

**Heritage impact assessment for the
PROPOSED UPGRADE OF ROAD R104, SILVERTON TO
BRONKHORSTSPRUIT,
GAUTENG PROVINCE**

HERITAGE IMPACT ASSESSMENT FOR THE PROPOSED UPGRADE OF ROAD R104, SILVERTON TO BRONKHORSTSPRUIT, GAUTENG PROVINCE

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Declaration:

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



J A van Schalkwyk (D Litt et Phil)
Heritage Consultant
June 2011

EXECUTIVE SUMMARY

HERITAGE IMPACT ASSESSMENT FOR THE PROPOSED UPGRADE OF ROAD R104, SILVERTON TO BRONKHORSTSPRUIT, GAUTENG PROVINCE

It is the intention of the South African National Roads Agency Limited (SANRAL) to upgrade National Route R104 between the Simon Vermooten (Silverton) interchange and the town of Bronkhorstspuit in Gauteng Province.

In accordance with Section 38 of the NHRA, an independent heritage consultant was therefore appointed by **Chameleon Environmental** to conduct a Heritage Impact Assessment (HIA) to determine if any sites, features or objects of cultural heritage significance occur within the boundaries of the area where it is planned to upgrade the road and develop the borrow pits, to assess the significance thereof and to consider alternatives and plans for the mitigation of any adverse impacts.

During the survey, the following features were identified:

- Four bridges built with a combination of cast concrete, dressed stone and steel work, crossing the Pienaarsrivier, Forfar Spruit, Honds Rivier and the Bronkhorstspuit.
- In addition a number of culverts built with stone and cast concrete pipes crossing below the road are found all over. Although it is accepted that the latter date to the time of the original construction of the road, they could easily be rebuilt or upgraded as required

As no information could be obtained from any source on the construction of the bridges, the following approach was followed to determine their significance:

- A review of the technology and materials used in the construction of the two bridges was done.
- The history of the development of the R104 was reviewed in an effort to determine an approximate date for the construction of the bridges.
- The history of the larger region was reviewed to determine if any event of historical, cultural or political significance could be linked to any of the two bridges.
- A review was done of other bridges on the R104 to determine how many "older" ones are still in existence.

From the above information it was determined that these bridges does not exhibit any remarkable construction techniques, nor can they be linked to any event or person and that similar bridges are still to be found along the route. But, considering that the rest of the route might also be upgraded at some stage and that the remaining bridges might then be demolished, it was decided to err on the side caution. Therefore, although bridges are viewed to have Grade III status they are judged to have high significance on a regional level.

- It is therefore recommended that the bridges should be documented before they can be upgraded/altered, but on condition of SAHRA issuing a permit for the demolishing of the bridges.

As there are no other sites, features or objects, apart from the various bridges that could be impacted on by the proposed upgrading of the R104, it is recommended that the proposed development be allowed to continue, on condition of acceptance of the above mitigation measures. Furthermore, it is requested that should archaeological sites or graves be exposed

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
June 2011

TECHNICAL SUMMARY

Property details						
Province	Gauteng					
Magisterial district	Pretoria, Cullinan, Bronkhorstspuit					
Topo-cadastral map	2528CB, 2528CD, 2528DC					
Closest town	Pretoria/Bronkhorstspuit					
Farm name	Various					
Portions/Holdings	-					
Coordinates	End points					
	No	Latitude	Longitude	No	Latitude	Longitude
	1	S 25.73789	E 28.32953	2	S 25.80564	E 28.73518

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	Yes
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

Development	
Description	Upgrading of R104
Project name	R104 Upgrade

Land use	
Previous land use	Road
Current land use	Vacant

Heritage sites assessment		
<i>Site type</i>	<i>Site significance</i>	<i>Site grading (Section 7 of NHRA)</i>
Bridges	Medium on a regional level	III

Impact assessment		
<i>Impact</i>	<i>Mitigation</i>	<i>Permits required</i>
High	Document	Yes

