IV sites, the applicable of mitigation measures would allow the development activities to continue.

6.2 Methodology for the assessment of potential impacts

All impacts identified during the EIA stage of the study will be classified in terms of their significance. Issues were assessed in terms of the following criteria:

- The **nature**, a description of what causes the effect, what will be affected and how it will be affected;
- The physical **extent**, wherein it is indicated whether:
 - 1 - the impact will be limited to the site;
 - 2 - the impact will be limited to the local area;
 - 3 - the impact will be limited to the region;
 - 4 - the impact will be national; or
 - 5 - the impact will be international;
- The **duration**, wherein it is indicated whether the lifetime of the impact will be:
 - 1 - of a very short duration (0–1 years);
 - 2 - of a short duration (2-5 years);
 - 3 - medium-term (5–15 years);
 - 4 - long term (> 15 years); or
 - 5 - permanent;
- The **magnitude** of impact, quantified on a scale from 0-10, where a score is assigned:
 - 0 - small and will have no effect;
 - 2 - minor and will not result in an impact;
 - 4 - low and will cause a slight impact;
 - 6 - moderate and will result in processes continuing but in a modified way;
 - 8 - high, (processes are altered to the extent that they temporarily cease); or
 - 10 - very high and results in complete destruction of patterns and permanent cessation of processes;
- The **probability** of occurrence, which describes the likelihood of the impact actually occurring and is estimated on a scale where:
 - 1 - very improbable (probably will not happen);
 - 2 - improbable (some possibility, but low likelihood);
 - 3 - probable (distinct possibility);
 - 4 - highly probable (most likely); or
 - 5 - definite (impact will occur regardless of any prevention measures);
- The **significance**, which is determined through a synthesis of the characteristics described above (refer formula below) and can be assessed as low, medium or high;
- The **status**, which is described as either positive, negative or neutral;
- The degree to which the impact can be reversed;
- The degree to which the impact may cause irreplaceable loss of resources; and
- The degree to which the impact can be mitigated.

The **significance** is determined by combining the criteria in the following formula:

$S = (E+D+M) \times P$; where
 S = Significance weighting
 E = Extent
 D = Duration
 M = Magnitude
 P = Probability

The **significance weightings** for each potential impact are calculated as follows:

Table 3: Significance Ranking

Significance of impact		
Points	Significant Weighting	Discussion
< 30 points	Low	Where this impact would not have a direct influence on the decision to develop in the area.
31-60 points	Medium	Where the impact could influence the decision to develop in the area unless it is effectively mitigated.
> 60 points	High	Where the impact must have an influence on the decision process to develop in the area.

7. PROJECT DESCRIPTION

7.1 Site location

The study area is at the Ekurhuleni reservoir located on Portion 187 Meyersdal within the boundaries of the Meyersdal Eco Estate. This estate is located south of the N12 and west of the R59 in the larger Meyersdal region of the City of Johannesburg District Municipality (Fig. 2). For more information, see the Technical Summary on p. v above.

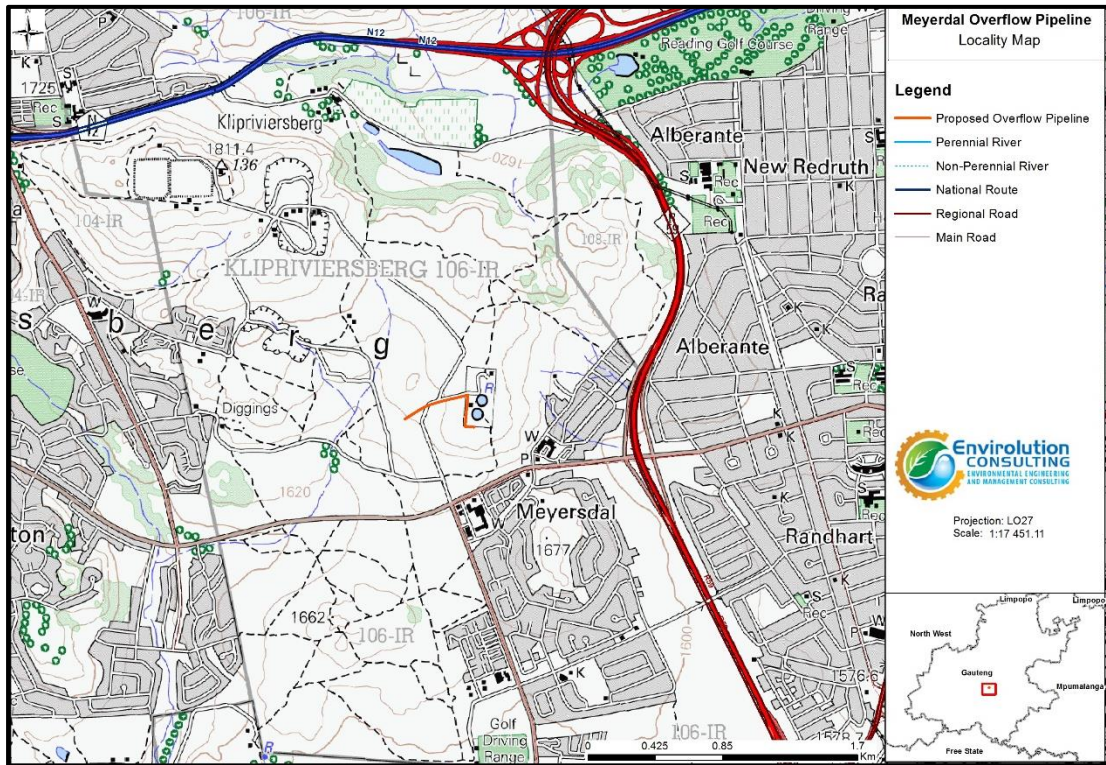


Fig. 2. Location of the study area in regional context.
(Map supplied by Envirolution)

7.2 Development proposal

Rand Water is proposing an overflow pipeline from the Ekurhuleni reservoir located on Portion 187 Meyersdal. The aforementioned area is approximately 61 000 m² (6.1Ha). The Reservoir overflow affects the remainder of Portion 241 on the South as well as Meyersdal Nature Estate Extension 6 (Portion 80). The reservoirs belong to Ekurhuleni Metropolitan Municipality and are supplied water by Rand Water from Palmiet Pump Stations (see Fig. 4 below).

