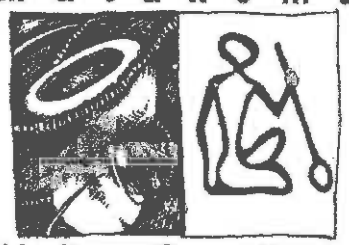
Matakoma



Heritage Consultants

BOHLWEKI ENVIRONMENTAL (PTY) LTD

HERITAGE ASSESSMENT

Stone River Arch Development, Rietvlei 101, Johannesburg, Gauteng

Version 1.0

13 JULY 2006

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EXECUTIVE SUMMARY

As we know from legislation the surveying, capturing and management of heritage resources is an integral part of the greater management plan laid down for any major development or historic existing operation. With the proclamation of the National Heritage Resources Act 1999 (Act 25 of 1999) this process has been lain down clearly. This legislation aims to under pin the existing legislation, which only addresses this issue at a glance, and gives guidance to developers and existing industries to the management of their Heritage Resources.

The importance of working with and following the guidelines lain down by the South African Heritage Resources Agency cannot be stressed enough.

This document forms part of the Environmental Scoping Assessment for the Stone River Arch development in the Malburton area.

During the survey nine heritage sites were found in the development area.

The following section gives an outline of the sites found and the proposed mitigation measures.

Archaeological Sites
Number of sites found:
Four sites were identified during the survey. If the development were to stay on the lower reaches of the ridge only three of the sites will be in danger.

Recommendation:
The best option and first prize would be the preservation of the sites in situ. If the development is of such nature that the sites will be severely impacted on mitigation measures will have to be employed.

If the sites were to be preserved in situ, it will have to be fenced off. A buffer zone of at least 15 meters will have to be kept around the site as to facilitate the protection of the site during development.

In the instance that the site needs to be destructed, an archaeologist needs to document the site and afterwards a destruction permit needs to be applied for from the Provincial office of the South African

Heritage Resources Agency (SAHRA) before such a time that the site is destructed.

It is also recommended that an archaeologist be on site to act as a monitor with a watching brief in the areas close to the archaeological sites.

Cemeteries
Number of sites found:
One cemetery with 48 graves were found.

Recommendation:
The best option and first prize would be the preservation of the cemetery *in situ*. If the mining is of such a nature that the site will be severely impacted on the graves and cemetery will have to be relocated.

If the cemetery were to be preserved *in situ*. It will have to be fenced of and provided with a gate for access by family members. A buffer zone of at least 15 meters will have to be kept around the cemetery as to facilitate the protection of the site during development.

In the instance that the cemetery needs to be relocated, this must be done with adherence to all legal requirements as well as an extensive social consultation process required within the process. It is well advised that a company with a proven record of accomplishment be used to manage and complete such a project.

Historical Buildings
Number of sites found:
Two sites were found

Recommendation:
The best option and first prize would be the preservation of the farmstead *in situ*. It is recommended that a conservation architect evaluate the buildings to ascertain their significance and age. If development is of such a nature that the site will be severely impacted on and the site area older than 60 years, the site will have to be documented and a destruction permit applied for before destruction.

If the site is to be preserved *in situ*, it will have to be fenced and a buffer zone of at least 15 meters will have to be kept around the site as to facilitate the protection of the site during construction.

Historical Ruins
Number of sites found:
Two sites were found

Recommendation:
The best option and first prize would be the preservation of the ruins *in situ*. If development is of such a nature that the site will be severely impacted on no further action is necessary.

If the site is to be preserved *in situ*, it will have to be fenced and a buffer zone of at least 15 meters will have to be kept around the site as to facilitate the protection of the site during development.

A heritage resources management plan must be developed for managing the heritage resources in the study area during construction and after. This includes basic training for construction staff on possible finds, action steps for mitigation measures, surface collections, excavations and communication routes to follow in the case of a discovery.

Further recommendations made in ***Section 9*** of the report must be addressed to facilitate responsible management of the heritage resources in the study area.

CONTENTS

ANNEXURE

FIGURES

1. INTRODUCTION

Matakoma Heritage Consultants (Pty) Ltd was contracted by Bohlweki Environmental (Pty) Ltd to conduct a Heritage Assessment for the proposed Stone River Arch Development, district Johannesburg.

The aim of the study is to identify all heritage sites, document, and assess their importance within Local, Provincial and national context. From this we aim to assist the developer in managing the discovered heritage resources in a responsible manner, in order to protect, preserve, and develop them within the framework provided by he National Heritage Resources Act of 1999 (Act 25 of 1999).

The report outlines the approach and methodology utilised before and during the survey, which includes in Phase 1: Archival research, information collection from various sources and public consultations; Phase 2: Physical surveying of the area by air on foot and vehicle; and Phase 3: Reporting the outcome of the study.

During the survey, ten sites of cultural significance were identified. These sites were recorded by means of photos, GPS location, and description. Possible impacts were identified and mitigation measures are proposed in the following report.

This report must also be submitted to SAHRA's provincial office for scrutiny.

2. APPROACH AND METHODOLOGY

The aim of the study is to extensively cover all data available to compile a background history of the study area; this was accomplished by means of the following phases.

2.1. ARCHIVAL RESEARCH

The first phase comprised of a desktop study with the aim of gathering data to compile a background history of the area. This desktop study covered the following:

Utilising data stored in the National as well as Transvaal Archives for information gathering. The aim with this is to compile a data list of archaeological sites, historical sites, graves, architecture, oral history, and ethnographical information on the inhabitants of the area.

As heritage surveys deal with the locating of heritage resources in a prescribed cartographic landscape, the study of archival and historical data, and especially cartographic material, can represent a very valuable supporting tool in finding and identifying such heritage resources.

Sources from the following institutions were consulted:

- National Archives, Pretoria
- UNISA Library, Pretoria
- Directorate Surveys and Mapping, Cape Town

2.2 PHYSICAL SURVEYING

Due to the nature of cultural remains, the majority that occur below surface, a physical walk through of the study area was conducted. Matakoma Heritage Consultants were appointed to conduct a survey of 60 hectares for the project.

Aerial photographs and 1:50 000 maps of the area were consulted and literature of the area were studied before undertaking the survey. The purpose of this was to identify topographical areas of possible historic and pre-historic activity. The study area was surveyed over two days, by means of vehicle and extensive surveys on foot by Matakoma Heritage Consultants. All sites discovered both inside and bordering the proposed development area was plotted on 1:50 000 maps and their GPS co-ordinates noted. 35mm photographs on digital film were taken at all the sites.

3. WORKING WITH LEGISLATION

It is very important that cultural resources be evaluated according to the National Heritage Recourse Act. In accordance with the Act, we have found the following:

- These sites are classified as important based on evaluation of the National Heritage Recourses Act 1999 (Act No 25 of 1999) section 3 (3).

A place or object is to be considered part of the national estate if it has cultural significance or other special value because of-

- (a) its importance in the community, or pattern of South Africa's history;
- (b) its possession of uncommon, rare or endangered aspects of South Africa's natural or cultural heritage;
- (c) its potential to yield information that will contribute to an understanding of South Africa's natural or cultural heritage;
- (d) its importance in demonstrating the principal characteristics of a particular class of South Africa's natural or cultural places or objects;
- (e) its importance in exhibiting particular aesthetic characteristics valued by a community or cultural group;
- (f) its importance in demonstrating a high degree of creative or technical achievement at a particular period;
- (g) its strong or special association with a particular community or cultural group for social, cultural or spiritual reasons;
- (h) 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
- (i) sites of significance relating to the history of slavery in South Africa.

- (Refer to Section 9 of this document for assessment)
- This site should be managed through using the National Heritage Recourses Act 1999 (Act No 25 of 1999) sections 4,5 and 6 and sections 39-47.
- Please refer to Section 9 for Management Guidelines.

4. ASSESSMENT CRITERIA

This chapter describes the evaluation criteria used for the sites listed below.
The significance of archaeological sites was based on four main criteria:

- **site integrity** (i.e. primary vs. secondary context),
- **amount of deposit, range of features** (e.g., stonewalling, stone tools and enclosures),
- **uniqueness** and
- **Potential** to answer present research questions.

Management actions and recommended mitigation, which will result in a reduction in the impact on the sites, will be expressed as follows:
A - No further action necessary;
B - Mapping of the site and controlled sampling required;
C - Preserve site, or extensive data collection and mapping of the site; and
D - Preserve site

Impacts on these sites by the development will be evaluated as follows

4.1 IMPACT

Impacts on these sites by the development will be evaluated as follows

5.1 Significance rating scale as prescribed by the Client

5.2 Temporal scale used in assessing issues

Short term - less than 5 years. Many construction phase impacts will be of a short duration.
Medium term - between 5 and 15 years.
Long term - between 15 and 30 years
Permanent - over 30 years and resulting in a permanent and lasting change that will always be there.

5.3 Severity/beneficial scale use in the EIA

Very severe An irreversible and permanent change to the affected system(s) or party (ies) which cannot be mitigated. For example, the permanent change to topography resulting from a quarry.	**Very beneficial** A permanent and very substantial benefit to the affected system(s) or party(ies), with no real alternative to achieving this benefit. For example, the creation of a large number of long term jobs.
Severe Long term impacts on the affected system(s) or party(ies) that could be mitigated. However, this mitigation would be difficult, expensive or time consuming or some combination of these. For example, the clearing of forest vegetation.	**Beneficial** A long term impact and substantial benefit to the affected system(s) or party(ies). Alternative ways of achieving this benefit would be difficult, expensive or time consuming, or some combination of these. For example, an increase in the local economy.
Moderately severe Medium to long term impacts on the affected system(s) or party (ies), that could be mitigated. For example constructing a narrow road through vegetation with a low conservation value.	**Moderately beneficial** A medium to long term impact of real benefit to the affected system(s) or party(ies). Other ways of optimising the beneficial effects are equally difficult, expensive and time consuming (or some combination of these), as achieving them in this way. For example a slight improvement in the (local) roads.
Slight Medium or short term impacts on the affected system(s) or party(ies). Mitigation is very easy, cheap, less time consuming or not necessary. For example, a temporary fluctuation in the water table due to water abstraction.	**Slightly beneficial** A short to medium term impact and negligible benefit to the affected system(s) or party(ies). Other ways of optimising the beneficial effects are easier, cheaper and quicker, or some combination of these. For example, a slight increase in the amount of goods available for purchasing.
No effect The system(s) or party(ies) is not affected by the proposed development.	**Don't know/Can't know** In certain cases it may not be possible to determine the severity of an impact.

5.4 The significance rating scale

VERY HIGH

These impacts would be considered by society as constituting a major and usually permanent change to the (natural and/or

social) environment, and usually result in **severe** or **very severe** effects, or **beneficial** or **very beneficial** effects.
Example: The loss of a species would be viewed by informed society as being of VERY HIGH significance.
Example: The establishment of a large amount of infrastructure in a rural area, which previously had very few services, would be regarded by the affected parties as resulting in benefits with a VERY HIGH significance.

HIGH
These impacts will usually result in long term effects on the social and/or natural environment. Impacts rated as HIGH will need to be considered by society as constituting an important and usually long term change to the (natural and/or social) environment. Society would probably view these impacts in a serious light.
Example: The loss of a diverse vegetation type, which is fairly common elsewhere, would have a significance rating of HIGH over the long term, as the area could be rehabilitated.
Example: The change to soil conditions will impact the natural system, and the impact on affected parties (in this case people growing crops on the soil) would be HIGH.

MODERATE
These impacts will usually result in medium- to long-term effects on the social and/or natural environment. Impacts rated as MODERATE will need to be considered by society as constituting a fairly important and usually medium term change to the (natural and/or social) environment. These impacts are real but not substantial.
Example: The loss of a sparse, open vegetation type of low diversity may be regarded as MODERATELY significant.
Example: The provision of a clinic in a rural area would result in a benefit of MODERATE significance.

LOW
These impacts will usually result in medium to short term effects on the social and/or natural environment. Impacts rated as LOW will need to be considered by the public and/or the specialist as constituting a fairly unimportant and usually short term change to the (natural and/or social) environment. These impacts are not substantial and are likely to have little real effect.

Example: The temporary change in the water table of a wetland habitat, as these systems are adapted to fluctuating water levels.
Example: The increased earning potential of people employed as a result of a development would only result in benefits of LOW significance to people who live some distance away.

NO SIGNIFICANCE
There are no primary or secondary effects at all that are important to scientists or the public.
Example: A change to the geology of a particular formation may be regarded as severe from a geological perspective, but is of NO significance in the overall context.

5.5 The risk or likelihood scale

Very unlikely to occur - the chance of these impacts occurring is extremely slim, e.g. an earthquake destroying a bridge.
Unlikely to occur - the risk of these impacts occurring is slight. For example an impact such as an increase in alcoholism and associated family violence because of increased wealth is unlikely to occur.
May occur - the risk of these impacts is more likely, although it is not definite, for example the chance that a road accident may occur during the construction phase.
Will definitely occur - there is no chance that this impact will not occur, for example the clearing of vegetation.

5.6 The degree of certainty or confidence used in this EIA
Definite: More than 90% sure of a particular fact. To use this one will need to have substantial supportive data.
Probable: Over 70% sure of a particular fact, or of the likelihood of that impact occurring.
Possible: Only over 40% sure of a particular fact or of the likelihood of an impact occurring.
Unsure: Less than 40% sure of a particular fact or the likelihood of an impact occurring.

Example
Impact Evaluation

DEMOLISHED: site will be demolished or is already demolished

Example
Evaluation

Impact	*Impact Significance*	*Heritage Significance*	*Certainty*	*Duration*	*Mitigation*
Negative	*Moderately negative*	*Medium*	*Possible*	*Permanent*	*C*

5. HISTORICAL BACKGROUND OF AREA

5.1 INTRODUCTION

Dr A.C. van Vollenhoven was commissioned by *Matakoma Heritage Consultants* to undertake an archival / desktop study on portions of the farm Rietvlei 101 IR. This archival study forms part of the Heritage Impact Assessment Report undertaken for proposed development on that farm.

5.2 METHODOLOGY

For this purpose research was conducted in the National Archives Depot (NAD) and the Deeds Office in Pretoria. In the Deeds office the old farm registers, correspondence files and old Surveyor-General's maps were consulted.

The specific archives that were consulted in the NAD, are the South African Archives Depot (SAD), the Transvaal Archives Depot (TAD), the National Register of Manuscripts and Photographs, National Archives cartographic material, library material and copies (MAN), Archives Depot of Audio-Visual Material (OVM) and the all inclusive archives (RSA). The TAD deals with documents before 1910 and the SAD with those after 1910. The MAN deals with photographs, maps and other material indicated and OVM with audio-visual material.

The RSA is a combined database of all the other databases. This means that the number of documents found in all the other databases should also be found here. However experience has shown that it sometimes differs and therefore the search had to be conducted here.

Key words that were used showed the following results: Rietvlei, or the combination of the words Riet and Valley. The words Stone Rivers showed no results. Regarding the words Rietvlei 101IR only 1 document was found in the TAD and 1 in the SAD. Nothing else was found. In the RSA 2 documents were found which confirmed this result.

Although both these documents deal with the farm Rietvlei 101IR, it does not provide applicable information and has therefore been ignored.

5.3. ASPECTS OF THE AREA'S HISTORY AS HIGHLIGHTED THROUGH THE ARCHIVAL STUDY

The restant of portion 2 of the farm Rietvlei is a portion of the original farm Rietvlei 101IR. The farm was originally called Rietvlei no 17 (Deeds office: DB62/129, diagram A, 86/79, SG255/17; Deeds office, DT 3436/1869, diagram A, 172/79, SG172/79). The farm is not mentioned as being one of the first to be occupied in this region, roundabout 1839/40 (see Bergh 1999: 15). Therefore it must have been occupied later.

It is fortunate that the farm did not change hands many times during the first more or less 100 years of it's existence. Therefore it is quite easy to reconstruct the history thereof. After this time it however has been subdivided numerous times. Today the farm has been subdivided in various smaller portions of land.

Sarel Johannes Marais first occupied the original farm Rietvlei. It was transferred to him from the Government of the South African Republic (ZAR) on 1 October 1856 (Deeds office, Farm register no 27). Marais stayed the owner of portion A of the farm once the subdivision of the farm started. Portion A was later called portion 1.

On 28 October 1869 portion 2 was transferred to Christoffel Johannes Marais, son of S.J. Marais. When the latter died it was subdivided into four portions and transferred from his estate, respectively to Sarel Johannes Francois Marais, Louis Johannes Wessels Bergh, Christoffel Johannes Marais and Jan Hendrik Perie. This was on 12 July 1911.

On the same date some of the parts of the farm were again consolidated. The portion belonging to S.F.J. (sic) Marais was then also transferred to L.J.W. Bergh. The other two portions were then also consolidated with these and transferred to Petrus Johannes du Preez, again on 12 July 1911 (Deeds office, Farm register no 27). One should not be confused by all these transactions appearing to be on the same date. In those years transactions were usually only written in once in a few years, but then indicated all previous transactions. It means that the latest transaction, which is the consolidation of all four portions, is the only one that really occurred on the indicated date.

Portion 2 of the farm was again transferred on 24 January 1920 to Cornelius Alewyn Johannes Jansen (Deeds office, Farm register no 27). It was only after this date that the farm was subdivided into various smaller portions.