TABLE OF CONTENTS

	Page
EXECUTIVE SUMMARY	II
TECHNICAL SUMMARY	IV
TABLE OF CONTENTS	V
LIST OF FIGURES.....	V
GLOSSARY OF TERMS AND ABBREVIATIONS	VI
1. INTRODUCTION.....	1
2. TERMS OF REFERENCE	1
3. HERITAGE RESOURCES	3
4. STUDY APPROACH AND METHODOLOGY	4
5. DESCRIPTION OF THE AFFECTED ENVIRONMENT	5
6. SITE SIGNIFICANCE AND ASSESSMENT	12
7. CONCLUSIONS	14
8. REFERENCES.....	16
APPENDIX 1: CONVENTIONS USED TO ASSESS THE SIGNIFICANCE OF HERITAGE RESOURCES	17
APPENDIX 2: CONVENTIONS USED TO DETERMINE THE IMPACT OF DEVELOPMENT ON HERITAGE RESOURCES	18
APPENDIX 3. RELEVANT LEGISLATION	20

LIST OF FIGURES

	Page
Fig. 1. Location of the study area in regional context.	5
Fig. 2. Location of known sites of cultural significance in the vicinity of the study area.	5
Fig. 3. Typical stone walled Late Iron Age site.	6
Fig. 4. Fortifications and cemeteries dating to the Anglo-Boer War.	7
Fig. 5. Examples of farmsteads in the region.....	8
Fig. 6. A typical farm cemetery in the region.	8
Fig. 7. Section of Fred Jeppe's map dating to 1899.	9
Fig. 8. Close-up of the F. Jeppe's map.	10
Fig. 9. The 1943 version of the 1:50 000 topo-cadastral map.	10
Fig. 10. Bridges over the Pienaarsrivier, Forfar Spruit, Hondsrivier and Bronkhorstspruit and one of a number of similar culverts.	12

GLOSSARY OF TERMS AND ABBREVIATIONS

TERMS

Study area: Refers to the entire study area as indicated by the client in the accompanying Fig. 1 & 2.

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
Late 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. These people, according to archaeological evidence, spoke early variations of the Bantu Language. Because 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
Late Iron Age	AD 1300 - AD 1830

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

ABBREVIATIONS

ADRC	Archaeological Data Recording Centre
ASAPA	Association of Southern African Professional Archaeologists
BP	Before Present
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

HERITAGE IMPACT ASSESSMENT FOR THE PROPOSED UPGRADE OF ROAD R104, SILVERTON TO BRONKHORSTSPRUIT, GAUTENG PROVINCE

1. INTRODUCTION

It is the intention of the South African National Roads Agency Limited (SANRAL) to upgrade National Route R104 between the Simon Vermooten (Silverton) interchange and the town of Bronkhorstspuit in Gauteng Province. The roadwork includes the following:

- Upgrading of the road bed;
- Upgrading of culverts/bridges.

South Africa's heritage resources, also described as the "national estate", comprise a wide range of sites, features, objects and beliefs. According to Section 27(18) of the National Heritage Resources Act (NHRA), Act 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 therefore appointed by **Chameleon Environmental** to conduct a Heritage Impact Assessment (HIA) to determine if any sites, features or objects of cultural heritage significance occur within the boundaries of the area where it is planned to upgrade the road, to assess the significance thereof and to consider alternatives and plans for the mitigation of any adverse impacts.

This HIA 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) and is intended for submission to the South African Heritage Resources Agency (SAHRA).

2. TERMS OF REFERENCE

2.1 Scope of work

The aim of this HIA, broadly speaking, is to determine if any sites, features or objects of cultural heritage significance occur within the boundaries of the area where it is planned to upgrade the section of the road.

The scope of work for this study consisted of:

- Conducting of a desk-top investigation of the area, in which all available literature, reports, databases and maps were studied;
- A visit to the proposed development area.

The objectives were to

- Identify possible archaeological, cultural and historic sites within the proposed development area;
- 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

- No information could be obtained about the original date of construction of the road or the various bridges.

Table 1: Applicable category of heritage impact assessment study and report.

Type of study	Aim	SAHRA involved	SAHRA response
Screening	<p>The aim of the screening investigation is to provide an overview of possible heritage-related issues regarding the proposed development by an appropriate heritage specialist. It is based on the review and use of existing heritage data pertaining to the site.</p> <p>The result of this investigation is a brief statement indicating potential heritage impacts/issues and can assist the developer in preliminary planning.</p> <p>This report does grant the developer permission to proceed with the proposed development.</p>	Not necessary	
Scoping (basic assessment)	<p>The aim of the scoping investigation is to provide an informed heritage-related opinion about the proposed development by an appropriate heritage specialist. The objectives are to assess heritage sites and their significance (involving site inspections, existing heritage data); to review the general compatibility of the development proposals with heritage policy and possible heritage features on the site.</p> <p>The result of this investigation is a heritage scoping report indicating the presence/absence of heritage resources and what would be required to manage them in the context of the proposed development.</p> <p>This report does not grant the developer permission to proceed with the proposed development.</p>	Not compulsory	
Heritage Impact Assessment	<p>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.</p> <p>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.</p> <p>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.</p>	Provincial Heritage Resources Authority	Comments on built environment and decision to approve or not
		SAHRA Archaeology, Palaeontology and Meteorites Unit	Comments and decision to approve or not

3. HERITAGE RESOURCES

3.1 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).