The primary objective of the project is to mitigate the risk of flooding private properties downhill of the Meyersdal reservoirs due to oversupply of pumped water from Rand Water's Palmiet Pump Station to the Ekurhuleni District Municipality's Meyersdal Water Reservoirs in Alberton.



Fig. 3. Layout of the proposed development. (Map supplied by Envirolution)

8. DESCRIPTION OF THE AFFECTED ENVIRONMENT

8.1 Site description

The geology of the region is made up of lava, changing to quartzite in the north and dolomite in the south. The original vegetation is classified as Rocky Highveld Grassland, but in most sections this has changed due to urbanisation activities. The topography of the region is described as hills and lowlands, changing to lowlands south of the study area.

Over the last couple of years, the region has been subjected to rapid urban development, putting pressure on the archaeological heritage in the region. The latter consist mostly of Late Iron Age Stone walled sites, belonging to the Tswana-speaking people that settled in the region since the late 1600s. Proper mitigation measures have been instituted in order for these developments to continue (Huffman 2000; Huffman & Lathy 1997).





Fig. 4. Views over the study area.

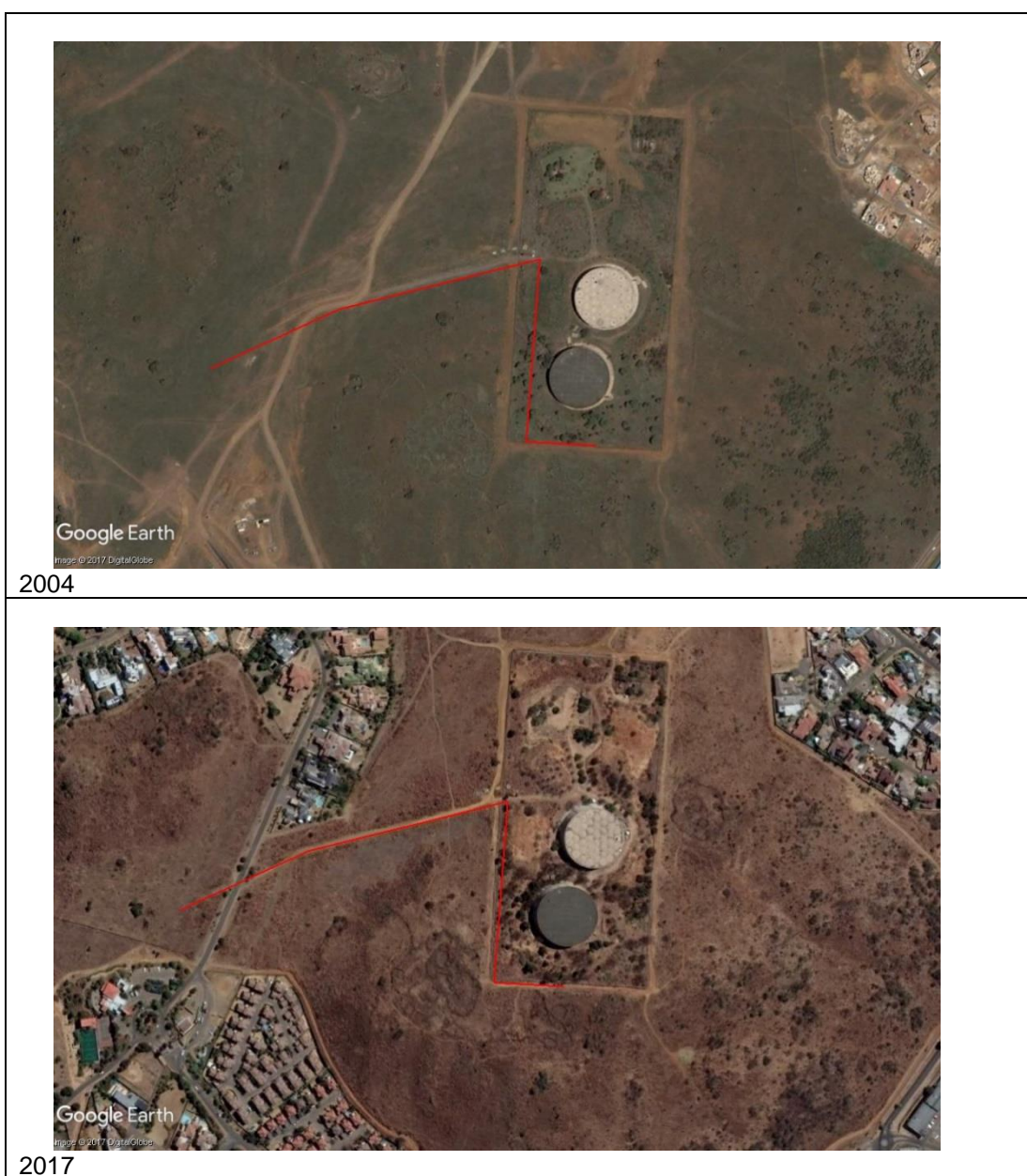


Fig. 5. Encroaching urbanization in the region.

Although mitigation was implemented for the development of the Eco Estate, it is uncertain if this was the situation regarding the development of the reservoir.