Portion 2, or at least some portions thereof seem to have been in the hands of the Jansen family for quite some time. Documents dating to 1958 for instance still indicate the Jansen family (Deeds office, File 24/6/3, 6666, 3/10/1958). This included the restant of portion 2, which were transferred on 5 December 1946 from C.A.J. Jansen to Ulrique Jansen. She probably was his daughter and it is indicated that she was a spinster, born on 18 September 1919 (Deeds office, Farm register no 27; Deeds office, File 24/6/3, 101/655/1).

Portions of the restant were later on divided into portions 62 and 69. Portion 62 was transferred from U. Wegener (born Jansen) to Basil Francois Jansen on 5 October 1962. It therefore seems as if Ulrique Jansen married after 1946 (Deeds office, Farm register no 27; Deeds office, File 24/6/3, 101/655/1, 25/03/1959). On 14 January 1970 this portion was transferred from B.F. Jansen to the Glen April Development Corporation Limited. From this company it was transferred to Standard Bank of South Africa Limited on 15 April 1981 (Deeds office, Farm register no 27).

Portion 69 was transferred from U. Wegener (born Jansen) to Rietvlei Park (Proprietary) Limited on 3 June 1975 (Deeds office, Farm register no 27). The deeds registers make no mention of portion 112. Looking at the Development Plan provided by

Matakoma, it seems as if it is a portion of portion 69. This must be a very recent development.

Many maps, including two old maps were also found in the office of the Surveyor-General. The first of these (Office of the Surveyor-General, 255/17) seems to be the map of the original farm Rietvlei no 17. This map dates to 1917 but does not show any additional information of a historical nature.

The second map, dating to 1879 is of much more interest (Office of the Surveyor-General, 172/79). Some buildings are visible on this map, although it does not indicate what these are. If compared with the Development Plan provided, it seems as if these are on portion 69. The number 69 does occur on this map and seems to indicate this portion, meaning that it has been known by this number at least since 1879, although the first mention of this in the farm register is only 1975 (see above).

Further information of interest on this map is that it indicates that the first owner of the farm, C.J. Marais, still owned it by 1879. At that period in time it was deemed as part of the Heidelberg district, since Johannesburg had not yet been established. The farm was surveyed by A.B. Anderson, government surveyor.

A last bit of information on the farm is found in a file in the deeds office (Deeds office, File 24/6/3). This includes letters indicating that the restant of portion 2 of the farm Rietvlei was again subdivided on 2 December 2002 and that portion A of this is a part of the township of Mulbarton. This only proves that the development of the area has been in progress for some time and probably is still ongoing.

5.6. CONCLUSIONS

It can be constituted that S.J. Marais was the first owner of the farm Rietvlei. Later on portion 2 was owned by different people and eventually consolidated again and owned by C.A.J. Jansen. It is likely that he had a daughter, U. Jansen, who owned the restant of portion 2. After further subdivisions of the restant, portion 69 eventually was owned by Rietvlei Park (Proprietary) Limited. Portion 112 seems to be a further and recent subdivision of portion 69.

The surnames mentioned in the text are of importance. It might be found on graves in the area, giving further evidence of the people residing there. It may also still be known to some of the inhabitants of the area.

6. SITES OF SIGNIFICANCE

The following section outlines the sites identified in the development area, and evaluates them according to the evaluation criteria of the National Heritage Resources Act.

6.1 2628AC-MHC001

6.1.1 The identification and mapping of all heritage resources in the affected area

The site is situated in the north eastern corner of the property on the ridge dominating the surrounding landscape. The Late Iron Age stonewalling that is the main feature of this site extends some 150 metres east to west on the top of the ridge and down towards the northern slope of the ridge.

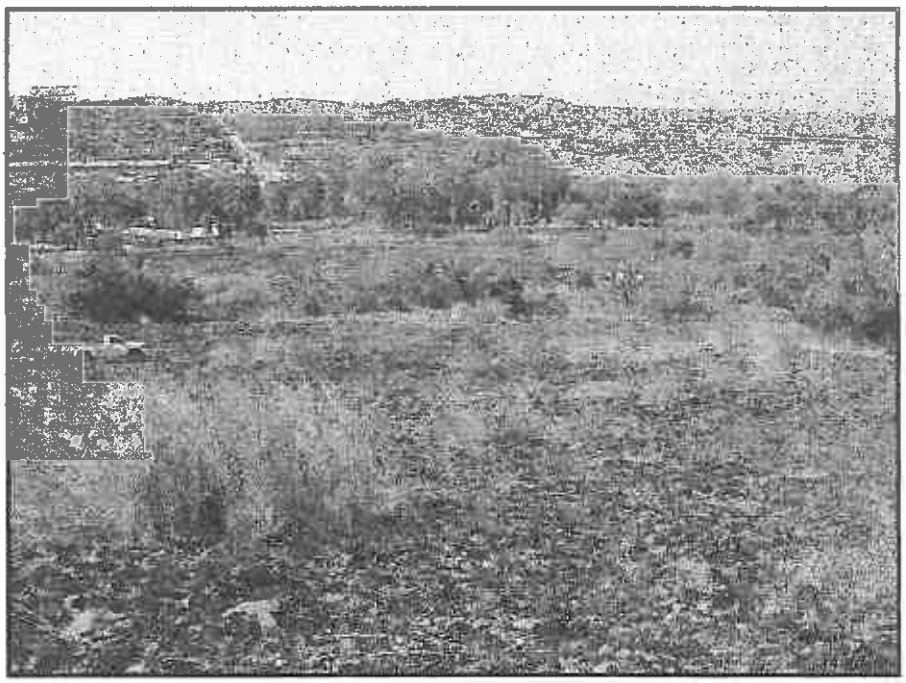

Figure 1: Stone walling

The stone walling forms terracing, and in some cases this terracing is up to 1 metre high. Some of the enclosures show signs of human activity with grain bin platforms and hut foundations being some of the features.

Potsherds are scattered over most of the settlement unit, with a low frequency of decorated potsherds found.

The settlement unit conforms to the N-type as identified by Maggs (1976) and Class III - Klipriversberg walling as identified by Mason (1968) and Huffman (per. Comm.).

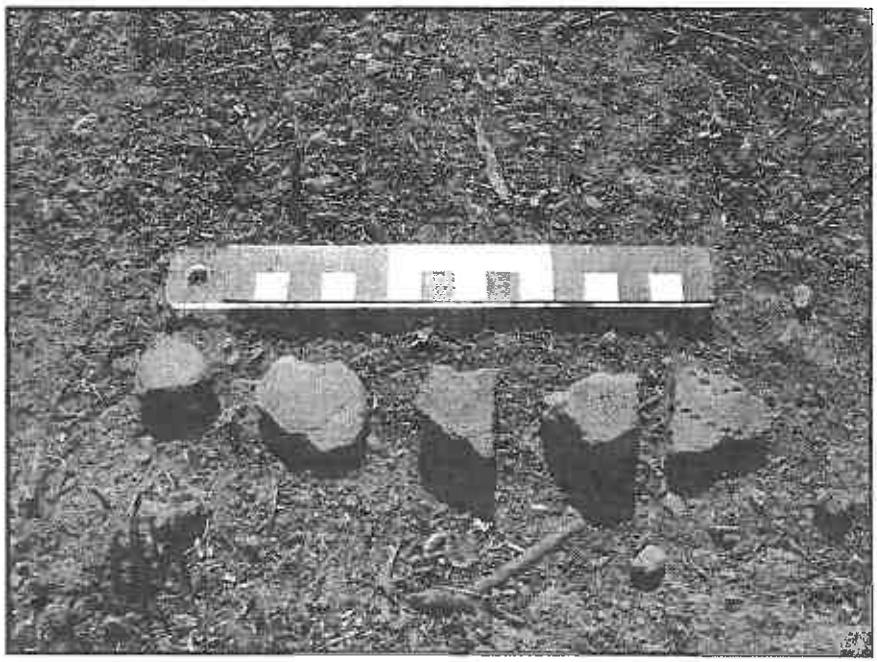

Figure 2: Potsherds

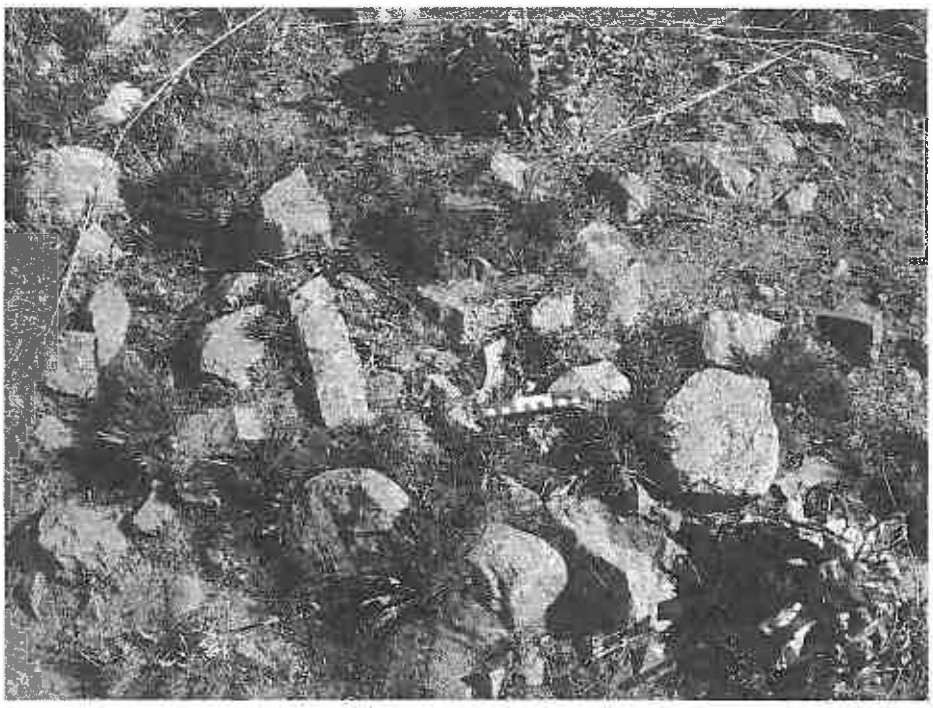

Figure 3: Grain bin platform

6.1.2 An assessment of the significance of such resources in terms of the heritage assessment criteria set out in section 3(3) of the National Heritage Recourses Act 1999 (Act No 25of 1999).

The site is of medium significance due to its good state of preservation and primary context and is classified as important based on evaluation of the National Heritage Recourses Act 1999 (Act No 25of 1999)

Section 3(3)(a) - its importance in the community, or pattern of South Africa's history
Section 3(3)(g) - its strong or special association with a particular community or cultural group for social, cultural or spiritual reasons

6.1.3 An assessment of the impact of the development on such heritage recourses and an evaluation of the impact of the development on heritage resources relative to the sustainable social and economic benefits to be derived from the development.

The site is situated on a ridge that is classified as ecologically highly sensitive. The developers indicated that the ridge might not be developed for this reason.

The sites medium significance and primary context makes any direct impact due to development on the site highly significant.

The Kliprivers berg area of Johannesburg is experiencing a development boom at the moment as can be derived from the large amount of residential developments happening in the southern part of Johannesburg. The Stone River Arch development aims to provide a residential and commercial infrastructure in this area and will contribute to the overall infrastructure development of the area.

Impact Evaluation

Impact	*Impact Significance*	*Heritage Significance*	*Certainty*	*Duration*	*Mitigation*
Negative	*Moderately negative*	*Medium*	*Possible*	*Permanent*	*C*

6.1.4 The results of consultation with communities affected by the proposed development and other interested parties regarding the impact of the development on heritage resources

The Iron Age sequence of the Klipriversberg is currently a focus of academic research due to the enormous strain being placed on the area by development. The identification and conservation of such settlements is considered as important by the archaeological community.

6.1.5 If heritage resources will be affected by the proposed development, the consideration of alternatives

The best option and first prize would be the preservation of the site *in situ* with the implementation of a heritage conservation plan.

6.1.6 Plans for mitigation of any adverse effects during and after the completion of the proposed development

The preservation of the site *in situ*, will required uffer zone of at least 15 meters to facilitate the protection of the site during development.

The implementation of a heritage conservation and management program will be necessary after construction, to protect the site after completion of the project.

6.2 2628AC-MHC002

6.2.1 The identification and mapping of all heritage resources in the affected area

The site is situated on the north eastern slope of the property on the ridge dominating the surrounding landscape. The Late Iron Age stonewalling that is the main feature of this site covers an area of 60 metres in diameter.

Some of the enclosures show signs of human activity with grain hut foundations being features.

Potsherds are scattered over most of the settlement unit, with a low frequency of decorated potsherds found.

The settlement unit conforms to the N-type as identified by Maggs (1976) and Class III - Klipriversberg walling as identified by Mason (1968) and Huffman (pers. Comm.).

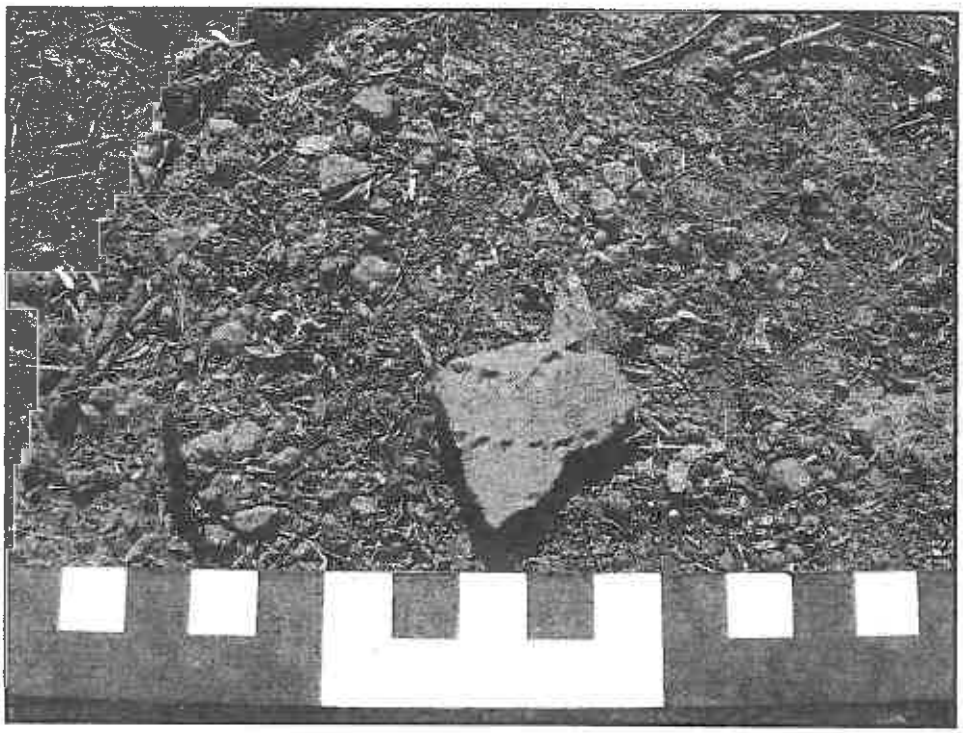

Figure 4: Potsherds

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Section 3(3)(a) - its importance in the community, or pattern of South Africa's history
Section 3(3)(g) - its strong or special association with a particular community or cultural group for social, cultural or spiritual reasons

6.2.3 An assessment of the impact of the development on such heritage recourses and an evaluation of the impact of the development on heritage resources relative to the sustainable social and economic benefits to be derived from the development.

The site is situated lower down on a ridge that is classified as ecologically highly sensitive. The developers indicated that the ridge might not be developed for this reason.

The sites medium significance and primary context makes any direct impact due to development on the site highly significant.

The Kliprivers berg area of Johannesburg is experiencing a development boom now as can be derived from the large amount of residential developments happening in the southern part of Johannesburg. The Stone River Arch development aims to provide a residential and commercial infrastructure in this area and will contribute to the overall infrastructure development of the area.

Impact Evaluation

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The Iron Age sequence of the Klipriversberg is currently a focus of academic research due to the enormous strain being placed on the area by development. The identification and conservation of such settlements is considered as important by the archaeological community.

6.2.5 If heritage resources will be affected by the proposed development, the consideration of alternatives

The best option and first prize would be the preservation of the site *in situ* with the implementation of a heritage conservation plan.

In the event that the site will be impacted on by development it is recommended that the site be documented by field mapping,

extensive data collection by means of excavations, and photo recording of the site.

6.2.6 Plans for mitigation of any adverse effects during and after the completion of the proposed development

The preservation of the site *in situ*, will required buffer zone of at least 15 meters to facilitate the protection of the site during development.

The implementation of a heritage conservation and management program will be necessary after construction, to protect the site after completion of the project.

6.3 2628AC-MHC003

6.3.1 The identification and mapping of all heritage resources in the affected area

The site covers to top of a small koppie that forms part of the main ridge that dominates the northern boundary of the property. The Late Iron Age stonewalling that is the main feature of this site covers an area of 100 metres in diameter.