3.2 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 1). This allowed some form of control over the application of similar values for similar sites.

4. STUDY APPROACH AND METHODOLOGY

4.1 Extent of the Study

This survey and impact assessment covers the area as presented in Section 5 and as illustrated in Figures 1 - 2.

4.2 Methodology

4.2.1 Preliminary investigation

4.2.1.1 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, historical sources and heritage impact assessment reports were consulted (Praagh 1906; Joubert 1955; Floor 1985; Bergh 1998).

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

4.2.1.2 Data bases

The *Heritage Atlas Database*, the *Environmental Potential Atlas*, the *Chief Surveyor General (CS-G)* and the *National Archives of South Africa (NASA)* were consulted.

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

4.2.1.3 Other sources

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

- Information of a very general nature was obtained from these sources.

4.2.2 Field survey

The area that had to be investigated was identified by **Chameleon Environmental** by means of maps. As this is a linear development the survey was done by travelling the total route.

5. DESCRIPTION OF THE AFFECTED ENVIRONMENT

5.1 Site location and description

The road that is to be upgraded is the section of National Route R104 between the Simon Vermooten (Silverton) interchange and the town of Bronkhorstspuit in Gauteng Province (see Fig. 1). For more information, please see the Technical Summary presented above.

The geology of the region is mostly made up of quartzite, changing to shale in the east. The topography is described as flat, except where it crosses the Magaliesberg, after which it changes to gently rolling hills. The vegetation of the region is classified as Rocky Highveld Grassland, changing to Moist Cool Highveld Grassland in the south-eastern part of the study area.

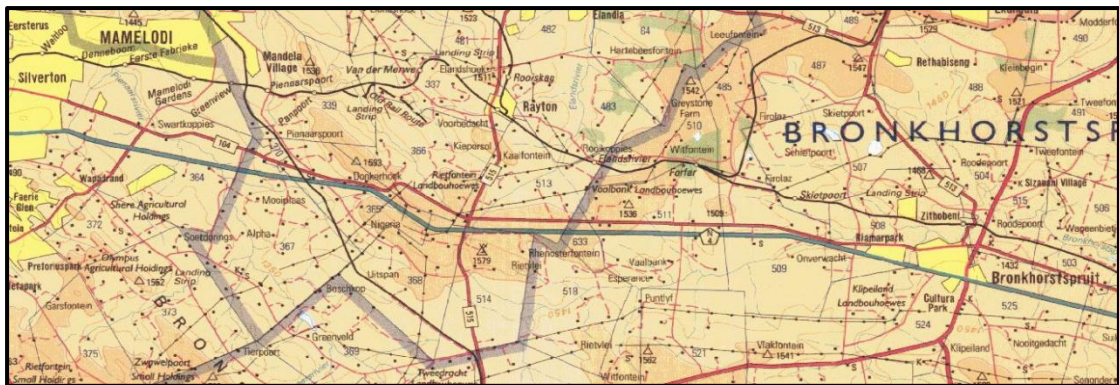


Fig. 1. Location of the study area in regional context.
(Maps 2530: Chief Surveyor-General)

5.2 Regional overview

Figure 2 gives an indication of the location of some of the known sites of cultural significance in the vicinity of the study area.



Fig. 2. Location of known sites of cultural significance in the vicinity of the study area.

5.2.1 Stone Age

Stone tools dating to the various phases of the Stone Age occur all over the region. Stone Age tools associated with the Early and Middle Stone Age are common in the area, especially along the spruits and rivers where they cut through ridges and at the lower parts of the ridges and larger outcrops. These are viewed as find spots rather than sites per se. That means that as most of these are surface finds, they are viewed to be out of context and do not have any significance. Only a few stratified sites are known in the Magaliesberg range, but even these have little significance as the deposits have either eroded away, or have been impacted upon by later occupants of the shelters. However, this does not mean that the discovery of new sites can be ruled out.