As yet it is uncertain as to when the reservoir was originally constructed. No reference could be found indicating that an archaeological impact assessment was done prior to its construction. From the image in Fig. 6, it seems if there is a real possibility that the construction of the reservoir could have had an impact on smaller sections of at least three different Late Iron Age stone walled sites.

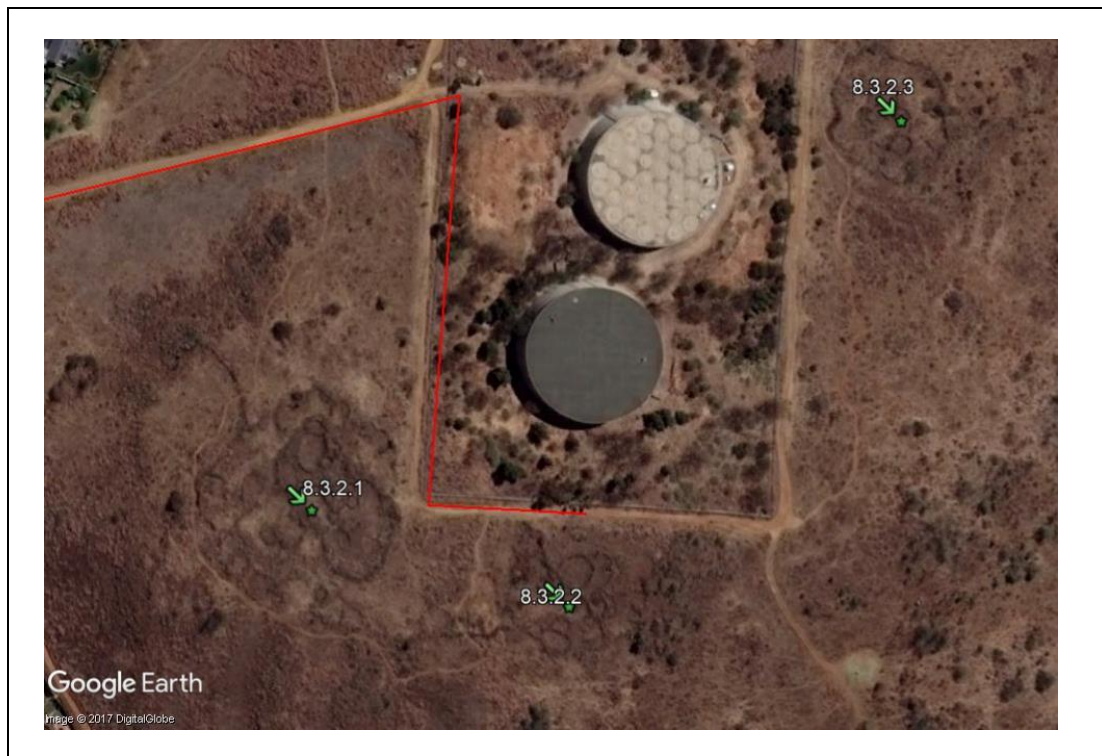


Fig. 6. Possible impact of the reservoir on archaeological sites.
(Image: Google Earth)

8.2 Overview of the region

The aim of this section is to present an overview of the history of the larger region in order to eventually determine the significance of heritage sites identified in the study area, within the context of their historic, aesthetic, scientific and social value, rarity and representivity – see Section 3.2 and Appendix 3 for more information.

The cultural landscape qualities of the region essentially consist of two components. The first is a rural area in which the human occupation is made up of a pre-colonial (Stone Age and Iron Age) occupation and a much later colonial (farmer) component. The second component is an urban one consisting of a number of towns, most of which developed during the last 150 years or less, which, over time also gave rise to an industrial (mining) component.

8.2.1 Stone Age

Very little habitation of the central highveld area took place during Stone Age times. Tools dating to the Early Stone Age period are mostly found in the vicinity of larger watercourses, e.g. the Vaal River or the Harts River and especially in sheltered areas such as at the Taung fossil site. During Middle Stone Age (MSA) times (c. 150 000 – 30 000 BP), people became more mobile, occupying areas formerly avoided. In many cases, tools dating to this period are found on the banks of the many pans that occur all over. The MSA is a technological stage characterized by flakes and flake-blades with faceted platforms, produced from prepared cores, as distinct from the core tool-based ESA technology.

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 region. These are mostly open sites located near river and pans. For the first time we also 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. The LSA people have also left us with a rich legacy of rock art, which is an expression of their complex social and spiritual beliefs.

8.2.2 Iron Age

Iron Age people started to settle in southern Africa c. AD 300, with one of the oldest known sites at Broederstroom south of Hartebeespoort Dam dating to AD 470. Having only had cereals (sorghum, millet) that need summer rainfall, Early Iron Age (EIA) people did not move outside this rainfall zone, and neither did they occupy the central interior highveld area. Because of their specific technology and economy, Iron Age people preferred to settle on the alluvial soils near rivers for agricultural purposes, but also for firewood and water.

The occupation of the larger geographical area (including the study area) did not start much before the 1500s. By the 16th century things changed, with the climate becoming warmer and wetter, creating condition that allowed Late Iron Age (LIA) farmers to occupy areas previously unsuitable, for example the treeless plains of the Free State and North West Province.

Substantial archaeological research has been done in the Klipriviersberg region for some time (see Mason 1969, 1986; Huffman 2002; Huffman & Lathy 1997). The stone-walled Late Iron Age settlements in the region can be classified as either Group I or Group II. Group I (dated to AD 1600 to AD 1700) settlements consists of a central kraal surrounded by a smooth outer periphery wall incorporating small stock enclosures. Group II (dated AD 1700 to 1830s) settlements seem to have developed from Group I and are characterised by more central enclosures and the outer wall includes some scallops for houses along with the typical small stock enclosures. Both settlement types are associated with the Bafokeng, a division of the Sotho-Tswana.