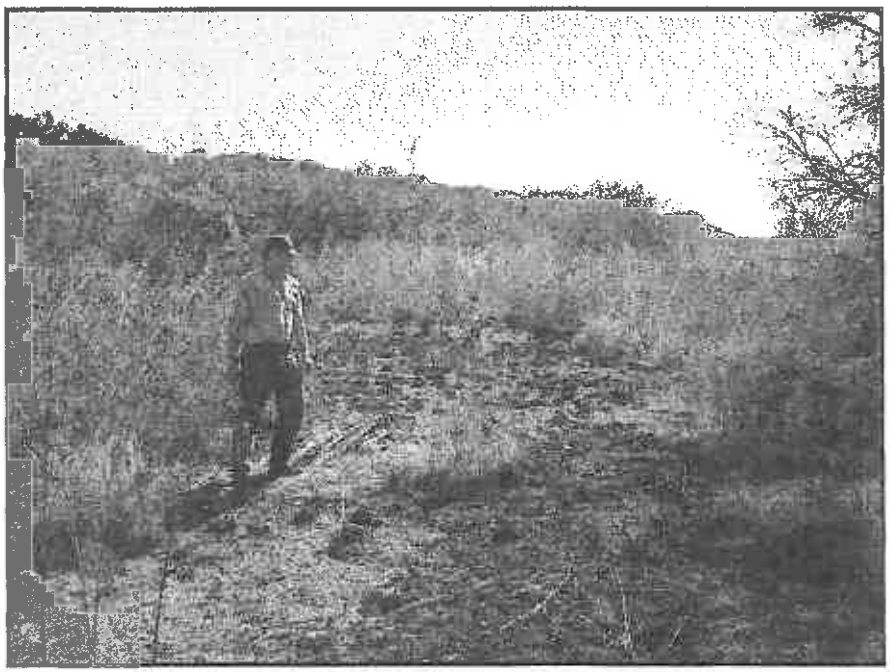

Figure 5: Ash Midden

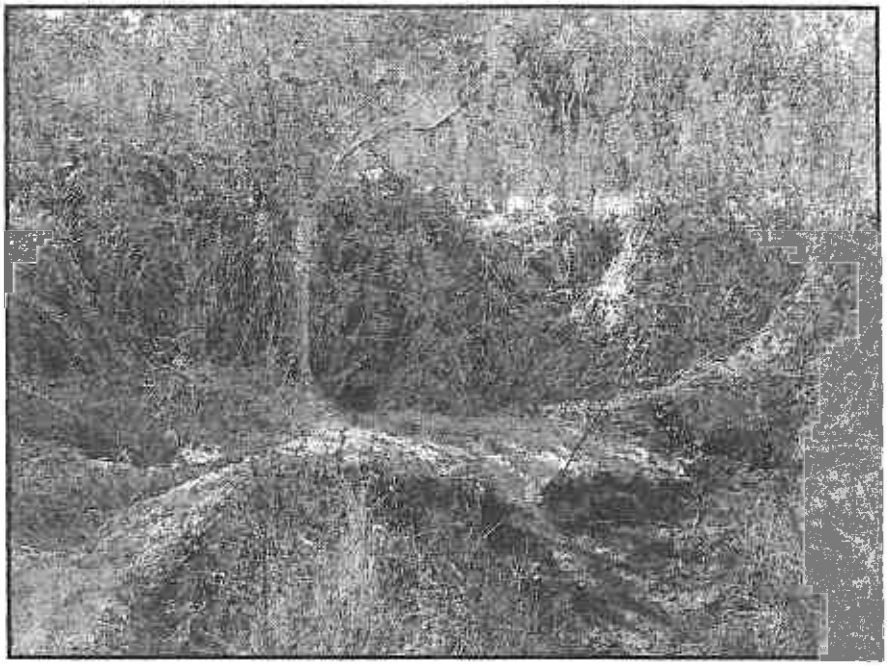

Figure 6: Ash exposed by animals

Some of the enclosures show signs of human activity with large ash middens being the main feature of the site, indicating deposits in the region of 2 metres deep.

Potsherds are scattered over most of the settlement unit, with a low frequency of decorated potsherds found.

The settlement unit conforms to the N-type as identified by Maggs (1976) and Class III-Klipriviersberg as identified by Mason (1968) and Huffman (pers. Comm.).

6.3.2 An assessment of the significance of such resources in terms of the heritage assessment criteria set out in section 3(3) of the National Heritage Recourses Act 1999 (Act No 25of 1999).

The site is of medium significance due to its good state of preservation and primary context that will be able to provide large amounts of research data and is classified as important based on evaluation of the National Heritage Resources Act 1999 (Act No 25of 1999)

Section 3(3)(a) - its importance in the community, or pattern of South Africa's history

Figure 7: Stone walling

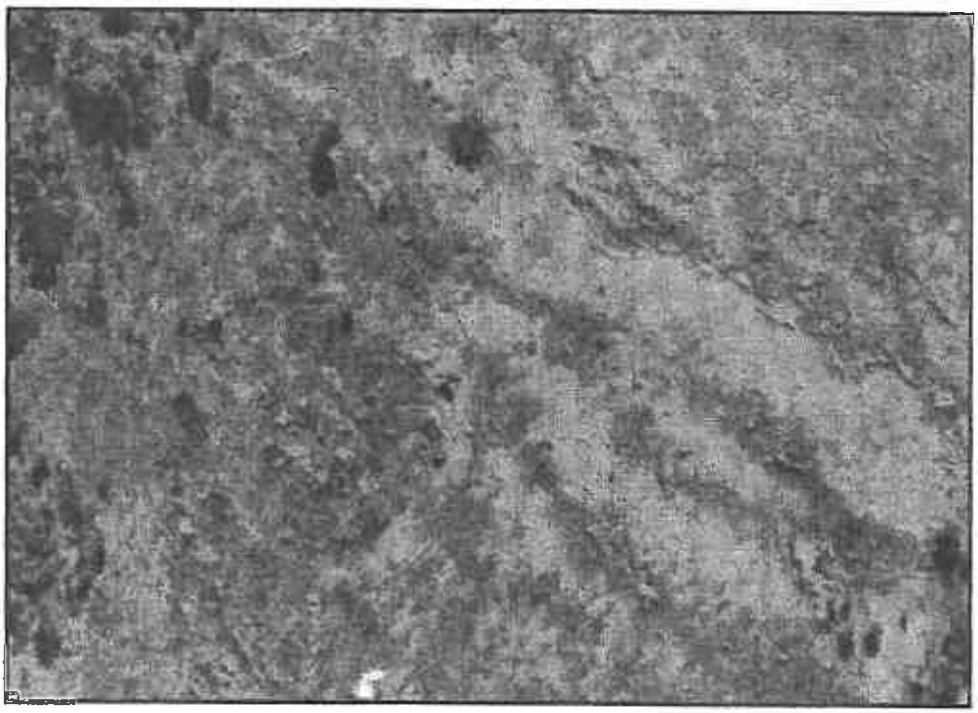

Figure 8: Aerial photo of site

The site consists of a single large circular stonewalled enclosure with three smaller enclosures located in the centre of the site. An extension of the site extends further towards the east moving

provide a residential and commercial infrastructure in this area and will contribute to the overall infrastructure development of the area.

Impact Evaluation

Impact	*Impact Significance*	*Heritage Significance*	*Certainty*	*Duration*	*Mitigation*
Negative	*Moderately negative*	*Medium*	*Possible*	*Permanent*	*C*

6.4.4 The results of consultation with communities affected by the proposed development and other interested parties regarding the impact of the development on heritage resources

The Iron Age sequence of the Klipriviersberg is currently a focus of academic research due to the enormous strain being placed on the area by development. The identification and conservation of such settlements is considered as important by the archaeological community.

6.4.5 If heritage resources will be affected by the proposed development, the consideration of alternatives

The best option and first prize would be the preservation of the site *in situ* with the implementation of a heritage conservation plan.

In the event that the site will be impacted on by development it is recommended that the site be documented by field mapping, extensive data collection by means of excavations, and photo recording of the site.

6.4.6 Plans for mitigation of any adverse effects during and after the completion of the proposed development

The preservation of the site *in situ*, will required buffer zone of at least 15 meters to facilitate the protection of the site during development.

The implementation of a heritage conservation and management program will be necessary after construction, to protect the site after completion of the project.

6.5 2628AC-MHC005

6.5.1 The identification and mapping of all heritage resources in the affected area

The site is that of a cemetery consisting of approximately 48, of which 46 are stone packed graves and two have formal headstone. The date on the formal headstone indicates a 1954 date for this particular grave.

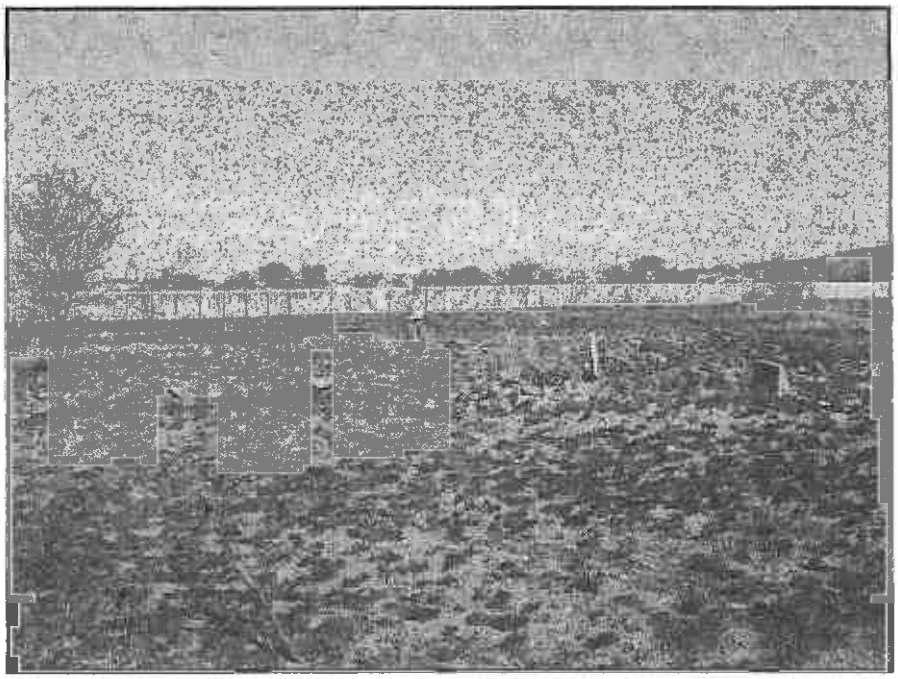

Figure 9: Cemetery

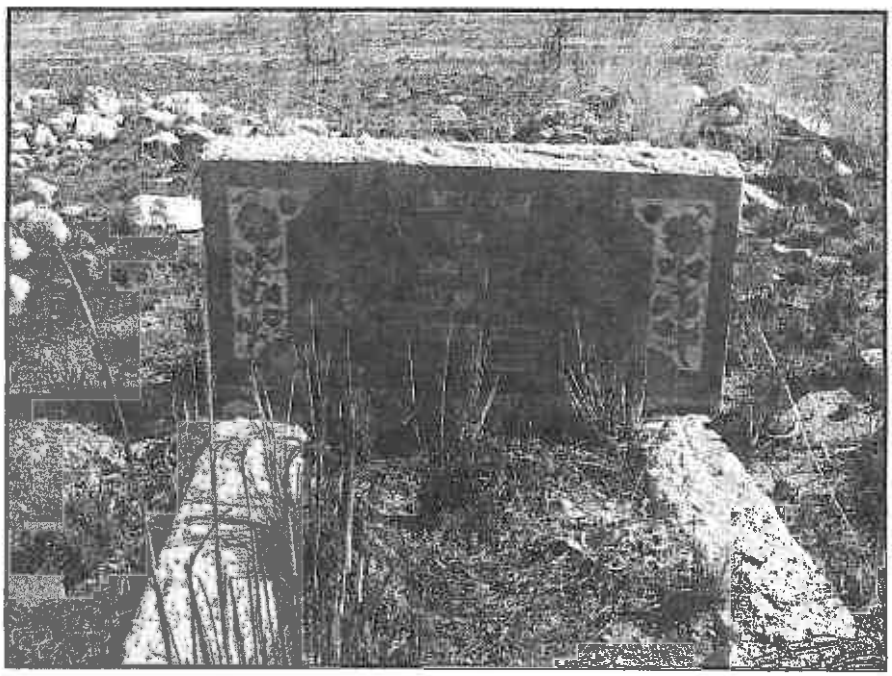

Figure 10: Formal Headstone

6.5.2 An assessment of the significance of such resources in terms of the heritage assessment criteria set out in section 3(3) of the National Heritage Recourses Act 1999 (Act No 25of 1999).

This site is of high significance based on evaluation of the National Heritage Recourses Act 1999 (Act No 25of 1999)

Section 3(3)(a) - its importance in the community, or pattern of South Africa's history
Section 3(3)(g) - its strong or special association with a particular community or cultural group for social, cultural or spiritual reasons

6.5.3 An assessment of the impact of the development on such heritage recourses and an evaluation of the impact of the development on heritage resources relative to the sustainable social and economic benefits to be derived from the development.

Development in this area will provide a substantial boost to the financial well being and economic growth to the Klipriviersberg area. The preservation of this site will not contribute to the overall social and economic situation of the area.

Impact Evaluation

Impact	*Impact Significance*	*Heritage Significance*	*Certainty*	*Duration*	*Mitigation*
Negative	*High negative*	*High*	*Possible*	*Permanent*	*C*

6.5.4 The results of consultation with communities affected by the proposed development and other interested parties regarding the impact of the development on heritage resources

Most of the farmers and labourers consulted with regards to graves and cemeteries expressed a need for the preservation of the cemeteries. They however also indicated that if in the case of relocation of such a cemetery they would like to be consulted and be part of the process.

6.5.5 If heritage resources will be affected by the proposed development, the consideration of alternatives

The best option and first prize would be the preservation of the cemetery *in situ*. If the development is of such a nature that the site will be severely impacted on the graves and cemetery will have to be relocated.

6.5.6 Plans for mitigation of any adverse effects during and after the completion of the proposed development

If the cemetery were to be preserved *in situ*. It will have to be fenced of and provided with a gate for access by family members. A buffer zone of at least 15 meters will have to be kept around the cemetery as to facilitate the protection of the site during development.

In the instance that the cemetery needs to be relocated, this must be done with adherence to all legal requirements as well as an extensive social consultation process required within the process. It is well advised that a company with a proven record of accomplishment be used to manage and complete such a project.

6.6 2628AC-MHC006

6.6.1 The identification and mapping of all heritage resources in the affected area

This is the location of a historical structure build of fired clay bricks. The structure consisted of at least four rooms. The foundations are constructed of stone and modern bricks. The house is currently occupied by vagrants and in disrepair.

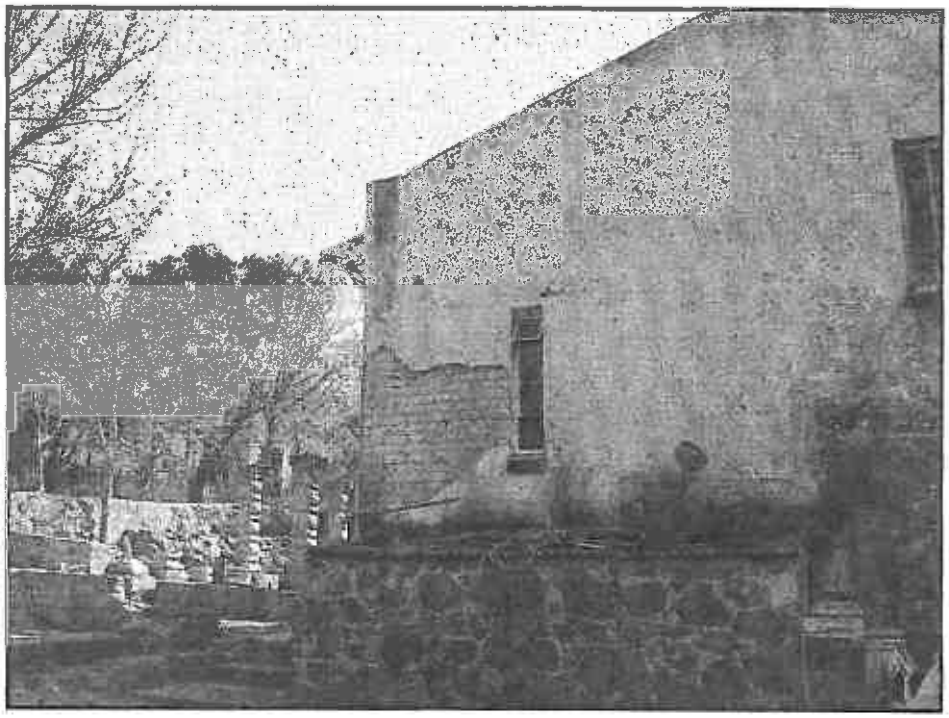

Figure 11: House

6.6.2 An assessment of the significance of such resources in terms of the heritage assessment criteria set out in section 3(3) of the National Heritage Recourses Act 1999 (Act No 25of 1999).