5.2.2 Iron Age

Sites dating to the Late Iron Age are found all over. Some of them can be related to the Tswana-speakers, whereas others to the Ndebele-speakers and possibly a few also to the Ndebele of Mzilikazi. However, this still needs to be researched in more detail.

The Iron Age sites tend to cluster in the Bronberg as well as on the more open flatlands, especially in areas where outcrops (dolorite, etc.) occur. It is possible, although not yet proven, that this distinction can be linked to the difference between the Sotho and Ndebele referred to above. Some engravings, attributed to either the Stone Age or Iron Age occur on the farm Mooiplaats.

- Archaeological sites

Very little information regarding the archaeology of the study area exists few intensive surveys have been done in the region.

NHRA Category	Archaeological and palaeontological sites
Protection status	
	General Protection - Section 35: Archaeology, palaeontology and meteorites



Fig. 3. Typical stone walled Late Iron Age site.

5.2.3 Historical period

Early white farmers selected farms (such as Mooiplaats) and then provided a description of the farm to the local landdrost, who noted the detail in a registration book and gave the claimant a copy. Claimed land was then inspected before a title and deed were issued. Since the registration of land entailed registration costs and annual land taxes, it was often delayed as long as possible. As a result, the registration of land claimed on the basis of burgher rights continued well into the 1890s.

Very few, if any resources that can be ascribed to early white settlement in the area, are still in existence. It is possible that a more intensive survey would reveal a number, such as the farm buildings at “Friesland” on the farm Zwartkoppies.

The Pretoria – Lorenzo-Marques (Maputo) railway line, also known as the NZASM line, was built through the region during the 1880s. A number of features, e.g. bridges, culverts, stations, houses, good sheds, etc. still exist and forms part of this feature.

Of course, this was also the area over which the British troops advanced during the 2nd Anglo-Boer War, before engaging in battle, on 11 and 12 June 1900, that was later to become known as the “Battle of Diamond Hill” or, the “Slag van Donkerhoek”. It was one of the largest battles that took place during the war and the remains of gun placements, trenches and fortifications can still be found, however, mostly to the east of the study area.

- Battlefields

NHRA Category	Buildings, structures, places and equipment of cultural significance
Protection status	
	General Protection - Section 34: Structures older than 60 years



Fig. 4. Fortifications and cemeteries dating to the Anglo-Boer War.

Since its founding in 1855, urban development of Pretoria remained concentrated in the central area around Church Square. Elsewhere, settlement was mainly agricultural, characterized by the subdivision of the original farms to accommodate children. During the 1940-1950 era there was a large increase in the urban population and many new suburbs were developed on the periphery of the urban area.

Silverton was established in 1890 and remained an independent municipality until 1964, when it became part of Greater Pretoria. During the Depression years a large number of destitute farmers were settled here in shanties, giving rise to the nick-name Blikkiesdorp.

The town of Bronkhorstspuit was established in 1904 on the farm Hondsrivier and named Erasmus after the owner of the farm, CJG Erasmus. In 1935 it was renamed Bronkhorstspuit after the stream that passes through the town.

- Farmsteads

NHRA Category	Buildings, structures, places and equipment of cultural significance
Protection status	
General Protection - Section 34: Structures older than 60 years	

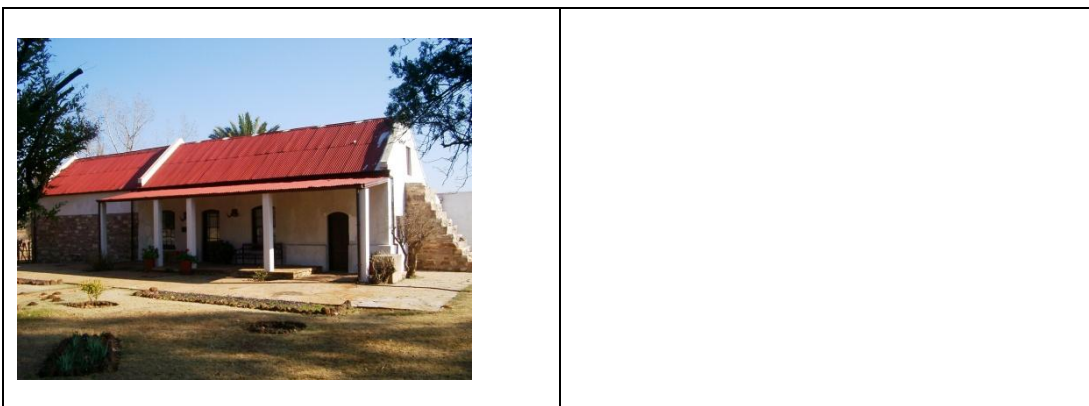


Fig. 5. Examples of farmsteads in the region.