8.2.3 Historic period

White settlers moved into the area during the first half of the 19th century. They were largely self-sufficient, basing their survival on cattle/sheep farming and hunting. Few towns were established, and it remained an undeveloped area. Urbanisation and industrial development took place to the north and east in regions where gold mining took place.

Farmsteads are complex features in the landscape, being made up of different yet interconnected elements. Typically, these consist of a main house, gardens, outbuildings, sheds and barns, with some distance from that labourer housing and various cemeteries. In addition, roads and tracks, stock pens and wind mills complete the setup. An impact on one element therefore impacts on the whole.

Apart from the formal cemeteries that occur in municipal areas (towns or villages), a number of these, some quite informal, i.e. without fencing, is expected to occur sporadically all over,

but probably in the vicinity of the various farmsteads. Many might also have been forgotten, making it very difficult to trace the descendants in a case where the graves are to be relocated.

From early days this region was subjected to intense gold mining activities (Praagh 1906). The result is that most sites and features of heritage significance in the larger region derive from this development.

Alberton's first town hall and factory were built in 1918. Alberton's roads were tarred in 1926. Mail had to be fetched from Germiston by horse and as there was no post office during this time in Alberton, the mail was delivered to a general store. The first official post office was opened in 1926. Building work started in 1938 on the new town hall.

8.3 Identified sites

A number of sites, features and objects of cultural significance were identified in the study area (Fig. 7) – see Appendix 6 for a discussion of each individual site.

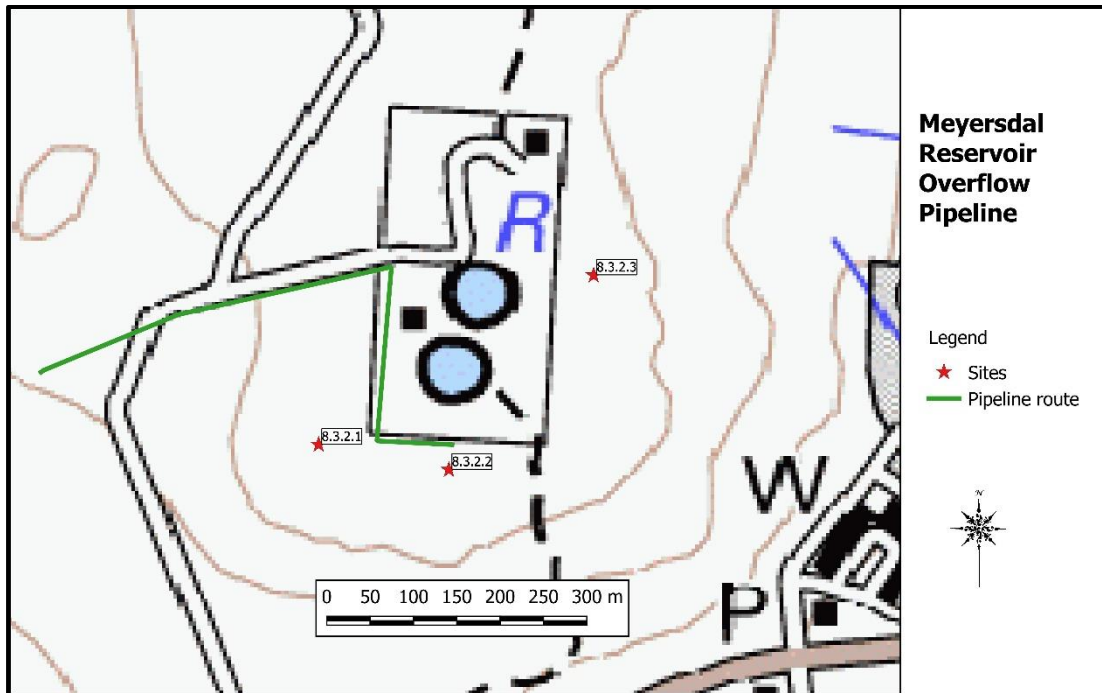


Fig. 7. Location of heritage sites in the study area.

In terms of Section 7 of the NHRA, all the sites currently known or which are expected to occur in the study area are evaluated to have a grading as identified in the table below. The probable impact of the proposed development as calculate by reference to the methodology as set out in Section 6.2 above, is also indicated in the same table.

Table 4. Summary of Identified Heritage Resources in the Study Area.

IDENTIFIED HERITAGE RESOURCES

NHRA category	Number	Coordinates	Impact rating
<i>Formal protections (NHRA)</i>			
National heritage site (Section 27)	None	-	-
Provincial heritage site (Section 27)	None	-	-
Provisional protection (Section 29)	None	-	-
Listed in heritage register (Section 30)	None	-	-
<i>General protections (NHRA)</i>			
Structures older than 60 years (Section 34)	None	-	-
Archaeological site or material (Section 35)	8.3.2.1	-26.28517, 28.09022	Medium
	8.3.2.2	-26.28548, 28.09156	Medium
	8.3.2.3	-26.28345, 28.09305	Low
Palaeontological site or material (Section 35)	None	-	-
Graves or burial grounds (Section 36)	None	-	-
Public monuments or memorials (Section 37)	None	-	-
<i>Other</i>			
Any other heritage resources (describe)	None	-	-

8.3.1 Stone Age

- No sites, features or objects of cultural significance dating to the Stone Age were identified in the study area.

8.3.2 Iron Age

- (8.3.2.1 – 8.3.2.3) Three stone walled settlement sites dating to the Late Iron Age.
 - These features have High/Medium local significance – Grade IV-A

8.3.3 Historic period

- No sites, features or objects of cultural significance dating to the historic period were identified in the study area.

8.4 Impact assessment

Heritage impacts are categorised as:

- Direct or physical impacts, implying alteration or destruction of heritage features within the project boundaries;
- Indirect impacts, e.g. restriction of access or visual intrusion concerning the broader environment;
- Cumulative impacts that are combinations of the above.