It is impossible to identify the age of the building from archival maps, but indications are that it may have been built in the late 50's-60'

The site is of low significance. This site is how ever classified based on evaluation of the National Heritage Recourses Act 1999 (Act No 25of 1999) Section 3(3) -

(a) its importance in the community, or pattern of South Africa's history;
(d) its importance in demonstrating the principal characteristics of a particular class of South Africa's natural or cultural places or objects;
(e) its importance in exhibiting particular aesthetic characteristics valued by a community or cultural group;
(f) its importance in demonstrating a high degree of creative or technical achievement at a particular period;

6.6.3 An assessment of the impact of the development on such heritage recourses and an evaluation of the impact of the development on heritage resources relative to the sustainable social and economic benefits to be derived from the development.

At this stage it is unclear what the age of the building is and this can be clarified by a conservation architect.

Impact Evaluation

Impact	*Impact Significance*	*Heritage Significance*	*Certainty*	*Duration*	*Mitigation*
Negative	*Low negative*	*Low*	*Uncertain*	*Permanent*	*B*

6.6.4 The results of consultation with communities affected by the proposed development and other interested parties regarding the impact of the development on heritage resources

The vagrants living in the house indicated that they will have no place to live if the house were to be demolished. They also indicated that they were not aware of any initiation schools or places of religious significance in the area.

6.6.5 If heritage resources will be affected by the proposed development, the consideration of alternatives

A conservation architect will be required to evaluate the house.

6.6.6 Plans for mitigation of any adverse effects during and after the completion of the proposed development

In the event that it is found that the structure is older than 60 years a destruction permit will be needed from the South African Heritage Resources Agency.

6.7 2628AC-MHC007

6.7.1 The identification and mapping of all heritage resources in the affected area

This is the location of the remains of foundations of several square structures build with stone scattered over a 50 meter area. The structures were probably that of farm labourer houses as can be deducted from the small single rooms, the structures comprise of.

Figure 12: Stone foundations

6.7.2 An assessment of the significance of such resources in terms of the heritage assessment criteria set out in section 3(3) of the National Heritage Recourses Act 1999 (Act No 25of 1999).

Due to the poor preservation of the site it is not feasible to conduct further research on the site or the preservation there of.

The site is of low significance. However the site is classified based on evaluation of the National Heritage Recourses Act 1999 (Act No 25of 1999) Section 3(3) -

(a) its importance in the community, or pattern of South Africa's history;

6.7.3 An assessment of the impact of the development on such heritage recourses and an evaluation of the impact of the development on heritage resources relative to the sustainable social and economic benefits to be derived from the development.

Development in this area will provide a substantial boost to the financial well being and economic growth to the Klipriviersberg area. The preservation of this site will not contribute to the overall social and economic situation of the area.

Impact Evaluation

Impact	*Impact Significance*	*Heritage Significance*	*Certainty*	*Duration*	*Mitigation*
Negative	*Low negative*	*Low*	*Uncertain*	*Permanent*	*A*

6.7.4 The results of consultation with communities affected by the proposed development and other interested parties regarding the impact of the development on heritage resources

No information on this site could be found.

6.7.5 If heritage resources will be affected by the proposed development, the consideration of alternatives

No further action needed.

6.7.6 Plans for mitigation of any adverse effects during and after the completion of the proposed development

No further action needed.

6.8 2628AC-MHC008

6.8.1 The identification and mapping of all heritage resources in the affected area

This is the location of the remains of a historical homestead built with fired clay bricks. Only a few walls are still standing and are currently being demolished for building materials.

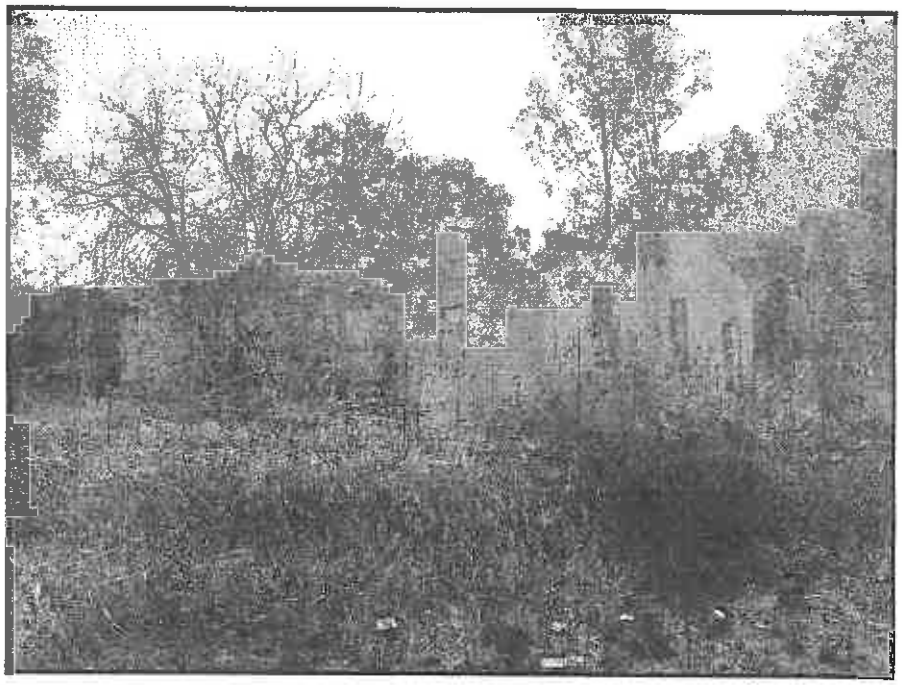

Figure 13: Stone foundations

6.8.2 An assessment of the significance of such resources in terms of the heritage assessment criteria set out in section 3(3) of the National Heritage Recourses Act 1999 (Act No 25of 1999).

Due to the poor preservation of the site it is not feasible to conduct further research on the site or the preservation there of.

The site is of low significance. However the site is classified based on evaluation of the National Heritage Recourses Act 1999 (Act No 25of 1999) Section 3(3) -

(a) its importance in the community, or pattern of South Africa's history;

6.7.3 An assessment of the impact of the development on such heritage recourses and an evaluation of the impact of the development on heritage resources relative to the sustainable social and economic benefits to be derived from the development.

Development in this area will provide a substantial boost to the financial well being and economic growth to the Klipriviersberg area. The preservation of this site will not contribute to the overall social and economic situation of the area.

Impact Evaluation

Impact	*Impact Significance*	*Heritage Significance*	*Certainty*	*Duration*	*Mitigation*
Negative	*Low negative*	*Low*	*Uncertain*	*Permanent*	*A*

6.8.4 The results of consultation with communities affected by the proposed development and other interested parties regarding the impact of the development on heritage resources

No information on this site could be found.

6.8.5 If heritage resources will be affected by the proposed development, the consideration of alternatives

No further action needed.

6.8.6 Plans for mitigation of any adverse effects during and after the completion of the proposed development

No further action needed.

6.9 2628AC-MHC009

6.9.1 The identification and mapping of all heritage resources in the affected area

The site is that of a building currently utilised as the mains offices and shop of a nursery. The main building is constructed with prefabricated materials. It was confirmed by the owner that the structures was previously utilised as a school. Conforming to the numerous prefabricated school buildings in South Africa.

Figure 14: Nursery building

6.9.2 An assessment of the significance of such resources in terms of the heritage assessment criteria set out in section 3(3) of the National Heritage Recourses Act 1999 (Act No 25of 1999).

It is recommended that the building be assessed by a conservation architect to ascertain its significance in the event that the building is to be demolished. At the moment it seems

that the nursery will be included as a fixture in the new development.

6.9.3 An assessment of the impact of the development on such heritage recourses and an evaluation of the impact of the development on heritage resources relative to the sustainable social and economic benefits to be derived from the development.

Development in this area will provide a substantial boost to the financial well being and economic growth to the Klipriviersberg area. The preservation of this site will not contribute to the overall social and economic situation of the area.

Impact Evaluation

Impact	*Impact Significance*	*Heritage Significance*	*Certainty*	*Duration*	*Mitigation*
Negative	*Low negative*	*Uncertain*	*Uncertain*	*Permanent*	*A*

6.9.4 The results of consultation with communities affected by the proposed development and other interested parties regarding the impact of the development on heritage resources

No information on this site could be found.

6.9.5 If heritage resources will be affected by the proposed development, the consideration of alternatives

The site needs to be evaluated by a conservation architect in the event that the building will be demolished. If the building is older that 60 years a destruction permit will be required from SAHRA

6.9.6 Plans for mitigation of any adverse effects during and after the completion of the proposed development

The site needs to be evaluated by a conservation architect in the event that the building will be demolished. If the building is older that 60 years a destruction permit will be required from SAHRA

7. ASSUMPTIONS AND LIMITATIONS

Due to the nature of cultural remains that occur, in most cases, below surface, the possibility remains that some cultural remains may not have been discovered during the survey. Although Matakoma Heritage Consultants the area as thorough as possible, it is incumbent upon the developer to inform the relevant heritage agency should further cultural remains be unearthed or laid open during the process of development.

Vegetation height and density during the survey also influenced the visibility of cultural material and features, especially in the ridge areas.

8. LEGAL AND POLICY REQUIREMENTS

In areas where there has not yet been a systematic survey to identify conservation worthy places, a permit is required to alter or demolish any structure older than 60 years. This will apply until a survey has been done and identified heritage resources are formally protected.

Archaeological and palaeontological sites, materials, and meteorites are the source of our understanding of the evolution of the earth, life on earth and the history of people. In the new legislation, permits are required to damage, destroy, alter, or disturb them. People who already possess material are required to register it.

The management of heritage resources are integrated with environmental resources and this means that before development takes place heritage resources are assessed and, if necessary, rescued.

In addition to the formal protection of culturally significant graves, all graves, which are older than 60 years and are not in a cemetery (such as ancestral graves in rural areas), are protected. The legislation protects the interests of communities that have interest in the graves: they may be consulted before any disturbance takes place.

The graves of victims of conflict and those associated with the liberation struggle will be identified, cared for, protected and memorials erected in their honour.

Anyone who intends to undertake a development must notify the heritage resource authority and if there is reason to believe that heritage resources will be affected, an impact assessment report

must be compiled at the developer's cost. Thus developers will be able to proceed without uncertainty about whether work will have to be stopped if a heritage resource is discovered.

According to the National Heritage Act (Act 25 of 1999 section 32) it is stated that:

An object or collection of objects, or a type of object or a list of objects, whether specific or generic, that is part of the national estate and the export of which SAHRA deems it necessary to control, may be declared a heritage object, including -

- objects recovered from the soil or waters of South Africa, including archaeological and palaeontological objects, meteorites and rare geological specimens;
- visual art objects;
- military objects;
- numismatic objects;
- objects of cultural and historical significance;
- objects to which oral traditions are attached and which are associated with living heritage;
- objects of scientific or technological interest;
- books, records, documents, photographic positives and negatives, graphic material, film or video or sound recordings, excluding those that are public records as defined in section 1 (xiv) of the National Archives of South Africa Act, 1996 (Act No. 43 of 1996), or in a provincial law pertaining to records or archives; and
- any other prescribed category.

If it is necessary to refer to any of the above-mentioned objects, the National Heritage Act (Act 25 of 1999 Sections 31-38) are included in Appendix 2.

Under the new National Heritage Resources Act (Act No. 25 of 1999), provisions are made that deal with, and offer protection, to all historic and pre-historic cultural remains, including graves and human remains.

- Graves younger than 60 years fall under Section 2(1) of the Removal of Graves and Dead Bodies Ordinance (Ordinance no. 7 of 1925) as well as the Human Tissues Act (Act 65 of 1983) and are the jurisdiction of the National Department of Health and the relevant Provincial Department of Health and must be submitted for final approval to the Office of the relevant Provincial Premier. This function is usually delegated to the Provincial MEC for Local Government and Planning, or in some cases the MEC for Housing and Welfare.

7. ASSUMPTIONS AND LIMITATIONS

Due to the nature of cultural remains that occur, in most cases, below surface, the possibility remains that some cultural remains may not have been discovered during the survey. Although Matakoma Heritage Consultants the area as thorough as possible, it is incumbent upon the developer to inform the relevant heritage agency should further cultural remains be unearthed or laid open during the process of development.

Vegetation height and density during the survey also influenced the visibility of cultural material and features, especially in the ridge areas.

8. LEGAL AND POLICY REQUIREMENTS

In areas where there has not yet been a systematic survey to identify conservation worthy places, a permit is required to alter or demolish any structure older than 60 years. This will apply until a survey has been done and identified heritage resources are formally protected.

Archaeological and palaeontological sites, materials, and meteorites are the source of our understanding of the evolution of the earth, life on earth and the history of people. In the new legislation, permits are required to damage, destroy, alter, or disturb them. People who already possess material are required to register it.

The management of heritage resources are integrated with environmental resources and this means that before development takes place heritage resources are assessed and, if necessary, rescued.

In addition to the formal protection of culturally significant graves, all graves, which are older than 60 years and are not in a cemetery (such as ancestral graves in rural areas), are protected. The legislation protects the interests of communities that have interest in the graves: they may be consulted before any disturbance takes place.

The graves of victims of conflict and those associated with the liberation struggle will be identified, cared for, protected and memorials erected in their honour.

Anyone who intends to undertake a development must notify the heritage resource authority and if there is reason to believe that heritage resources will be affected, an impact assessment report

Authorisation for exhumation and reinterment must also be obtained from the relevant local or regional council where the grave is situated, as well as the relevant local or regional council to where the grave is being relocated. All local and regional provisions, laws and by-laws must also be adhered to. In order to handle and transport human remains the institution conducting the relocation should be authorised under Section 24 of Act 65 of 1983 (Human Tissues Act).

- Graves older than 60 years, but younger than 100 years fall under Section 36 of Act 25 of 1999 (National Heritage Resources Act) as well as the Human Tissues Act (Act 65 of 1983) and are the jurisdiction of the South African Heritage Resource Agency (SAHRA). The procedure for Consultation Regarding Burial Grounds and Graves (Section 36(5) of Act 25 of 1999) is applicable to graves older than 60 years that are situated outside a formal cemetery administrated by a local authority. Graves in the category located inside a formal cemetery administrated by a local authority will also require the same authorisation as set out for graves younger than 60 years over and above SAHRA authorisation. If the grave is not situated inside a formal cemetery but is to be relocated to one, permission from the local authority is required and all regulations, laws and by-laws set by the cemetery authority must be adhered to.

Refer to **Annexure B** for further information on legislation.

9. ASSESSMENT AND RECOMMENDATIONS

*All the sites identified during the survey are mapped on the map provided in **Annexure C***
*A list of coordinates of the sites is provided in **Annexure D***

Refer to Section 6 sub paragraphs 5 and 6 of each site for recommendations.

A summary of the recommendations for each of the main heritage sites follows:

Archaeological Sites
Number of sites found:

Four sites were identified during the survey. If the development were to stay on the lower reaches of the ridge only three of the sites will be in danger.

Recommendation:

The best option and first prize would be the preservation of the sites in situ. If the development is of such nature that the sites will be severely impacted on mitigation measures will have to be employed.

If the sites were to be preserved in situ, it will have to be fenced off. A buffer zone of at least 15 meters will have to be kept around the site as to facilitate the protection of the site during development.

In the instance that the site needs to be destructed, an archaeologist needs to document the site and afterwards a destruction permit needs to be applied for from the Provincial office of the South African Heritage Resources Agency (SAHRA) before such a time that the site is destructed.

It is also recommended that an archaeologist be on site to act as a monitor with a watching brief in the areas close to the archaeological sites.

Cemeteries

Number of sites found:

One cemetery with 48 graves were found.

Recommendation:

The best option and first prize would be the preservation of the cemetery *in situ*. If the mining is of such a nature that the site will be severely impacted on the graves and cemetery will have to be relocated.

If the cemetery were to be preserved *in situ*. It will have to be fenced of and provided with a gate for access by family members. A buffer zone of at least 15 meters will have to be kept around the cemetery as to facilitate the protection of the site during development.

In the instance that the cemetery needs to be relocated, this must be done with adherence to all legal requirements as well as

an extensive social consultation process required within the process. It is well advised that a company with a proven record of accomplishment be used to manage and complete such a project.

Historical Buildings
Number of sites found:
Two sites were found

Recommendation:
The best option and first prize would be the preservation of the farmstead *in situ*. It is recommended that a conservation architect evaluate the buildings to ascertain their significance and age. If development is of such a nature that the site will be severely impacted on and the site area older than 60 years, the site will have to be documented and a destruction permit applied for before destruction.

If the site is to be preserved *in situ*, it will have to be fenced and a buffer zone of at least 15 meters will have to be kept around the site as to facilitate the protection of the site during construction.

Historical Ruins
Number of sites found:
Two sites were found

Recommendation:
The best option and first prize would be the preservation of the ruins *in situ*. If development is of such a nature that the site will be severely impacted on no further action is necessary.

If the site is to be preserved *in situ*, it will have to be fenced and a buffer zone of at least 15 meters will have to be kept around the site as to facilitate the protection of the site during development.

A heritage resources management plan must be developed for managing the heritage resources in the study area during construction and after. This includes basic training for construction staff on possible finds, action steps for mitigation measures, surface collections, excavations and communication routes to follow in the case of a discovery.