- Cemeteries

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.

NHRA Category	Graves, cemeteries and burial grounds
Protection status	
General Protection - Section 36: Graves or burial grounds	



Fig. 6. A typical farm cemetery in the region.

Most of these cemeteries, irrespective of the fact that they are for land owner or farm labourers (with a few exceptions where they were integrated), are family orientated. They are therefore serve as important „documents“ linking people directly by name to the land.

5.3 Identified sites

The following cultural heritage resources were identified in the study area:

5.3.1 Stone Age

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

5.3.2 Iron Age

- No sites, features or objects dating to the Iron Age were identified in the study area.

5.3.3 Historic period

- No sites, features or objects dating to the historic period were identified in the study area, other than that which is described below.

No primary sources on the history of the development of the R104 road exist and what is presented below is therefore derived from secondary sources.

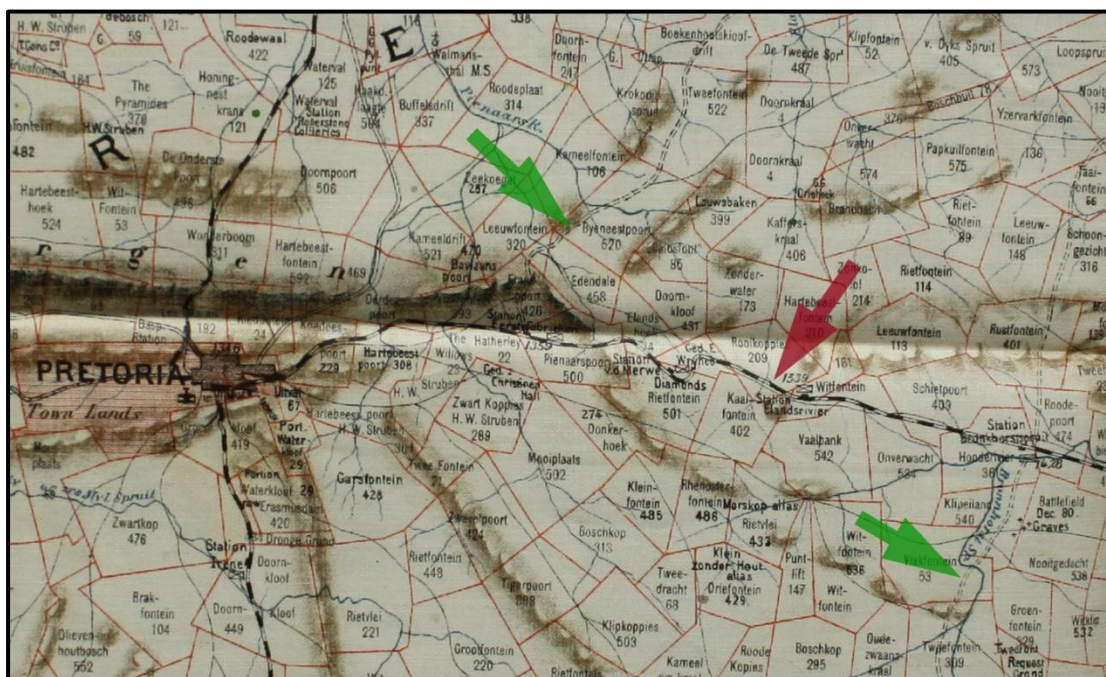


Fig. 7. Section of Fred Jeppe's map dating to 1899.

It seems as if Tsamaya Road passing through Mamelodi, also referred to as Denneboomweg, dates back to the late 19th century when it took travellers to Sekhukhuneland (De Jong 1995).

For some or other reason there was little traffic going directly east from Pretoria. This is in all probability the fact that there were no towns in that region – Bronkhorstspuit was established only in 1904. This is illustrated by Fred Jeppe on his map (Fig. 7) dating to 1899. He shows a number of roads and smaller tracks as well as the railway line towards Mozambique. However, none of these follow the alignment of the current road.