Impacts can be managed through one or a combination of the following measures:

- Mitigation
- Avoidance
- Compensation
- Enhancement (positive impacts)
- Rehabilitation
- Interpretation
- Memorialisation

Impact analysis of cultural heritage resources under threat of the proposed development, is based on the present understanding of the development and its significance is calculated (see Appendix 7 for the different site categories) and presented below:

- (8.3.2.1 – 8.3.2.3) A number of stone walled structures dating to the Late Iron Age.
 - Impact = the significance weighting for the impact on the identified sites is rated as **medium**.
 - Mitigation: A watching brief must be agreed upon to monitor the significant areas, i.e. close to the reservoir boundary fence, during construction of the pipeline.

A watching brief monitoring process is recommended whereby a heritage specialist inspect the construction site on regular basis in order to monitor possible impacts on heritage resources. Should any subsurface paleontological, archaeological or historical material or heritage resources be exposed during construction activities, all activities should be suspended, and the archaeological specialist should review the exposed features and material and make suitable recommendations for the way forward.

9. MANAGEMENT MEASURES

Heritage sites are fixed features in the environment, occurring within specific spatial confines. Any impact upon them is permanent and non-reversible. Those resources that cannot be avoided and that are directly impacted by the proposed development can be excavated/recorded and a management plan can be developed for future action. Those sites that are not impacted on can be written into the management plan, whence they can be avoided or cared for in the future.

Sources of risk were considered with regards to development activities defined in Section 2(viii) of the NHRA that may be triggered and are summarised in Table 6A and 6B below. These issues formed the basis of the impact assessment described. The potential risks are discussed according to the various phases of the project below.

9.1 Objectives

- Protection of archaeological, historical and any other site or land considered being of cultural value within the project boundary against vandalism, destruction and theft.
- The preservation and appropriate management of new discoveries in accordance with the NHRA, should these be discovered during construction activities.

The following shall apply:

- Known sites should be clearly marked in order that they can be avoided during construction activities.
- The contractors and workers should be notified that archaeological sites might be exposed during the construction activities.
- Should any heritage artefacts be exposed during excavation, work on the area where the artefacts were discovered, shall cease immediately and the Environmental Control Officer shall be notified as soon as possible;
- All discoveries shall be reported immediately to a heritage practitioner so that an investigation and evaluation of the finds can be made. Acting upon advice from these specialists, the Environmental Control Officer will advise the necessary actions to be taken;
- Under no circumstances shall any artefacts be removed, destroyed or interfered with by anyone on the site; and
- Contractors and workers shall be advised of the penalties associated with the unlawful removal of cultural, historical, archaeological or palaeontological artefacts, as set out in the National Heritage Resources Act (Act No. 25 of 1999), Section 51. (1).

9.2 Control

In order to achieve this, the following should be in place:

- A person or entity, e.g. the Environmental Control Officer, should be tasked to take responsibility for the heritage sites and should be held accountable for any damage.
- Known sites should be located and isolated, e.g. by fencing them off. All construction workers should be informed that these are no-go areas, unless accompanied by the individual or persons representing the Environmental Control Officer as identified above.
- In areas where the vegetation is threatening the heritage sites, e.g. growing trees pushing walls over, it should be removed, but only after permission for the methods proposed has been granted by SAHRA. A heritage official should be part of the team executing these measures.

Table 6A: Construction Phase: Environmental Management Programme for the project

Action required	Protection of heritage sites, features and objects		
Potential Impact	The identified risk is damage or changes to resources that are generally protected in terms of Sections 27, 28, 31, 32, 34, 35, 36 and 37 of the NHRA that may occur in the proposed project area.		
Risk if impact is not mitigated	Loss or damage to sites, features or objects of cultural heritage significance		
Activity / issue	Mitigation: Action/control	Responsibility	Timeframe
1. Removal of Vegetation 2. Construction of required infrastructure, e.g. access roads, water pipelines	See discussion in Section 9.1 above	Environmental Control Officer	During construction only
Monitoring	See discussion in Section 9.2 above		

Table 6B: Operation Phase: Environmental Management Programme for the project

Action required	Protection of heritage sites, features and objects		
Potential Impact	It is unlikely that the negative impacts identified for pre-mitigation will occur if the recommendations are followed.		
Risk if impact is not mitigated	Loss or damage to sites, features or objects of cultural heritage significance		
Activity / issue	Mitigation: Action/control	Responsibility	Timeframe
1. Removal of Vegetation 2. Construction of required infrastructure, e.g. access roads, water pipelines	See discussion in Section 9.1 above	Environmental Control Officer	During construction only
Monitoring	See discussion in Section 9.2 above		

10. RECOMMENDATIONS

Rand Water proposes to construct a new overflow pipeline at the water reservoir in Meyersdal, Ekurhuleni, Gauteng Province. Randwater has appointed Envirolution Consulting (Pty) Ltd to undertake an Environmental Impact Assessment (EIA) Process and compile an Environmental Management Programme (EMPr) for the proposed overflow pipeline.

The cultural landscape qualities of the region essentially consist of two components. The first is a rural area in which the human occupation is made up of a pre-colonial (Stone Age and Iron Age) occupation and a much later colonial (farmer) component. The second component is an urban one consisting of a number of towns, most of which developed during the last 150 years or less, which, over time also gave rise to an industrial (mining) component.

Identified heritage sites

- (8.3.2.1 – 8.3.2.3) A number of stone walled structures probably dating to the Late Iron Age.
 - These features have Medium local significance – Grade IV-A

Impact assessment

Impact analysis of cultural heritage resources under threat of the proposed development, is based on the present understanding of the development:

- (8.3.2.1 – 8.3.2.3) A number of stone walled structures dating to the Late Iron Age.
 - **Impact** = the significance weighting for the impact on the identified sites is rated as **medium**.
 - **Mitigation:** A watching brief must be agreed upon to monitor the significant areas, i.e. close to the reservoir boundary fence, during construction of the pipeline.