Management Guidelines

1. The National Heritage Resources Act (Act 25 of 1999) states that, any person who intends to undertake a development categorised as-

(a) the construction of a road, wall, powerline, pipeline, canal or other similar form of linear development or barrier exceeding 300m in length;

(b) the construction of a bridge or similar structure exceeding 50m in length;

(c) any development or other activity which will change the character of a site-

(i) exceeding 5 000m2 in extent; or

(ii) involving three or more existing erven or subdivisions thereof; or

(iii) involving three or more erven or divisions thereof which have been consolidated within the past five years; or

(iv) the costs of which will exceed a sum set in terms of regulations by SAHRA or a provincial heritage resources authority;

(d) the re-zoning of a site exceeding 10 000m2 in extent; or

(e) any other category of development provided for in regulations by SAHRA or a provincial heritage resources authority,

must at the very earliest stages of initiating such a development, notify the responsible heritage resources authority and furnish it with details regarding the location, nature and extent of the proposed development.

In the event that an area previously not included in an archaeological or cultural resources survey, is to be disturbed. The South African Heritage Resources Agency (SAHRA) needs to be contacted. An enquiry must be lodged with them into the necessity for a Heritage Impact Assessment.

2. In the event that a heritage assessment is required it is advisable to utilise a qualified heritage practitioner preferably registered with the Cultural Resources Management Section (CRM) of the Association of Southern African Professional Archaeologists (ASAPA). Refer to subsection 8.

This survey and evaluation must include:

(a) The identification and mapping of all heritage resources in the area affected;
(b) an assessment of the significance of such resources in terms of the heritage assessment criteria set out in section 6 (2) or prescribed under section 7 of the National Cultural Resources Act;
(c) an assessment of the impact of the development on such heritage resources;
(d) an evaluation of the impact of the development on heritage resources relative to the sustainable social and economic benefits to be derived from the development;
(e) the results of consultation with communities affected by the proposed development and other interested parties regarding the impact of the development on heritage resources;
(f) if heritage resources will be adversely affected by the proposed development, the consideration of alternatives; and
(g) plans for mitigation of any adverse effects during and after the completion of the proposed development.

3. It is advisable that an information section on cultural resources be included in the SHEQ training given to contractors involved in surface earthmoving activities. This sections must include basic information on:

a. Heritage
b. Graves;
c. Archaeological finds; and
d. Historical Structures;

This module must be tailor made to include all possible finds that could be expected in that area of construction.

4. In the event that a possible find is discovered during construction, all activities must be halted in the area of the discovery and a qualified archaeologist contacted.
5. The archaeologist needs to evaluate the finds on site and make recommendations towards possible mitigation measures.
6. If mitigation is necessary, an application for a rescue permit must be lodged with SAHRA.
7. After mitigation an application must be lodged with SAHRA for a destruction permit. This application must be supported by the mitigation report generated during the

rescue excavation. Only after the permit is issued may such a site be destroyed.

8. If during the initial survey sites of cultural significance is discovered, it will be necessary to develop a management plan for the preservation, documentation or destruction of such site. Such a program must include a watching brief, timeframe and agreed upon schedule of actions between the company and the archaeologist.
9. In the event that human remain are uncovered or previously unknown graves are discovered a qualified archaeologist needs to be contacted and an evaluation of the finds made.
10. If the remains are to be exhumed and relocated, the relocation procedures as accepted by SAHRA needs to followed. This includes an extensive social consultation process

Refer to ***Annexure E*** for an outline of the proposed archaeological watching brief that is recommended for this project.

The definition of an archaeological watching brief is a formal program of observation and investigation conducted during any operation carried out for non-archaeological reasons. This will be within a specified area or site on land, inter-tidal zone or underwater, where there is a possibility that archaeological deposits may be disturbed or destroyed. The programme will result in the preparation of a report and ordered archive.

The purpose of a watching brief is:

- To allow, within the resources available, the preservation by record of archaeological deposits, the presence and nature of which could not be established (or established with sufficient accuracy) in advance of development or other potentially disruptive works
- To provide an opportunity, if needed, for the watching archaeologist to signal to all interested parties, before the destruction of the material in question, that an archaeological find has been made for which the resources allocated to the watching brief itself are not sufficient to support treatment to a satisfactory and proper standard.

- A watching brief is not intended to reduce the requirement for excavation or preservation of known or inferred deposits, and it is intended to guide, not replace, any requirement for contingent excavation or preservation of possible deposits.
- The objective of a watching brief is to establish and make available information about the archaeological resource existing on a site.

Matakoma Heritage Consultants can be contacted on the way forward in this regard.

10. LIST OF PREPARES

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Wouter Fourie, BA (Hon) Archaeology (UP)

11. REFERENCES

11.1 ARCHAEOLOGICAL PAPERS

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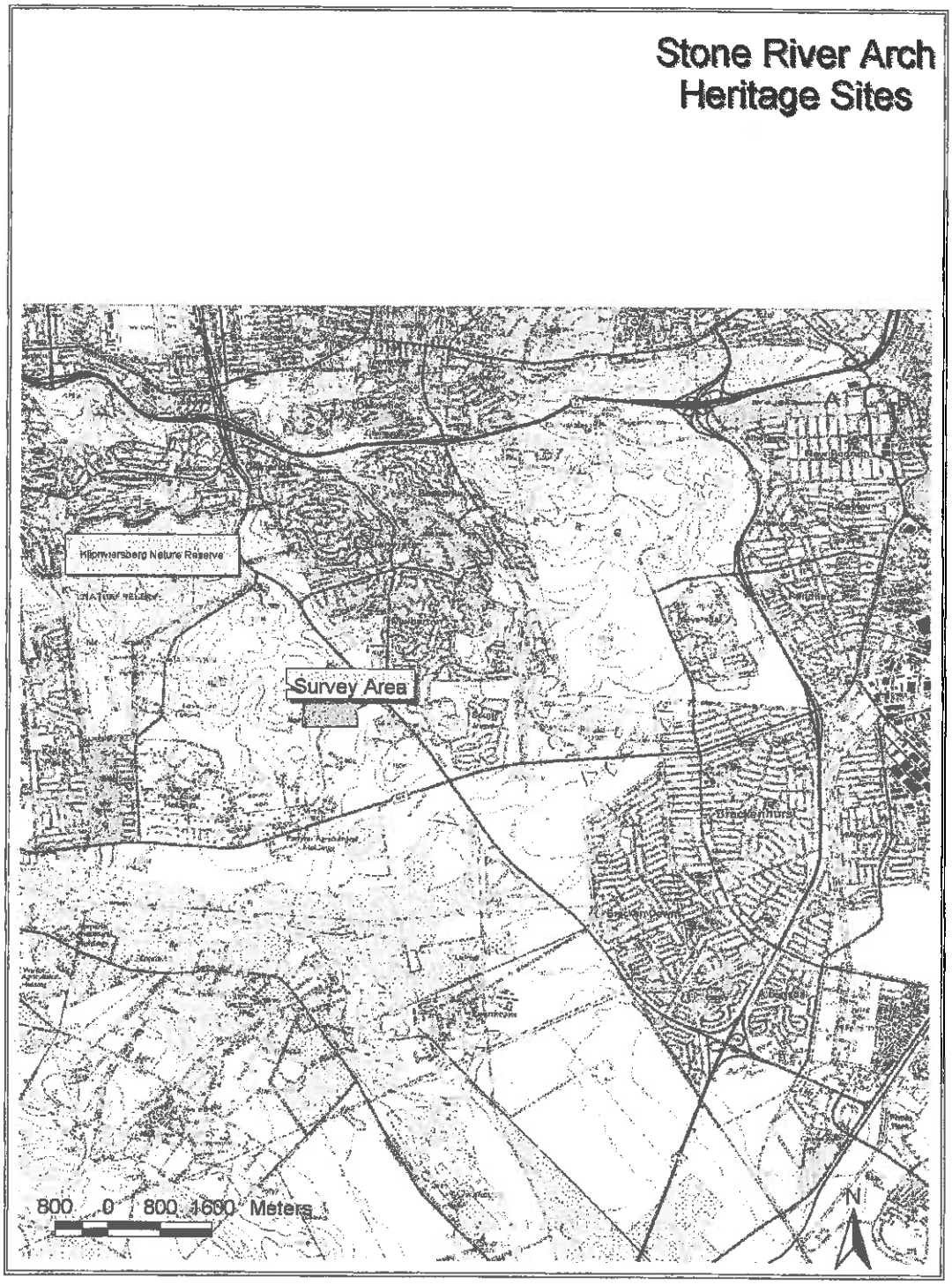
National Archives Depot: Transvaal Archives Depot, CDB 16093, PB13/2/J7/105, 1987-1988.
Office of the Surveyor-General, 255/17, map.
Office of the Surveyor-General, 172/79, map.

ANNEXURE A: Locality Map


Stone River Arch
Heritage Sites
Hlomvisberg Nature Reserve
Survey Area
800 0 800 1600 Meters
N

ANNEXURE B: Legislation extracts

[36]36 Burial grounds and graves

(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) (a) 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.

(5) SAHRA or a provincial heritage resources authority may not issue a permit for any activity under subsection (3) (b) unless it is satisfied

that the applicant has, in accordance with regulations made by the responsible heritage resources authority-

(a) made a concerted effort to contact and consult communities and individuals who by tradition have an interest in such grave or burial ground; and

(b) reached agreements with such communities and individuals regarding the future of such grave or burial ground.

(6) Subject to the provision of any other law, any person who in the course of development or any other activity discovers the location of a grave, the existence of which was previously unknown, must immediately cease such activity and report the discovery to the responsible heritage resources authority which must, in co-operation with the South African Police Service and in accordance with regulations of the responsible heritage resources authority-

(a) carry out an investigation for the purpose of obtaining information on whether or not such grave is protected in terms of this Act or is of significance to any community; and

(b) if such grave is protected or is of significance, assist any person who or community which is a direct descendant to make arrangements for the exhumation and re-interment of the contents of such grave or, in the absence of such person or community, make any such arrangements as it deems fit.

(7) (a) SAHRA must, over a period of five years from the commencement of this Act, submit to the Minister for his or her approval lists of graves and burial grounds of persons connected with the liberation struggle and who died in exile or as a result of the action of State security forces or agents provocateur and which, after a process of public consultation, it believes should be included among those protected under this section.

(b) The Minister must publish such lists as he or she approves in the Gazette.

(8) Subject to section 56 (2), SAHRA has the power, with respect to the graves of victims of conflict outside the Republic, to perform any function of a provincial heritage resources authority in terms of this section.

(9) SAHRA must assist other State Departments in identifying graves in a foreign country of victims of conflict connected with the liberation struggle and, following negotiations with the next of kin, or relevant authorities, it may re-inter the remains of that person in a prominent place in the capital of the Republic.

[37]37 Public monuments and memorials

Public monuments and memorials must, without the need to publish a notice to this effect, be protected in the same manner as places which are entered in a heritage register referred to in section 30.

[38]38 Heritage resources management

(1) Subject to the provisions of subsections (7), (8) and (9), any person who intends to undertake a development categorised as-

(a) the construction of a road, wall, powerline, pipeline, canal or other similar form of linear development or barrier exceeding 300m in length;

(b) the construction of a bridge or similar structure exceeding 50m in length;

(c) any development or other activity which will change the character of a site-

(i) exceeding 5 000m2 in extent; or

(ii) involving three or more existing erven or subdivisions thereof; or

(iii) involving three or more erven or divisions thereof which have been consolidated within the past five years; or
(iv) the costs of which will exceed a sum set in terms of regulations by SAHRA or a provincial heritage resources authority;

(d) the re-zoning of a site exceeding 10 000m2 in extent; or

(e) any other category of development provided for in regulations by SAHRA or a provincial heritage resources authority,

must at the very earliest stages of initiating such a development, notify the responsible heritage resources authority and furnish it with details regarding the location, nature and extent of the proposed development.

(2) The responsible heritage resources authority must, within 14 days of receipt of a notification in terms of subsection (1)-

(a) if there is reason to believe that heritage resources will be affected by such development, notify the person who intends to undertake the development to submit an impact assessment report. Such report must be compiled at the cost of the person proposing the development, by a person or persons approved by the responsible heritage resources authority with relevant qualifications and experience and professional standing in heritage resources management; or

(b) notify the person concerned that this section does not apply.

(3) The responsible heritage resources authority must specify the information to be provided in a report required in terms of subsection (2) (a): Provided that the following must be included:

(a) The identification and mapping of all heritage resources in the area affected;

(b) an assessment of the significance of such resources in terms of the heritage assessment criteria set out in section 6 (2) or prescribed under section 7;

(c) an assessment of the impact of the development on such heritage resources;

(d) an evaluation of the impact of the development on heritage resources relative to the sustainable social and economic benefits to be derived from the development;

(e) the results of consultation with communities affected by the proposed development and other interested parties regarding the impact of the development on heritage resources;

(f) if heritage resources will be adversely affected by the proposed development, the consideration of alternatives; and

(g) plans for mitigation of any adverse effects during and after the completion of the proposed development.

(4) The report must be considered timeously by the responsible heritage resources authority which must, after consultation with the person proposing the development, decide-

(a) whether or not the development may proceed;

(b) any limitations or conditions to be applied to the development;

(c) what general protections in terms of this Act apply, and what formal protections may be applied, to such heritage resources;

(d) whether compensatory action is required in respect of any heritage resources damaged or destroyed as a result of the development; and

(e) whether the appointment of specialists is required as a condition of approval of the proposal.

(5) A provincial heritage resources authority shall not make any decision under subsection (4) with respect to any development which impacts on a heritage resource protected at national level unless it has consulted SAHRA.

(6) The applicant may appeal against the decision of the provincial heritage resources authority to the MEC, who-

(a) must consider the views of both parties; and

(b) may at his or her discretion-

(i) appoint a committee to undertake an independent review of the impact assessment report and the decision of the responsible heritage authority; and

(ii) consult SAHRA; and

(c) must uphold, amend or overturn such decision.

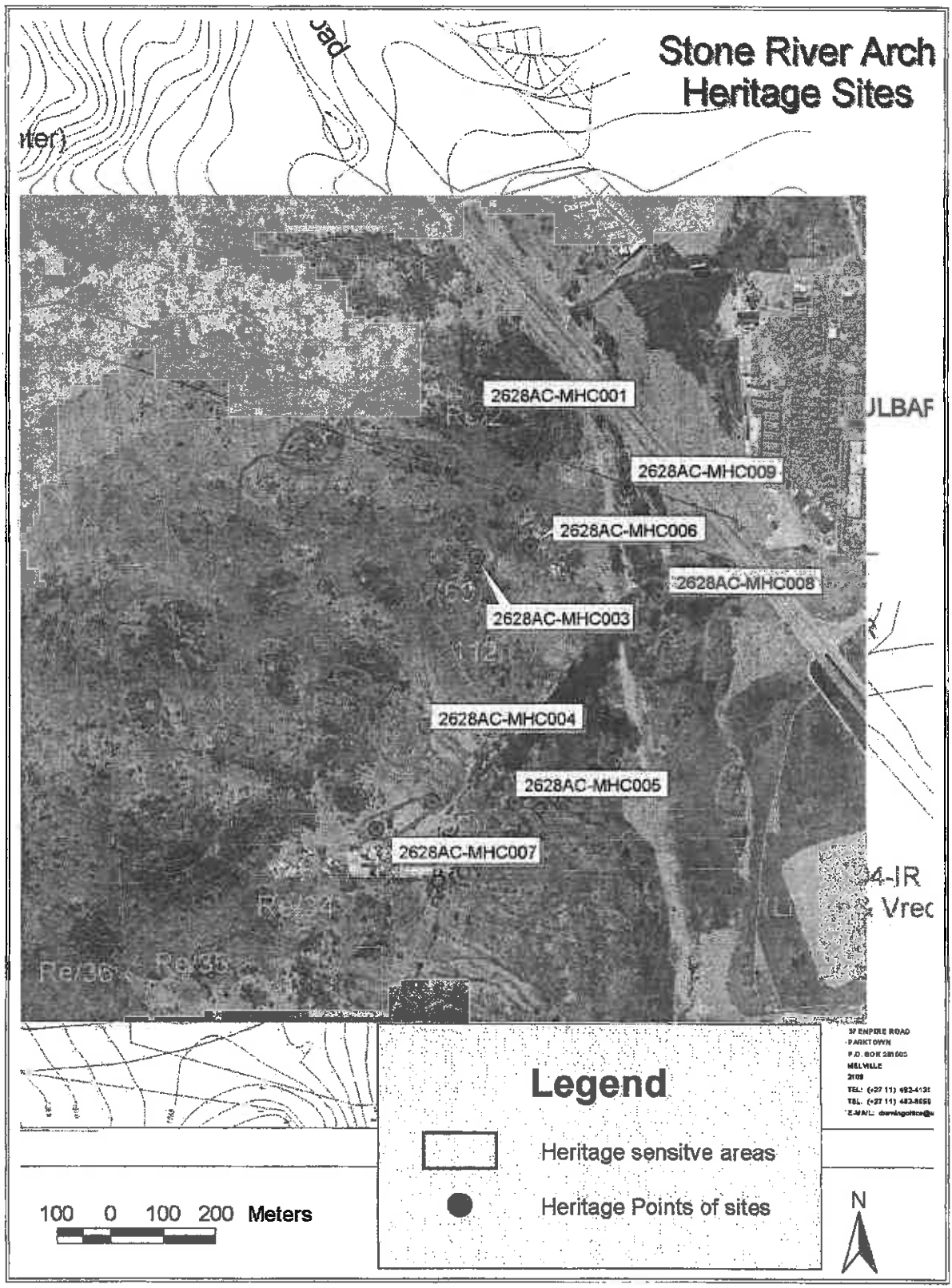
(7) The provisions of this section do not apply to a development described in subsection (1) affecting any heritage resource formally protected by SAHRA unless the authority concerned decides otherwise.