When a closer look is taken at the map (Fig. 8), one can determine that there used to be a track that passes south of the town of Bronkhorstspuit, crossing the Battle field of 1880. This serves as an indication of why the British troops took that route when they marched on Pretoria. In addition, a track seems to have run parallel with the railway line and a third one, probably coming from the direction of Cullinan, is located to the north. All three of these tracks come together west of the Balmoral station. The implication is that by 1900 there was as yet no route following the existing alignment. The track that follows the railway line was in all probability made when the railway line was constructed. However, this is also located north of the existing R104.

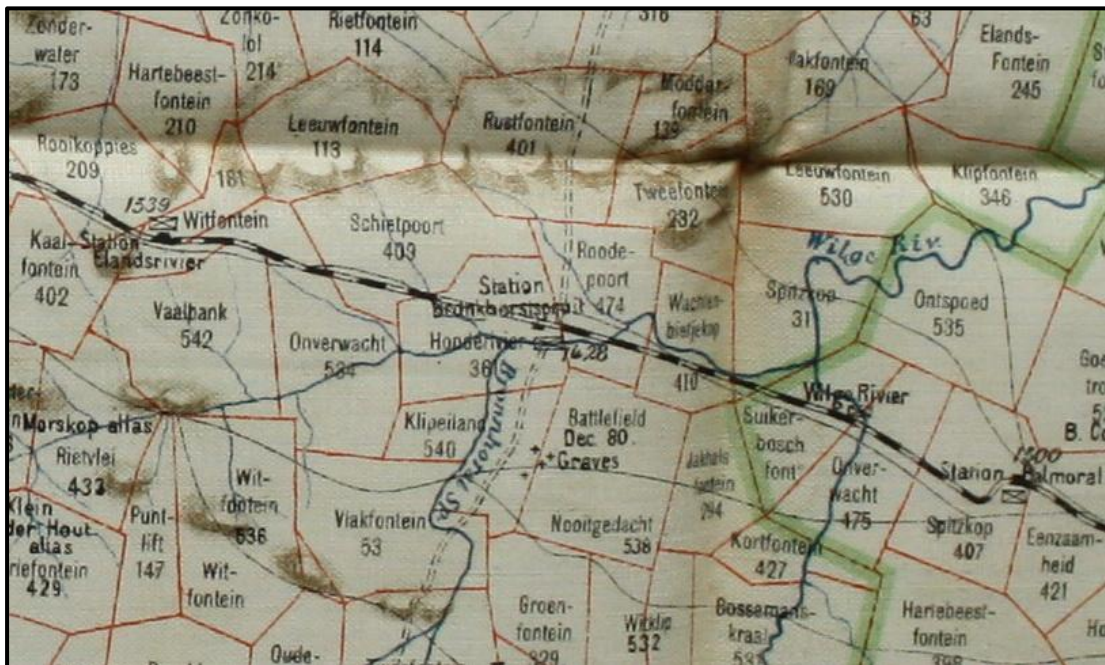


Fig. 8. Close-up of the F. Jeppe's map.

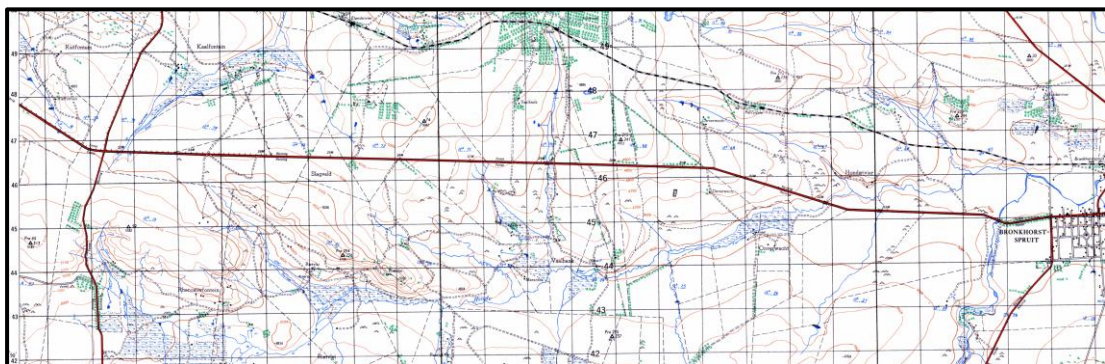


Fig. 9. The 1943 version of the 1:50 000 topo-cadastral map.
(Map: Chief Surveyor-General)