Reasoned opinion as to whether the proposed activity should be authorised:

- From a heritage point of view, it is recommended that the proposed development be allowed to continue on acceptance of the proposed mitigation measures.

Conditions for inclusion in the environmental authorisation:

- A watching brief must also be agreed upon to monitor the significant areas, i.e. close to the reservoir boundary fence, during construction.
- Should archaeological sites or graves be exposed in other areas during construction work, it must immediately be reported to a heritage practitioner so that an investigation and evaluation of the finds can be made.

11. REFERENCES

11.1 Data bases

Chief Surveyor General
Environmental Potential Atlas, Department of Environmental Affairs and Tourism.
Heritage Atlas Database, Pretoria
National Archives of South Africa
SAHRA Archaeology and Palaeontology Report Mapping Project (2009)
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11.2 Literature

Acocks, J.P.H. 1975. *Veld Types of South Africa*. Memoirs of the Botanical Survey of South Africa, No. 40. Pretoria: Botanical Research Institute.

Huffman, T.N. 2002. *Archaeological assessment of stone-walled settlements on the Meyersdal Nature Reserve, Klipriviersberg, Alberton*. Unpublished report. University of the Witwatersrand.

Huffman, T.N. & Lathy, G. 1997. *Archaeological investigations at Meyersdal Koppie, Alberton*. Unpublished report. University of the Witwatersrand.

Mason, R.J. 1986. *The origins of black people of Johannesburg and the southern western central Transvaal, AD 350-1880*. Occasional Paper No. 16. Johannesburg. University of the Witwatersrand Archaeological Research Unit.

Van Schalkwyk, J.A. & Pelsler, A.J. 1999. *A Survey of Cultural Resources in the Klipriviersberg Nature Reserve, Johannesburg District*. Unpublished report 1999KH004. Pretoria.

11.3 Maps and aerial photographs

1: 50 000 Topocadastral maps

Google Earth

APPENDIX 1. INDEMNITY AND TERMS OF USE OF THIS REPORT

The findings, results, conclusions and recommendations given in this report are based on the author's best scientific and professional knowledge as well as available information. The report is based on survey and assessment techniques which are limited by time and budgetary constraints relevant to the type and level of investigation undertaken and the author reserve the right to modify aspects of the report including the recommendations if and when new information may become available from ongoing research or further work in this field, or pertaining to this investigation.

Although all possible care is taken to identify all sites of cultural importance during the investigation of study areas, it is always possible that hidden or sub-surface sites could be overlooked during the study. The author of this report will not be held liable for such oversights or for costs incurred as a result of such oversights.

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APPENDIX 2. SPECIALIST COMPETENCYJohan (Johnny) van Schalkwyk

J A van Schalkwyk, D Litt et Phil, heritage consultant, has been working in the field of heritage management for more than 40 years. Originally based at the National Museum of Cultural History, Pretoria, he has actively done research in the fields of anthropology, archaeology, museology, tourism and impact assessment. This work was done in Limpopo Province, Gauteng, Mpumalanga, North West Province, Eastern Cape, Northern Cape, Botswana, Zimbabwe, Malawi, Lesotho and Swaziland. Based on this work, he has curated various exhibitions at different museums and has published more than 70 papers, most in scientifically accredited journals. During this period he has done more than 2000 impact assessments (archaeological, anthropological, historical and social) for various government departments and developers. Projects include environmental management frameworks, roads, pipeline-, and power line developments, dams, mining, water purification works, historical landscapes, refuse dumps and urban developments.

A complete *curriculum vitae* can be supplied on request.

APPENDIX 3. CONVENTIONS USED TO ASSESS THE SIGNIFICANCE OF HERITAGE RESOURCES

A system for site grading was established by the NHRA and further developed by the South African Heritage Resources Agency (SAHRA 2007) and has been approved by ASAPA for use in southern Africa and was utilised during this assessment.

Significance

According to the NHRA, Section 2(vi) the **significance** of a heritage sites and artefacts is determined by it aesthetic, architectural, historical, scientific, social, spiritual, linguistic or technical value in relation to the uniqueness, condition of preservation and research potential. It must be kept in mind that the various aspects are not mutually exclusive, and that the evaluation of any site is done with reference to any number of these.

Matrix used for assessing the significance of each identified site/feature

1. SITE EVALUATION				
1.1 Historic value				
Is it important in the community, or pattern of history				
Does it have strong or special association with the life or work of a person, group or organisation of importance in history				
Does it have significance relating to the history of slavery				
1.2 Aesthetic value				
It is important in exhibiting particular aesthetic characteristics valued by a community or cultural group				
1.3 Scientific value				
Does it have potential to yield information that will contribute to an understanding of natural or cultural heritage				
Is it important in demonstrating a high degree of creative or technical achievement at a particular period				
1.4 Social value				
Does it have strong or special association with a particular community or cultural group for social, cultural or spiritual reasons				
1.5 Rarity				
Does it possess uncommon, rare or endangered aspects of natural or cultural heritage				
1.6 Representivity				
Is it important in demonstrating the principal characteristics of a particular class of natural or cultural places or objects				
Importance in demonstrating the principal characteristics of a range of landscapes or environments, the attributes of which identify it as being characteristic of its class				
Importance in demonstrating the principal characteristics of human activities (including way of life, philosophy, custom, process, land-use, function, design or technique) in the environment of the nation, province, region or locality.				
2. Sphere of Significance		High	Medium	Low
International				
National				
Provincial				
Regional				
Local				
Specific community				
3. Field Register Rating				
1.	National/Grade 1: High significance - No alteration whatsoever without permit from SAHRA			
2.	Provincial/Grade 2: High significance - No alteration whatsoever without			

	permit from provincial heritage authority.	
3.	Local/Grade 3A: High significance - Mitigation as part of development process not advised.	
4.	Local/Grade 3B: High significance - Could be mitigated and (part) retained as heritage register site	
5.	Generally protected A: High/medium significance - Should be mitigated before destruction	
6.	Generally protected B: Medium significance - Should be recorded before destruction	
7.	Generally protected C: Low significance - Requires no further recording before destruction	