(8) The provisions of this section do not apply to a development as described in subsection (1) if an evaluation of the impact of such development on heritage resources is required in terms of the Environment Conservation Act, 1989 (Act 73 of 1989), or the integrated environmental management guidelines issued by the Department of Environment Affairs and Tourism, or the Minerals Act, 1991 (Act 50 of 1991), or any other legislation: Provided that the consenting authority must ensure that the evaluation fulfils the requirements of the relevant heritage resources authority in terms of subsection (3), and any comments and recommendations of the relevant heritage resources authority with regard to such development have been taken into account prior to the granting of the consent.

(9) The provincial heritage resources authority, with the approval of the MEC, may, by notice in the Provincial Gazette, exempt from the requirements of this section any place specified in the notice.

(10) Any person who has complied with the decision of a provincial heritage resources authority in subsection (4) or of the MEC in terms of subsection (6) or other requirements referred to in subsection (8), must be exempted from compliance with all other protections in terms of this Part, but any existing heritage agreements made in terms of section 42 must continue to apply

ANNEXURE C:
Map of sites


Stone River Arch
Heritage Sites
2628AC-MHC001
2628AC-MHC009
2628AC-MHC006
2628AC-MHC008
2628AC-MHC003
2628AC-MHC004
2628AC-MHC005
2628AC-MHC007
Legend
Heritage sensitve areas
Heritage Points of sites
100 0 100 200 Meters
N

ANNEXURE D: TABLE WITH SITE DESCRIPTION AND COORDINATES

COMMENT	LAT	LONG
2628AC-MHC001	-26.29976758	28.04569244
2628AC-MHC001	-26.29930624	28.04574609
2628AC-MHC001	-26.29972466	28.04378808
2628AC-MHC002	-26.30190262	28.04540277
2628AC-MHC003	-26.30231568	28.04566026
2628AC-MHC003	-26.30122134	28.04640591
2628AC-MHC006	-26.30212792	28.04667413
2628AC-MHC007	-26.30654820	28.04476976
2628AC-MHC007	-26.30702027	28.04369152
2628AC-MHC004	-26.30525001	28.04466248
2628AC-MHC005	-26.30658575	28.04636300
2628AC-MHC008	-26.30300232	28.04916859
2628AC-MHC009	-26.30113014	28.04857314

ANNEXURE E: DESCRIPTION OF WATCHING BRIEF

STANDARD AND GUIDANCE - for an Archaeological Watching Brief

1. DEFINITION OF AN ARCHAEOLOGICAL WATCHING BRIEF

The definition of an archaeological watching brief is a formal programme of observation and investigation conducted during any operation carried out for non-archaeological reasons. This will be within a specified area or site on land, inter-tidal zone or underwater, where there is a possibility that archaeological deposit may be disturbed or destroyed. The programme will result in the preparation of a report and ordered archive.

This definition does not cover chance observations, which should lead to an appropriate archaeological project being designed and implemented, nor do they apply to monitoring for preservation of remains in situ.

2. PURPOSE OF A WATCHING BRIEF

The purpose of a watching brief is:

- To allow, within the resources available, the preservation by record of archaeological deposits, the presence and nature of which could not be established (or established with sufficient accuracy) in advance of development or other potentially disruptive works
- To provide an opportunity, if needed, for the watching archaeologist to signal to all interested parties, before the destruction of the material in question, that an archaeological find has been made for which the resources allocated to the watching brief itself are not sufficient to support treatment to a satisfactory and proper standard.
- A watching brief is not intended to reduce the requirement for excavation or preservation of known or inferred deposits, and it is intended to guide, not replace, any requirement for contingent excavation or preservation of possible deposits.
- The objective of a watching brief is to establish and make available information about the archaeological resource existing on a site.
- An archaeologist shall only undertake a watching brief, which is governed by a written and agreed specification or project design prepared in advance of work commencing.

• The specification or project design must identify the objectives, scope, geographical area, and means of dissemination of the results of the watching brief, and incorporate a method statement and work programme. The specification or project design should conform to the brief/project outline if one has been set, and must in any case be approved in advance by the planning archaeologist or curator.

The specification or project design should contain, as a minimum, the following elements:

- Non-technical summary
- Site location (including map) and descriptions
- Context of the project
- Geological and topographical background
- Archaeological and historical background
- General and specific aims of fieldwork
- Reference to relevant legislation
- Field methodology
- Collection and disposal strategy for artefacts and ecofacts
- Arrangement for immediate conservation of artefacts
- Post-fieldwork methodology
- Report preparation (method)
- Publication and dissemination proposals
- Copyright
- Archive deposition
- Timetable
- Staffing
- Health & safety considerations
- Monitoring procedures
- Contingency arrangements (if appropriate)

3. FIELDWORK

3.1 All relevant parties must agree to the specification and/or project design before work commences. All work must conform to the agreed specification or project design. All relevant parties must agree to any variations in writing.

3.2 Sufficient and appropriate resources (staff, equipment, accommodation etc) must be used to enable the project to achieve its aims, the desired quality and timetable, and comply with all statutory requirements. Any contingency elements must be clearly identified and justified. It is the role of the archaeologist undertaking the work to define appropriate staff levels.

3.3 All techniques used must comply with relevant legislation and be demonstrably fit for the defined purpose(s).

3.4 All staff, including subcontractors, must be suitably qualified and experienced for their project roles, and employed in line with relevant legislation and IFA by-laws (see Appendix 6). The site director and/or manager should preferably be a Principal Inspector with the Cultural Resources Management Section of the South African Association of Archaeologists (CRM Section of SA3).

3.5 All staff, including subcontractors, must be fully briefed and aware of the work required under the specification, and must understand the aims and methodologies of the project. All equipment must be suitable for the purpose and in sound condition and comply with Health and Safety regulations and recommendations.

3.6 Sufficient and appropriate resources (staff, equipment, accommodation etc) must be used to enable the project to achieve its aims, the desired quality and timetable, and to comply with all statutory requirements. Any contingency elements must be clearly identified and justified. It is the role of the archaeologist undertaking the work to define appropriate staff levels.

3.7 Full and proper records (written, graphic, electronic and photographic as appropriate) should be made for all work, using pro forma record forms and sheets as applicable. Digital records created, as part of the project should comply with specified data standards. An archaeologist must ensure that digital information, paper and photographic records should be stored in a secure and appropriate environment, and be regularly copied or backed up, and copies stored in a separate location.

3.8 Artefact and environmental data collection and discard policies, strategies and techniques must be fit for the defined purpose, and understood by all staff and subcontractors

3.9 Health and Safety regulations and requirements cannot be ignored no matter how imperative the need to record archaeological information; hence Health and Safety will take priority over archaeological matters. All archaeologists undertaking fieldwork must do so under a defined Health and Safety Policy.

3.10 Archaeologists undertaking fieldwork must observe safe working practices; the Health and Safety arrangements must be agreed and understood by all relevant parties before work commences

3.11 Archaeologists must liase closely with the principal contractor and comply with specified site rules. Archaeologists are advised to note the onerous responsibilities of the role of planning supervisor.

3.12 The archaeologist undertaking a watching brief must ensure that he or she has adequate insurance policies, public and employer's

liability and some relevant form of civil liability indemnity or professional indemnity.

3.13 On arrival on site, the archaeologist should report to the site manager or other identified representative of the principal contractors or developers, and conform to their arrangements for notification of entering and leaving site.

3.14 Where the archaeologist has by instruction or agreement the power to suspend development work, he or she shall, in exercising such power, follow procedures previously agreed with the other contractors on the site. Within the constraints of the nature of the archaeological resource, the archaeologist shall not cause unreasonable disruption to the maintenance of the work schedules of other contractors.

3.15 An archaeologist should keep a record of the date, time and duration of all visits, the number of staff concerned and any actions taken.

4. POST-FIELDWORK ANALYSES AND REPORTS

4.1 Suitably qualified and experienced staff, who must be apprised of the project design before commencing work, and who should understand the work required of them, must carry out all assessment and analytical work.

4.2 The level of recording and analysis of artefacts and ecofacts should be appropriate to the aims and purpose of the project.

4.3 All data generated as a result of assessment and/or analysis should be included in the project archive.

4.4 All reports must address the aims and purposes of the project design and/or specification.

4.5 All reports should be written in a clear, concise and logical style; technical terms should be explained if the report is for a non-archaeological audience. Consideration should be given during the preparation of the report to the requirements of public inquiries and courts of law if appropriate.

4.6 Subject to any contractual requirements on confidentiality, copies of the report must be submitted to the appropriate Provincial Heritage Resources Agency (PHRA) within six months of completion of report.

4.7 As a minimum, a site summary or data structure report should be submitted to the appropriate PHRA.

5. MONITORING

5.1 All work must be monitored by the archaeological contractor undertaking the project, and if appropriate by the PHRA, the Cultural Resources Management Section of the South African Association of Archaeologists (CRM Section of SA3), or their nominated representatives. The guidance below is directed in general at monitors from outside the organisation undertaking the work, but many of the points apply equally to internal monitors or managers.

5.2 A monitor should be suitably experienced and qualified, or have access to appropriate specialist advice.

5.3 Monitoring must be undertaken against the written specification and/or project design.

5.4 Monitors, where not representing the commissioning body, should bear in mind the need for flexibility, within the stated parameters, in contractual matters such as staff numbers, budgets or timetable.

5.5 All monitoring visits must be documented, and agreed by each party.

5.6 Non-compliance with the agreed specification or project design must be pointed out by the monitor to the archaeologist undertaking the work, and their client if appropriate, at the earliest opportunity.

5.7 Monitors should be aware of their professional and moral duties regarding Health and Safety, in particular reporting and advising against bad and unsafe practice.

5.8 All monitoring arrangements must be agreed at the outset of the project; the archaeologist undertaking fieldwork must inform the planning archaeologist or other monitor of the commencement of work with reasonable notice.

5.9 Although monitors may choose to visit at any time, they should normally inform the archaeologist undertaking the work of any intended visits in advance. Monitors must respect reasonable requests from the client commissioning the work to attend only at prearranged times and, if necessary, in the company of the client's representative.

5.10 Any costs for monitoring to be charged by the planning archaeologist or other monitor must be agreed in writing at the outset of the project.

6. REPORT CONTENTS

The specific requirements of any report will necessarily vary according to the scope of works, the nature of the results or other factors. However, the following sections will occur in most

Non-technical summary
This should outline in plain, non-technical language the principal reason for the work, its objectives and main results. It should include reference to authorship and commissioning body.
Introductory statements
These could include acknowledgements, circumstances of the project such as planning background, the archaeological background, an outline nature of work, the site description (including size, geology and topography, location), when the project was undertaken and by whom.

Aims and objectives
These should reflect or reiterate the aims set out in the project design or specification.

Methodology
The methods used, including the detail of any variation to the agreed project design or specification should be set out carefully, and explained as appropriate. These should be set out as a series of summary statements, organised clearly in relation to the methods used, and describing structural data, associated finds and/or environmental data recovered. Descriptive material should be clearly separated from interpretative statements. Technical terminology (including dating or period references) should be explained where necessary if the report is aimed at a largely non-archaeological audience. The results should be amplified where necessary by the use of drawings and photographs; and by supporting data contained in appendices (below).

Conclusions
It is appropriate to include a section, which sums up and interprets the results and puts them into context (local, national or otherwise). Other elements should include a confidence rating on techniques used, or on limitations imposed by particular factors (eg weather or problems of access).
Archive location
The final destination of the archive (records and finds) should be noted in the report.

Appendices
These should contain essential technical and supporting detail, including for example lists of artefacts and contexts or details of

measurements, gazetteers etc. It may also be appropriate to include the project design or specification for ease of reference.

Illustrations

Most reports will need the inclusion of one or more illustrations for clarity; as a minimum a location plan should be included. Any plans or sections should be clearly numbered and easily referenced to the National Grid and related to the specified area.

References and bibliography

A list of all sources used should be appended to the report.

Other

Contents list, disclaimers.

7. REFERENCES

The Institute of Field Archaeologists, 2001. STANDARD AND GUIDANCE - for an archaeological watching brief. United Kingdom

SURFACE WATER

GCS (PTY) LTD

WATER, ENVIRONMENTAL, ENGINEERING & EARTH SCIENCE CONSULTANTS

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Date: 12 July 2006

Bohlweki Environmental (Pty Ltd.
P.O Box 11784
Vorna Valley
MIDRAND
1686

Attention: Mr. Greg Seymour

REPORT ON THE HYDROLOGICAL CHARACTERISTICS (SURFACE WATER) AND FLOODLINE DETERMINATION FOR THE PROPOSED DEVELOPMENT AND ASSOCIATED INFRASTRUCTURE FOR THE STONE RIVER'S ARCH DEVELOPMENT.

Herewith please find Report No BOH.06.153 with regards to the Hydrological characteristics and floodline determination for the mentioned property.

Yours faithfully

André Pretorius
Hydrological Engineer

Waldo Dressel
Director

GCS (PTY) LTD

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REPORT NO BOH.06.153

DETERMINATION OF SURFACE WATER CHARACTERISTICS AND FLOODLINE DETERMINATION FOR THE PROPOSED STONE RIVER'S ARCH DEVELOPMENT.

HYDROLOGICAL STUDY
Stone River's Arch.
REPORT NO: BOH.06.153
Client: Bohlweki Environmental (Pty) Ltd.
PO Box 11784
Vorna Valley
MIDRAND
1686

DOCUMENT ISSUE STATUS

Report Issue	Draft for discussion		
Reference Number	BOH.06.153		
Title	**Name**	**Signature**	**Date**
Author	André Pretorius		
Project Director	W. Dressel		
Technical Reviewer			

This report is not to be used for contractual or engineering purposes unless the Report is designated "FINAL"

By

GCS (PTY) LTD
WATER, ENVIRONMENTAL ENGINEERING & EARTH SCIENCE CONSULTANTS

EXECUTIVE SUMMARY

Investigations were conducted into the surface water resources that could be impacted by the proposed development. These investigations included hydrological modelling and the determination of catchment size, mean annual runoff (MAR) and normal dry river flows for the potentially affected catchments. Floodline calculations were also conducted on the stream that fall within the proposed development area. Floodlines for the 1:50 and 1:100 year floods were determined. Only the 1:100 year floodlines have been presented on maps, due to the close proximity of flood levels. 100-meter lines from the centre of a watercourse have also been indicated on maps.

Possible impacts on the surface watercourses by the proposed development were discussed and no major impacts are foreseen if properly mitigated and managed. The concrete palisade fence located at the downstream border of the property should be altered to prevent the impedance of water and the resulting flooding of this property.

No water quality sampling was conducted and no background data was therefore obtained for this stream. The confluence of this stream and the Klip River is further downstream, after this stream has flowed through other developed areas.

1 INTRODUCTION

Investigations were conducted into the surface water resources that could be impacted by the proposed development. These investigations included hydrological modelling and the determination of catchment size, mean annual runoff (MAR) and normal dry river flows for the potentially affected catchments. Floodline calculations were also conducted on the stream that fall within the proposed development area. Floodlines for the 1:50 and 1:100 year floods were determined. Only the 1:100 year floodlines have been presented on maps, due to the close proximity of flood levels. 100-meter lines from the centre of a watercourse have also been indicated on maps.

A site visit was conducted to familiarise oneself with catchment characteristics and the regional context thereof. No actual data was collected in the field and all the surface hydrology studies have been based on desktop analyses. Catchment boundaries have been derived from Topographical maps and by using Geographic Information Systems (GIS) software. Please refer to **Figure A1, attached in Appendix A** for the locality map.

The Stone River's Arch development is a residential type of estate development. The proposed development will be located on Portion 69 of the farm Liefde en Vrede 104 IR in the upper reaches of the C 22 D Quaternary Catchment.

The geology of the Quaternary Catchment comprises of intercalated assemblage of compact sedimentary as well as porous unconsolidated and consolidated sedimentary strata. Soils in this region varies from moderate to deep sandy loam to moderate to deep clayey loam, with undulating relief. Vegetation for this area comprises of false grassveld (Simplified Acocks Veld Types). The erodibility index is high (Value of 6) and has an estimated sediment yield (Region 3) which is in the order of 14 000 tonnes per annum.

A nameless non- perennial tributary of the Klip River flows through the south-eastern edge of the property and joins the Klip River downstream of the catchment boundary. The overall topography falls in a southerly direction with gentle to steep slopes ranging between 3%-10%.