The 1943 version of the topo-cadastral map (Fig. 9) shows the existing road (R104) already on its current alignment, as well as a very small, somewhat under-developed town of Bronkhorstspuit. The implication therefore is that the current R104 road and bridges would have been constructed by then and would therefore be older than 60 years. No information could be found in the Archive that any of these bridges were destroyed during a flood and that they were rebuilt at a later stage. The implication therefore is that these bridges are also older than 60 years.

Inspection of the various bridges (Pienaarsrivier, Forfar Spruit, Hondsrivier and Bronkhorstspuit) indicates that they are all constructed in a similar manner. The exception of the Piernaarsriver bridge which have a number of elements lacking, indicating that it might date to a later stage – for example guide rails on the bridge deck which as mostly put in place to assist wagons when crossing.

- Bridges

NHRA Category	Buildings, structures, places and equipment of cultural significance
Protection status	
General Protection - Section 34: Structures older than 60 years	

Location	No. 1	S 25.75463	E 28.38076
	No. 2	S 25.79460	E 28.62027
	No. 3	S 25.80263	E 28.68390
	No. 4	S 25.80624	E 28.72338

Description
Four bridges built with a combination of cast concrete, dressed stone and steel work, crossing the Pienaarsrivier, Forfar Spruit, Hondsrivier and the Bronkhorstspuit. In addition a number of culverts built with stone and cast concrete pipes crossing below the road are found all over. Although it is accepted that the latter date to the time of the original construction of the road, they could easily be rebuilt or upgraded as required.

Significance	High on a regional level – Grade III
---------------------	--------------------------------------

Mitigation
A cursory count has revealed that not many bridges are found on the R104. How many of these had to be reconstructed after flooding is also not known. The fact that none show remains of older structures nor by-passes that were made during reconstruction indicate that they are still in their original state. All the bridges seem to be older than 60 years and also show interesting elements in their construction. If they are to be upgraded/altered during the upgrading of the road, it is recommended that they are documented prior to this taking place. Simple photographic documentation of some of the culverts is recommended. All of this should be done by a heritage specialist, after which a permit should be applied for from SAHRA.



Fig. 10. Bridges over the Pienaarsrivier, Forfar Spruit, Hondsrivier and Bronkhorstspruit and one of a number of similar culverts.

6. SITE SIGNIFICANCE AND ASSESSMENT

6.1 Heritage assessment criteria and grading

The NHRA 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 on a local authority level.

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 and Grade III sites, the applicable of mitigation measures would allow the development activities to continue.

6.2 Statement of significance

A matrix was developed whereby the above criteria, as set out in Sections 3(3) and 7 of the NHRA, No. 25 of 1999, were applied for each identified site (see Appendix 1). This allowed some form of control over the application of similar values for similar sites. Three categories of significance are recognized: low, medium and high. 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.

Table 2. Summary of identified heritage resources in the study area.

Identified heritage resources	
<i>Category, according to NHRA</i>	<i>Identification/Description</i>
Formal protections (NHRA)	
National heritage site (Section 27)	None
Provincial heritage site (Section 27)	None
Provisional protection (Section 29)	None
Place listed in heritage register (Section 30)	None
General protections (NHRA)	
structures older than 60 years (Section 34)	Yes
archaeological site or material (Section 35)	None
palaeontological site or material (Section 35)	None
graves or burial grounds (Section 36)	None
public monuments or memorials (Section 37)	None
Other	
Any other heritage resources (describe)	None

As no information could be obtained from any source on the construction of the bridges, the following approach was followed to determine their significance:

- A review of the technology and materials used in the construction of the two bridges was done.
- The history of the development of the R104 was reviewed in an effort to determine an approximate date for the construction of the bridges.

- The history of the larger region was reviewed to determine if any event of historical, cultural or political significance could be linked to any of the two bridges.
- A review was done of other bridges on the R104 to determine how many “older” ones are still in existence.

From the above information it was determined that these bridges does not exhibit any remarkable construction techniques, nor can they be linked to any event or person and that similar bridges are still to be found along the route. But, considering that the rest of the route might also be upgraded at some stage and that the remaining bridges might then be demolished, it was decided to err on the side caution. Therefore, although the bridges are viewed to have Grade III status they are judged to have high significance on a regional level.