APPENDIX 4. RELEVANT LEGISLATION

All archaeological and palaeontological sites, and meteorites are protected by the National Heritage Resources Act (Act no 25 of 1999) as stated in Section 35:

(1) Subject to the provisions of section 8, the protection of archaeological and palaeontological sites and material and meteorites is the responsibility of a provincial heritage resources authority: Provided that the protection of any wreck in the territorial waters and the maritime cultural zone shall be the responsibility of SAHRA.

(2) Subject to the provisions of subsection (8)(a), all archaeological objects, palaeontological material and meteorites are the property of the State. The responsible heritage authority must, on behalf of the State, at its discretion ensure that such objects are lodged with a museum or other public institution that has a collection policy acceptable to the heritage resources authority and may in so doing establish such terms and conditions as it sees fit for the conservation of such objects.

(3) Any person who discovers archaeological or palaeontological objects or material or a meteorite in the course of development or agricultural activity must immediately report the find to the responsible heritage resources authority, or to the nearest local authority offices or museum, which must immediately notify such heritage resources authority.

(4) No person may, without a permit issued by the responsible heritage resources authority-

- (a) destroy, damage, excavate, alter, deface or otherwise disturb any archaeological or palaeontological site or any meteorite;
- (b) destroy, damage, excavate, remove from its original position, collect or own any archaeological or palaeontological material or object or any meteorite;
- (c) trade in, sell for private gain, export or attempt to export from the Republic any category of archaeological or palaeontological material or object, or any meteorite; or
- (d) bring onto or use at an archaeological or palaeontological site any excavation equipment or any equipment which assist in the detection or recovery of metals or archaeological and palaeontological material or objects, or use such equipment for the recovery of meteorites.

In terms of cemeteries and graves the following (Section 36):

(1) Where it is not the responsibility of any other authority, SAHRA must conserve and generally care for burial grounds and graves protected in terms of this section, and it may make such arrangements for their conservation as it sees fit.

(2) SAHRA must identify and record the graves of victims of conflict and any other graves which it deems to be of cultural significance and may erect memorials associated with the grave referred to in subsection (1), and must maintain such memorials.

(3) No person may, without a permit issued by SAHRA or a provincial heritage resources authority-

- (a) destroy, damage, alter, exhume or remove from its original position or otherwise disturb the grave of a victim of conflict, or any burial ground or part thereof which contains such graves;
- (b) destroy, damage, alter, exhume, remove from its original position or otherwise disturb any grave or burial ground older than 60 years which is situated outside a formal cemetery administered by a local authority; or
- (c) bring onto or use at a burial ground or grave referred to in paragraph (a) or (b) any excavation equipment, or any equipment which assists in the detection or recovery of metals.

(4) SAHRA or a provincial heritage resources authority may not issue a permit for the destruction or damage of any burial ground or grave referred to in subsection (3)(a) unless it is satisfied that the applicant has made satisfactory arrangements for the exhumation and re-interment of the contents of such graves, at the cost of the applicant and in accordance with any regulations made by the responsible heritage resources authority.

The National Heritage Resources Act (Act no 25 of 1999) stipulates the assessment criteria and grading of archaeological sites. The following categories are distinguished in Section 7 of the Act:

- **Grade I:** Heritage resources with qualities so exceptional that they are of special national significance;
- **Grade II:** Heritage resources which, although forming part of the national estate, can be considered to have special qualities which make them significant within the context of a province or a region; and
- **Grade III:** Other heritage resources worthy of conservation, and which prescribes heritage resources assessment criteria, consistent with the criteria set out in section 3(3), which must be used by a heritage resources authority or a local authority to assess the intrinsic, comparative and contextual significance of a heritage resource and the relative benefits and costs of its protection, so that the appropriate level of grading of the resource and the consequent responsibility for its management may be allocated in terms of section 8.

Presenting archaeological sites as part of tourism attraction requires, in terms 44 of the Act, a Conservation Management Plan as well as a permit from SAHRA.

(1) Heritage resources authorities and local authorities must, wherever appropriate, co-ordinate and promote the presentation and use of places of cultural significance and heritage resources which form part of the national estate and for which they are responsible in terms of section 5 for public enjoyment, education, research and tourism, including-

- (a) the erection of explanatory plaques and interpretive facilities, including interpretive centres and visitor facilities;
- (b) the training and provision of guides;
- (c) the mounting of exhibitions;
- (d) the erection of memorials; and
- (e) any other means necessary for the effective presentation of the national estate.

(2) Where a heritage resource which is formally protected in terms of Part I of this Chapter is to be presented, the person wishing to undertake such presentation must, at least 60 days prior to the institution of interpretive measures or manufacture of associated material, consult with the heritage resources authority which is responsible for the protection of such heritage resource regarding the contents of interpretive material or programmes.

(3) A person may only erect a plaque or other permanent display or structure associated with such presentation in the vicinity of a place protected in terms of this Act in consultation with the heritage resources authority responsible for the protection of the place.

APPENDIX 5. RELOCATION OF GRAVES

If the graves are younger than 60 years, an undertaker can be contracted to deal with the exhumation and reburial. This will include public participation, organising cemeteries, coffins, etc. They need permits and have their own requirements that must be adhered to.

If the graves are older than 60 years old or of undetermined age, an archaeologist must be in attendance to assist with the exhumation and documentation of the graves. This is a requirement by law.