1.1 Rainfall and Evaporation Data

The Rietvlei Weather Station (Station no. 0476048) is located approximately 2.7 km north west of the study area (area where the proposed development will take place). The mean annual precipitation (MAP) measured at this rainfall station is 686 mm per annum. This rainfall data should however be used with caution since it is only 22.8 % reliable. The JHB- Ormonde Weather Station (Station no. 0476016) is located approximately 6 km north west of the study area and has a MAP of 704 mm. The JHB- Oakdene Weather Station (Station no. 0476076 A) is located approximately 5.5 km to the north of the study area and has a MAP of 696 mm. The Zwartkopjes (RWB) Weather Station (Station no. 0476111) is located approximately 4.2 km to

the south west of the study area and has a MAP of 643 mm. While Rietvlei is situated closer to the study area, values from Zwartkopjes could be used with greater confidence since, it falls within the same rainfall isohyet.

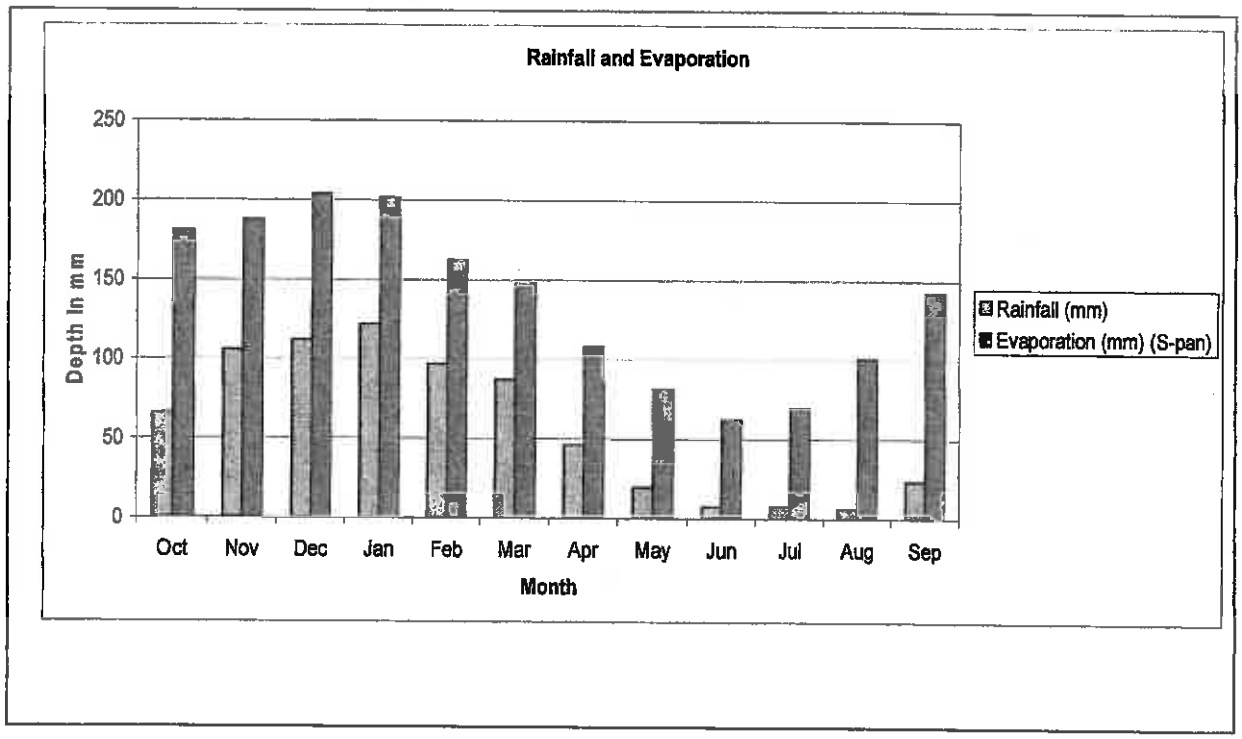
The C 22 D Quaternary Catchment receives an annual average rainfall of 701 mm, the majority of which falls during the months of October to April, according to the *Surface Water Resources of South Africa report (Water Research Commission 1990)*. The mean rainfall figures are given in **Table 1** and are illustrated in **Figure 1**. The month of January has the highest average monthly rainfall of 206 mm.

Mean annual evaporation for this region is 1650 mm, of which the monthly distribution is shown in **Table 1**. The mean monthly evaporation figures are illustrated in **Figure 1**.

Table 1: Mean Monthly Rainfall and Evaporation for the C 22 D Quaternary Catchment.

Month	Rainfall (mm) Surface Water Resources of South Africa (1990)	Evaporation (mm) Surface Water Resources of South Africa (1990)
January	122.0	201.8
February	96.7	162.7
March	87.0	147.8
April	46.2	108.1
May	19.3	81.5
June	7.6	62.4
July	7.8	69.6
August	6.9	100.9
September	23.7	142.0
October	66.2	181.0
November	105.7	187.9
December	111.9	204.1
Mean Annual	**701**	**1650**

Figure 1: Mean Monthly Rainfall and Evaporation for the C 22 D Quaternary Catchment.



Design Rainfall depths for a 24-hour storm duration (1 day) was obtained from various weather stations, situated close to the study area, and are listed in **Table 2** for the various return periods.

Table 2: Design Rainfall Depths

Station Name	Altitude (m)	MAP (mm)	Return Period (years)						
			2	5	10	20	50	100	200
JHB- Ormonde (SAWS no. 0476016)	1710	750	55	75	91	108	132	153	175
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Zwartkopjes (RWB) (SWAWS no. 0476111)	1500	684	40	55	67	79	97	112	129

Note: Values was obtained from Design Rainfall Depths at Selected Stations in South Africa (Smithers, J.C. and Schulze, R.E., 2000b.)

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The study area is located within the Upper Klip River Catchment. The Nelspruit catchment drains into a south to southeasterly direction and eventually flows into the Vaal River at the Vaal Barrage near Vereeniging. The boundaries of the catchment are occupied by dense residential related activities as well as some nature conservation areas and are shown in **Figure A1, Appendix A.** The affected watercourse that would be impacted by water emanating from the mine site would be the Klip River.

1.2.2 Mean Annual Run-off

The mean annual run-off from the catchment areas has been estimated. Water Research Commission publications *(Surface Water Resources of South Africa- Volume 1)* were used to obtain the MAR for the Quaternary drainage regions. Data was modelled to determine the MAR for the affected catchment at the locations of the proposed development. The mean annual runoff for the C 22 D Quaternary Catchment is 11.3 x 10^6 m^3 per annum, which is equivalent to 33 mm of runoff depth. The variations in annual totals of rainfall and runoff depth are illustrated in **Figure 2,** from which it is clear that annual variations in runoff are substantial. **Figure 3** illustrates the seasonal distribution of rainfall and runoff depth. The model results, which are based on simulated naturalised conditions, may be indicating higher low flows than actually occur in the river. It should be noted that the results are based on regional parameters for the whole quaternary catchment (345 km^2), as there are no observed data against which to calibrate the model. These regional parameters do not take into account the processes that occur in smaller catchments (such as seepage into the channel bed and banks during low flows). Return flows back into the system, such as leaking water supply and sewer pipes, or discharges from swimming pools into the storm water network, was therefore not modelled.

Figure 2: Natural Run-off

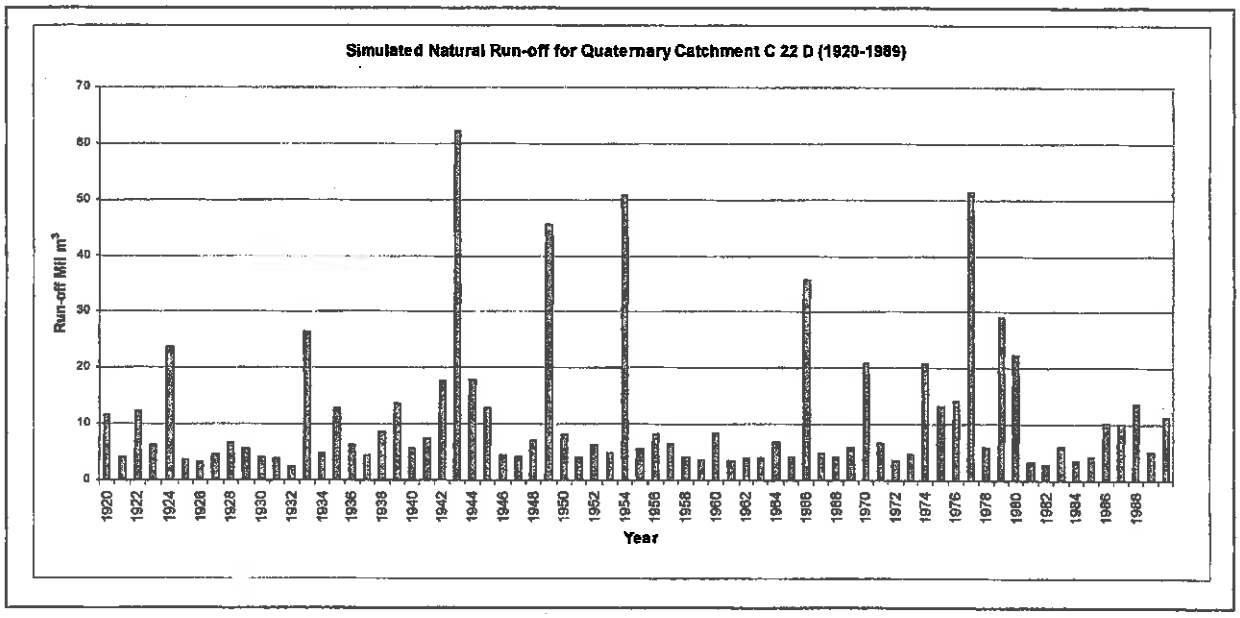
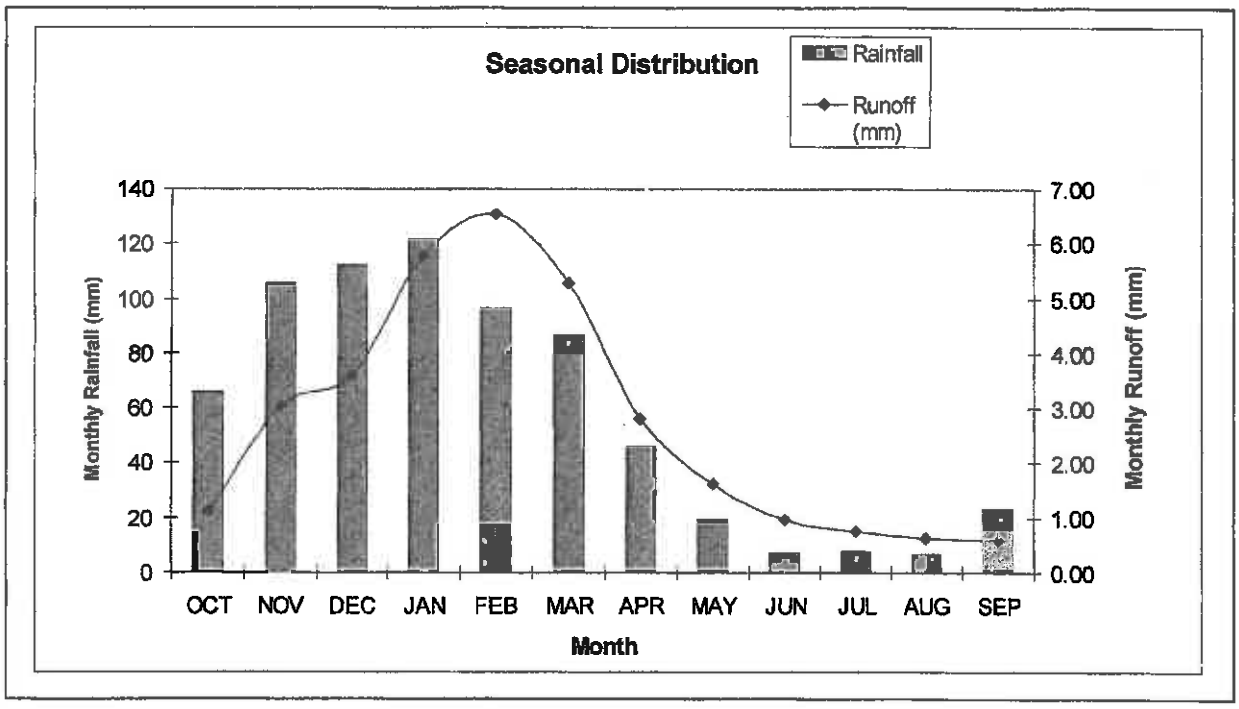


Figure 3: Seasonal Distribution



The mean annual runoff (MAR) and monthly runoff volumes for the study area was determined as 272 000 m^3 per annum, based on the MAR of the C 22 D Quaternary Catchment and are summarised in **Table 3** below.

Table 3: Estimated Mean Monthly and Annual Run-off

Estimated Mean Monthly and Annual Run-off																	
Study Area			Area (km^2)	Runoff in mm	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	MAR
					1.09	3.03	3.58	5.76	6.53	5.28	2.81	1.62	0.97	0.75	0.62	0.57	32.62
Stream	Catchment	Flow At			Average Monthly Runoff calculated as % of runoff modelled for Study Area (Mil m^3)												
Catchment A	A	A	8.3300		0.01	0.03	0.03	0.05	0.05	0.04	0.02	0.01	0.01	0.01	0.01	0.00	0.27

Note: No actual stream flow data was obtained.

Relevant cumulative flows for return periods for the study area are illustrated in **Table 4** below.

Table 4: Cumulative flows

Duration	Cumulative flows for return periods of :-					
	10 years		20 years		50 years	
	%MAR	Mil m^3	%MAR	Mil m^3	%MAR	Mil m^3
1-month	1.5	0.004	1.300	0.004	1.200	0.003
3-month	5	0.014	4.500	0.012	4.200	0.011
6-month	12	0.033	11.000	0.030	10.500	0.029
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2-year	120	0.326	100.000	0.272	90.000	0.245
3-year	220	0.598	180.000	0.489	160.000	0.435
MAR	0.272	Mil m^3				

1.2.3 Flood Peaks and Volumes

Flood peaks for the 1:50 and 1:100 year recurrence intervals were computed using the Rational Method (DWA Applications), the Modified Rational Method and the Standard Design Flood (SDF). The UPflood computer software program was also used to determine flood peaks for the relevant recurrence intervals. The tables below list the computed flood peaks, together with the Regional Maximum Flood (RMF). The Rational Method delivers accurate results for small catchments up to 5 km^2 in size. The Modified Rational Method is a derivative from the Rational Method to compute flood peaks for slightly larger catchments. Flood calculations were based on full residential development within the catchment.

Table 5: Probable Peak Flows

Method	Catchment Area (km2)	Recurrence Interval Peak Flow (m3/s)					
		1:2	1:5	1:10	1:20	1:50	1:100
Rational Method	8.33	26	39	53	74	119	176
Modified Rational Method*		25	38	53	72	116	173
SDF		9	31	52	75	110	139
RMF (m3/s)	289						
Note* The modified rational method was used to determine peak flows.							

The regional maximum flood peaks (RMF's) were determined according to the method set out in TR137 and by using a K- Value of 5.

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Floodlines were determined for the areas where the proposed infrastructure could be influenced by floodlines and levels.

The catchments were delineated from the 1:50 000 topographical maps to determine the peak flows and flood volumes. The contours from the provided site plan were used to extract cross-sections along the stream centrelines. Floodlines for the 1:50 and 1:100 recurrence intervals were calculated using computer modelling software HEC-RAS.

Estimated values were used for the river crossing (Klip River road bridge no 3828) in the modelling process, since limited detailed survey information was provided. A smaller bridge is also located approximately 30 meters further downstream from this bridge. This bridge has no access road and has been abandoned. This smaller bridge was also modelled, and it was found that it would overtop during the 1: 100 year flood event. Floodwater would also bypass this smaller bridge. A concrete palisade fence is located at the downstream border of the property. Floodlines have not been modelled at this point, since it is anticipated that the openings between the palisades would be blocked and water would dam up as a result of this. The horizontal force exerted by the water on the fence would increase as the rise in water depth, thus resulting in the possible collapse of this fence. Hydraulic characteristics on this fence have therefore not been determined, since it fell outside the scope of this study.

The peak flows for the catchments were calculated according to the Modified Rational Method. The Rational Method predicts peak runoff values from data on rainfall intensity and drainage basin characteristics. The method assumes that a rainstorm of uniform intensity covers the whole basin. Runoff will increase as water from more distant parts of the catchment area reaches the outlet. When the whole drainage area is contributing, a steady state is reached,

and discharge becomes a constant maximum. The time required to reach this steady state is called the *time of concentration*, and after this time, storm flow discharge is a fixed proportion of the rainfall intensity.

The Standard Design Flood as well as the Rational Method was used to compare values against the Modified Rational Method.

The 1:50 and 1:100 year floodlines were computed using the flow rates given in **Table 5** and the ground contours in the vicinity of the study area. Only the 1:100 year floodlines are presented on maps, due to the close proximity of the 1:50 year floodlines. **Please refer to Figure A2 attached in Appendix A.**

NOTE: It is important to note that due to the limited detail in the mapping used to calculate the floodlines local deviations from the floodlines as represented (e.g. caused by local depressions etc.) could occur. It will therefore be necessary to check the extent of the floodplain in the field based on flood levels calculated.