6.3 Impact assessment

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

Table 3. Summary of impact assessments.

Nature: Road bridges		
	Without mitigation	With mitigation
Extent	Local (1)	Local (1)
Duration	Permanent (5)	Permanent (3)
Magnitude	Moderate (2)	Moderate (4)
Probability	Probable (1)	Probable (1)
Significance	8 (Low)	8 (Low)
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	
Mitigation: As these structures are viewed to have high significance on a regional level, mitigation measures are required.		
Cumulative impacts: None		
Residual Impacts: None		

7. CONCLUSIONS

The aim of this survey was to locate, identify, evaluate and document sites, objects and structures of cultural significance found within the area of the proposed development, to assess the significance thereof and to consider alternatives and plans for the mitigation of any adverse impacts.

During the survey, the following features were identified:

- Four bridges built with a combination of cast concrete, dressed stone and steel work, crossing the Pienaarsrivier, Forfar Spruit, Honds Rivier and the Bronkhorstspruit.
- In addition a number of culverts built with stone and cast concrete pipes crossing below the road are found all over. Although it is accepted that the latter date to the time of the original construction of the road, they could easily be rebuilt or upgraded as required

As no information could be obtained from any source on the construction of the bridges, the following approach was followed to determine their significance:

- A review of the technology and materials used in the construction of the four bridges was done.
- The history of the development of the R104 was reviewed in an effort to determine an approximate date for the construction of the bridges.
- The history of the larger region was reviewed to determine if any event of historical, cultural or political significance could be linked to any of the two bridges.
- A review was done of other bridges on the R104 to determine how many “older” ones are still in existence.

From the above information it was determined that these bridges does not exhibit any remarkable construction techniques, nor can they be linked to any event or person and that similar bridges are still to be found along the route. But, considering that the rest of the route might also be upgraded at some stage and that the remaining bridges might then be demolished, it was decided to err on the side caution. Therefore, although bridges are viewed to have Grade III status they are judged to have high significance on a regional level.

- It is therefore recommended that the bridges should be documented before they can be upgraded/alterd, but on condition of SAHRA issuing a permit for the changes made to the bridges.

As there are no other sites, features or objects, apart from the various bridges that could be impacted on by the proposed upgrading of the R104, it is recommended that the proposed development be allowed to continue, on condition of acceptance of the above mitigation measures. Furthermore, it is requested that should archaeological sites or graves be exposed during construction work, it must immediately be reported to a heritage practitioner so that an investigation and evaluation of the finds can be made.

8. REFERENCES

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8.3 Maps and aerial photographs

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APPENDIX 1: CONVENTIONS USED TO ASSESS THE SIGNIFICANCE OF HERITAGE RESOURCES

Significance

According to the NHRA, Section 2(vi) the **significance** of heritage sites and artefacts is determined by its 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. 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				
2. Aesthetic value				
It is important in exhibiting particular aesthetic characteristics valued by a community or cultural group				
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				
4. Social value				
Does it have strong or special association with a particular community or cultural group for social, cultural or spiritual reasons				
5. Rarity				
Does it possess uncommon, rare or endangered aspects of natural or cultural heritage				
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.				
7. Sphere of Significance		High	Medium	Low
International				
National				
Provincial				
Regional				
Local				
Specific community				
8. Significance rating of feature				
1.	Low			
2.	Medium			
3.	High			

APPENDIX 2: CONVENTIONS USED TO DETERMINE THE IMPACT OF DEVELOPMENT ON HERITAGE RESOURCES

According to the NHRA, Section 2(vi) the **significance** of heritage sites and artefacts is determined by its 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.

Assessment of Impacts

Direct, indirect and cumulative impacts of the issues identified through the study, as well as all other issues identified in the EIA phase must be assessed in terms of the following criteria:

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

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

$$S=(E+D+M)P$$

S = Significance weighting

E = Extent

D = Duration

M = Magnitude

P = Probability

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

- » < 30 points: Low (i.e. where this impact would not have a direct influence on the decision to develop in the area),
- » 30-60 points: Medium (i.e. where the impact could influence the decision to develop in the area unless it is effectively mitigated),
- » > 60 points: High (i.e. where the impact must have an influence on the decision process to develop in the area).

APPENDIX 3. 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.