Once it has been decided to relocate particular graves, the following steps should be taken:

- Notices of the intention to relocate the graves need to be put up at the burial site for a period of 60 days. This should contain information where communities and family members can contact the developer/archaeologist/public-relations officer/undertaker. All information pertaining to the identification of the graves needs to be documented for the application of a SAHRA permit. The notices need to be in at least 3 languages, English, and two other languages. This is a requirement by law.
- Notices of the intention needs to be placed in at least two local newspapers and have the same information as the above point. This is a requirement by law.
- Local radio stations can also be used to try contact family members. This is not required by law, but is helpful in trying to contact family members.
- During this time (60 days) a suitable cemetery need to be identified close to the development area or otherwise one specified by the family of the deceased.
- An open day for family members should be arranged after the period of 60 days so that they can gather to discuss the way forward, and to sort out any problems. The developer needs to take the families requirements into account. This is a requirement by law.
- Once the 60 days has passed and all the information from the family members have been received, a permit can be requested from SAHRA. This is a requirement by law.
- Once the permit has been received, the graves may be exhumed and relocated.
- All headstones must be relocated with the graves as well as any items found in the grave.

Information needed for the SAHRA permit application

- The permit application needs to be done by an archaeologist.
- A map of the area where the graves have been located.
- A survey report of the area prepared by an archaeologist.
- All the information on the families that have identified graves.
- If graves have not been identified and there are no headstones to indicate the grave, these are then unknown graves and should be handled as if they are older than 60 years. This information also needs to be given to SAHRA.
- A letter from the landowner giving permission to the developer to exhume and relocate the graves.
- A letter from the new cemetery confirming that the graves will be reburied there.
- Details of the farm name and number, magisterial district and GPS coordinates of the gravesite.

APPENDIX 6. INVENTORY OF IDENTIFIED CULTURAL HERITAGE SITES

Location	No. 8.3.2.1	Stone walled site	-26.28517, 28.09022
	8.3.2.2	Stone walled site	-26.28548, 28.09156
	8.3.2.3	Stone walled site	-26.28345, 28.09305

Description

A number of stone walled structures dating to the Late Iron Age. Based on the complexity of their design, a central cattle enclosure and the outer wall consisting of some irregular scallops for houses along with the typical small stock enclosures adjacent to it. It can probably be linked to the Bafokeng, a division of the Sotho-Tswana. These settlements might link up with the other similar settlement sites in the larger region.

Significance of site/feature	Generally protected A: High/Medium significance – Grade IV-A
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Reasoned opinion: Due to urban expansion, there is an ever-increasing pressure on this type of sites, not only in the study area, but in the larger region as well.

Impact assessment

As a section of the pipeline will pass in close proximity of at least two of the identified sites, see the image below, there is a possibility that they might further be impacted on during trenching activities for the pipeline – it should be kept in mind that archaeological features and material occur below the surface and will only be exposed during sub-surface excavations.



Significance of impact: before/after mitigation

Extent	Duration	Magnitude	Probability	Significance	Weight
2	5	6	4	52	Medium
1	5	2	2	16	Low

Mitigation

Although the footprint of the reservoirs is not going to increase, the integrity of the sites has already been impacted on by the construction of the reservoirs. It is therefore proposed that a watching brief must be agreed upon to monitor the significant areas, i.e. close to the reservoir boundary fence, during construction of the pipeline.

Requirements

Conservation by local authority. Site should be mitigated before destruction. Destruction permit required from provincial heritage authority.

- It is proposed that a watching brief must be agreed upon to monitor the significant areas, i.e. close to the reservoir boundary fence, during construction of the pipeline.

References

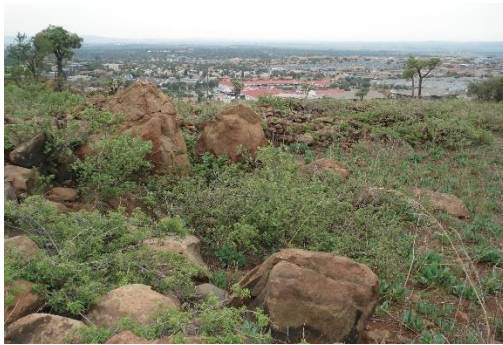
Google Earth



8.3.2.1



8.3.2.1



8.3.2.2



8.3.2.2



8.3.2.3



8.3.2.3

APPENDIX 7. ASSESSMENT OF IMPACTS
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Nature: (Sites 8.3.2.1 – 8.3.2.) A number of stone walled sites dating to the Late Iron Age.		
	Without mitigation	With mitigation
Construction Phase		
Probability	Highly probable (4)	Probable (2)
Duration	Permanent (5)	Short (5)
Extent	Limited to region (2)	Limited to site (1)
Magnitude	Moderate (6)	Low (2)
Significance	52	16
Status (positive or negative)	Negative	Negative
Operational Phase		
Probability	Probable (1)	Probable (1)
Duration	Permanent (5)	Short (5)
Extent	Limited to site (1)	Limited to site (1)
Magnitude	Low (2)	Low (2)
Significance	8	8
Status (positive or negative)	Negative	Negative
Reversibility		
Irreplaceable loss of resources?	Moderate	Moderate
Can impacts be mitigated	Yes	

Mitigation:

In this particular case, it is proposed that a watching brief must be agreed upon to monitor the significant areas, i.e. close to the reservoir boundary fence, during construction of the pipeline.

Cumulative impact:

Urban sprawl will continue to exert an impact on this type of sites in the region. It is difficult to speculate on how many such sites has already been compromised and it is therefore difficult to give a value judgement on cumulative impacts. It is highly recommended that a project is launched to review all remaining sites and that, based on that, no-go areas are red flagged in order to prevent unnecessary damaged to the remaining sites.