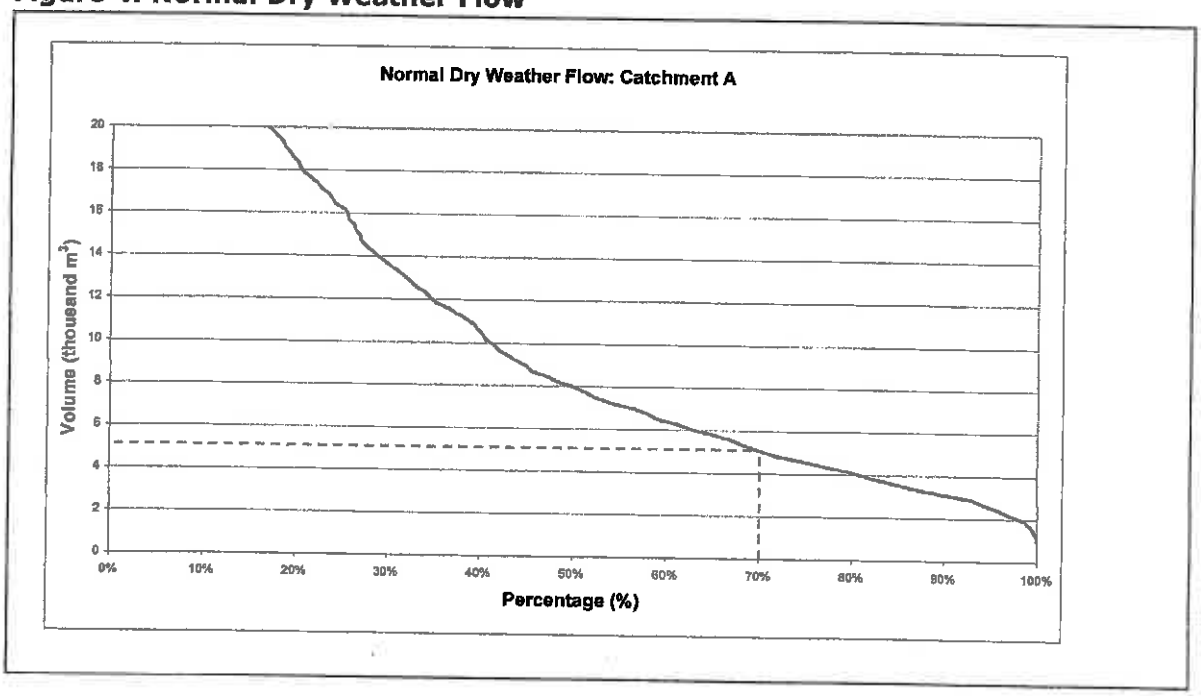
1.4 Normal Dry Weather Flow

The normal dry weather flow is defined as that flow that is exceeded 70% of the time.
Figure 2 illustrate the flow duration curves for the catchment, for all months. Based on the flow duration curve, the flows exceeded 70% of the time, or the normal dry weather flows, for the relevant catchments were determined. On the basis of the annual curve, the normal dry weather flow for the catchment is equal to:

- 5,070 m^3/year.

It is quite possible that at least some of this simulated flow would not appear as surface runoff in the channel, but would be lost to bed and bank seepage.

Figure 4: Normal Dry Weather Flow



1.5 Drainage Densities

The drainage density is the quotient of the total stream length within a catchment and the catchment area. The 1:50 000 scale topographic maps were used to determine the drainage densities and are summarised in **Table 6.**

Table 6: Drainage Densities

Description	Drainage Density (km/km^2)
Study Area	1.96
* Refer to Figures in the attached appendices.	

1.6 Impacts of Proposed Activities.

1.6.1 Proposed water storage dam

The proposed water storage dam will be used as a water feature and will thus serve a recreational purpose. This dam should be located away from the road servitude and from the road foundation. This is to prevent the road foundation being saturated, thus preventing settlement of the road.

The proposed water storage facility (dam) may have a small impact on the water quality due to an increase in water temperature and evaporative losses. Eutrophication may also occur. The anticipated impact on the Mean Annual Run-off (MAR) has not been determined yet, as no detailed design has been formalised. Seepage and evaporative losses should be taken into account during the design phase.

It is proposed that this dam be designed as a storm water attenuation dam that will release storm water run-off emanating from the catchment in a controlled manner downstream. The spillway should be sized in such a way to prevent the dam from overtopping and to protect the dam wall.

An alternative option would be an off-channel storage dam.

1.6.2 Increased Run-off from surface areas.

Increase in run-off and flow velocities are expected as a result of the increased impermeable surface areas and mitigation measures should be implemented to prevent the degradation of

the watercourses. Soil conservation measures should be implemented at identified areas. Storm water collection and conveyance systems should be engineered designed.
The property should also be cleared from exotic and invader plant species, which is especially found near or in the watercourse. Water, which is currently being used by this type of vegetation, may be made available for the ecology and downstream users.

1.7 References

- Lynch, S.D. 1994. Raster (grid) Rainfall database of annual, monthly and daily rainfall for Southern Africa .WRC Report 1156/1/04

- Midgley, D.C., Pitman W.V., Middleton, B.J. 1994. Surface Water Resources of South Africa 1990. WRC Report No 298/1.1/94, Volume 1 and Appendices

- Smithers, J.C. and Shulze, R.E., 2000b. Design rainfall and flood estimation in South Africa. WRC Report No 1060/1/03

APPENDIX A

Figures

GCS (PTY) LTD

WATER, ENVIRONMENTAL, ENGINEERING & EARTH SCIENCE CONSULTANTS

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South Africa

Tel: +27 (0)11 803 5726

Fax: +27 (0)11 803 5745

Date: 12 July 2006

Bohlweki Environmental (Pty Ltd.
P.O Box 11784
Vorna Valley
MIDRAND
1686

Attention: Mr. Greg Seymour

REPORT ON THE HYDROLOGICAL CHARACTERISTICS (SURFACE WATER) AND FLOODLINE DETERMINATION FOR THE PROPOSED DEVELOPMENT AND ASSOCIATED INFRASTRUCTURE FOR THE STONE RIVER'S ARCH DEVELOPMENT.

Herewith please find Report No BOH.06.153 with regards to the Hydrological characteristics and floodline determination for the mentioned property.

Yours faithfully

André Pretorius
Hydrological Engineer

Waldo Dressel
Director

GCS (PTY) LTD

WATER, ENVIRONMENTAL, ENGINEERING & EARTH SCIENCE CONSULTANTS

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REPORT NO BOH.06.153

DETERMINATION OF SURFACE WATER CHARACTERISTICS AND FLOODLINE DETERMINATION FOR THE PROPOSED STONE RIVER'S ARCH DEVELOPMENT.

HYDROLOGICAL STUDY
Stone River's Arch.
REPORT NO: BOH.06.153
Client: Bohlweki Environmental (Pty) Ltd.
PO Box 11784
Vorna Valley
MIDRAND
1686

DOCUMENT ISSUE STATUS

Report Issue	Draft for discussion		
Reference Number	BOH.06.153		
Title	**Name**	**Signature**	**Date**
Author	André Pretorius		
Project Director	W. Dressel		
Technical Reviewer			

This report is not to be used for contractual or engineering purposes unless the Report is designated "FINAL"

By

GCS PTY LTD
WATER, ENVIRONMENTAL ENGINEERING & EARTH SCIENCE CONSULTANTS

EXECUTIVE SUMMARY

Investigations were conducted into the surface water resources that could be impacted by the proposed development. These investigations included hydrological modelling and the determination of catchment size, mean annual runoff (MAR) and normal dry river flows for the potentially affected catchments. Floodline calculations were also conducted on the stream that fall within the proposed development area. Floodlines for the 1:50 and 1:100 year floods were determined. Only the 1:100 year floodlines have been presented on maps, due to the close proximity of flood levels. 100-meter lines from the centre of a watercourse have also been indicated on maps.

Possible impacts on the surface watercourses by the proposed development were discussed and no major impacts are foreseen if properly mitigated and managed. The concrete palisade fence located at the downstream border of the property should be altered to prevent the impedance of water and the resulting flooding of this property.

No water quality sampling was conducted and no background data was therefore obtained for this stream. The confluence of this stream and the Klip River is further downstream, after this stream has flowed through other developed areas.

1 INTRODUCTION

Investigations were conducted into the surface water resources that could be impacted by the proposed development. These investigations included hydrological modelling and the determination of catchment size, mean annual runoff (MAR) and normal dry river flows for the potentially affected catchments. Floodline calculations were also conducted on the stream that fall within the proposed development area. Floodlines for the 1:50 and 1:100 year floods were determined. Only the 1:100 year floodlines have been presented on maps, due to the close proximity of flood levels. 100-meter lines from the centre of a watercourse have also been indicated on maps.

A site visit was conducted to familiarise oneself with catchment characteristics and the regional context thereof. No actual data was collected in the field and all the surface hydrology studies have been based on desktop analyses. Catchment boundaries have been derived from Topographical maps and by using Geographic Information Systems (GIS) software. Please refer to **Figure A1, attached in Appendix A** for the locality map.

The Stone River's Arch development is a residential type of estate development. The proposed development will be located on Portion 69 of the farm Liefde en Vrede 104 IR in the upper reaches of the C 22 D Quaternary Catchment.

The geology of the Quaternary Catchment comprises of intercalated assemblage of compact sedimentary as well as porous unconsolidated and consolidated sedimentary strata. Soils in this region varies from moderate to deep sandy loam to moderate to deep clayey loam, with undulating relief. Vegetation for this area comprises of false grassveld (Simplified Acocks Veld Types). The erodibility index is high (Value of 6) and has an estimated sediment yield (Region 3) which is in the order of 14 000 tonnes per annum.

A nameless non- perennial tributary of the Klip River flows through the south-eastern edge of the property and joins the Klip River downstream of the catchment boundary. The overall topography falls in a southerly direction with gentle to steep slopes ranging between 3%-10%.

1.1 Rainfall and Evaporation Data

The Rietvlei Weather Station (Station no. 0476048) is located approximately 2.7 km north west of the study area (area where the proposed development will take place). The mean annual precipitation (MAP) measured at this rainfall station is 686 mm per annum. This rainfall data should however be used with caution since it is only 22.8 % reliable. The JHB- Ormonde Weather Station (Station no. 0476016) is located approximately 6 km north west of the study area and has a MAP of 704 mm. The JHB- Oakdene Weather Station (Station no. 0476076 A) is located approximately 5.5 km to the north of the study area and has a MAP of 696 mm. The Zwartkopjes (RWB) Weather Station (Station no. 0476111) is located approximately 4.2 km to

the south west of the study area and has a MAP of 643 mm. While Rietvlei is situated closer to the study area, values from Zwartkopjes could be used with greater confidence since, it falls within the same rainfall isohyet.

The C 22 D Quaternary Catchment receives an annual average rainfall of 701 mm, the majority of which falls during the months of October to April, according to the *Surface Water Resources of South Africa report (Water Research Commission 1990)*. The mean rainfall figures are given in **Table 1** and are illustrated in **Figure 1**. The month of January has the highest average monthly rainfall of 206 mm.

Mean annual evaporation for this region is 1650 mm, of which the monthly distribution is shown in **Table 1**. The mean monthly evaporation figures are illustrated in **Figure 1**.

Table 1: Mean Monthly Rainfall and Evaporation for the C 22 D Quaternary Catchment.

Month	Rainfall (mm) Surface Water Resources of South Africa (1990)	Evaporation (mm) Surface Water Resources of South Africa (1990)
January	122.0	201.8
February	96.7	162.7
March	87.0	147.8
April	46.2	108.1
May	19.3	81.5
June	7.6	62.4
July	7.8	69.6
August	6.9	100.9
September	23.7	142.0
October	66.2	181.0
November	105.7	187.9
December	111.9	204.1
Mean Annual	**701**	**1650**

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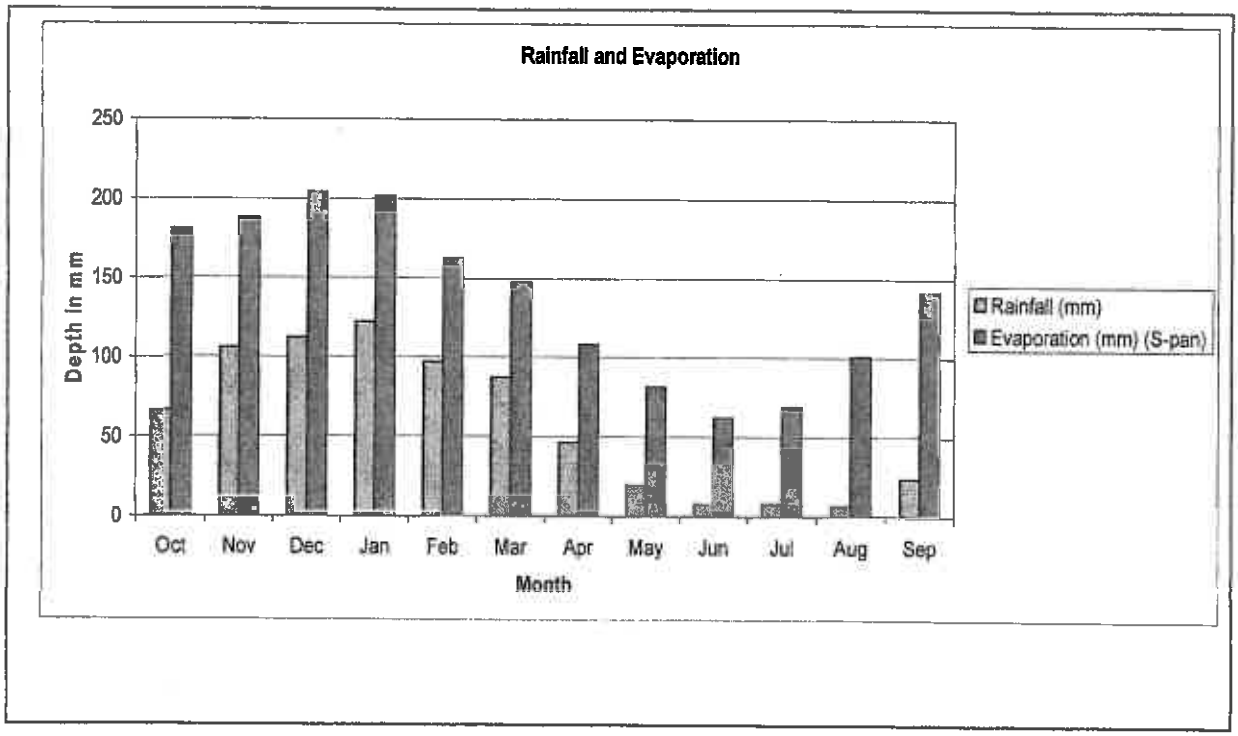

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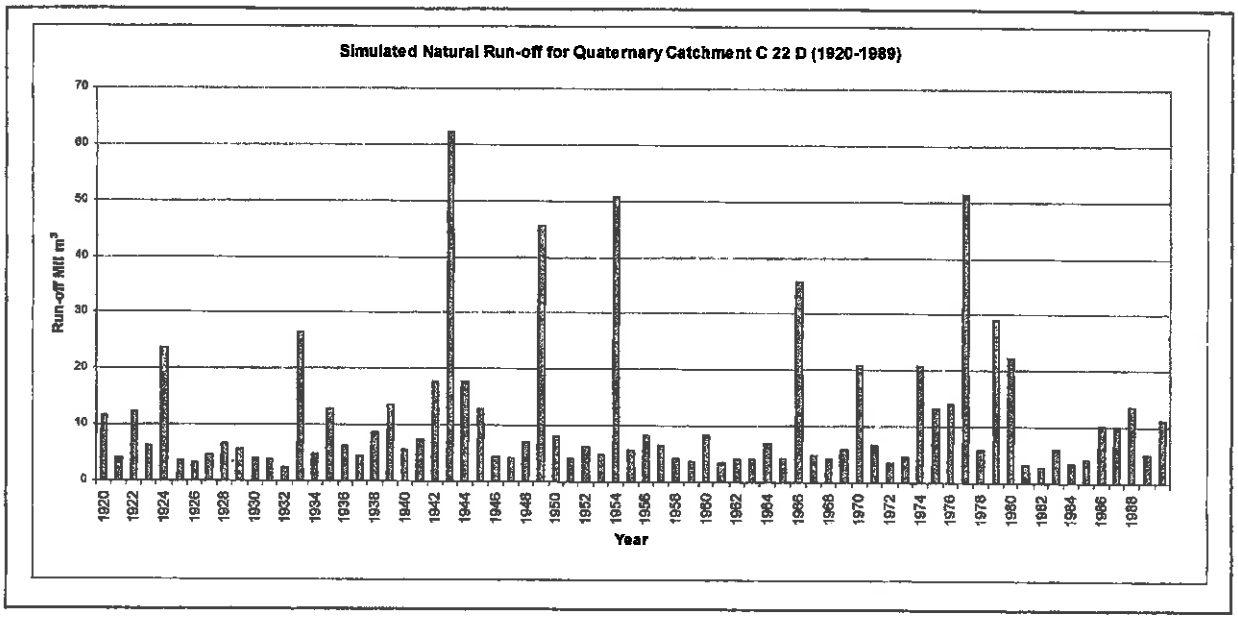

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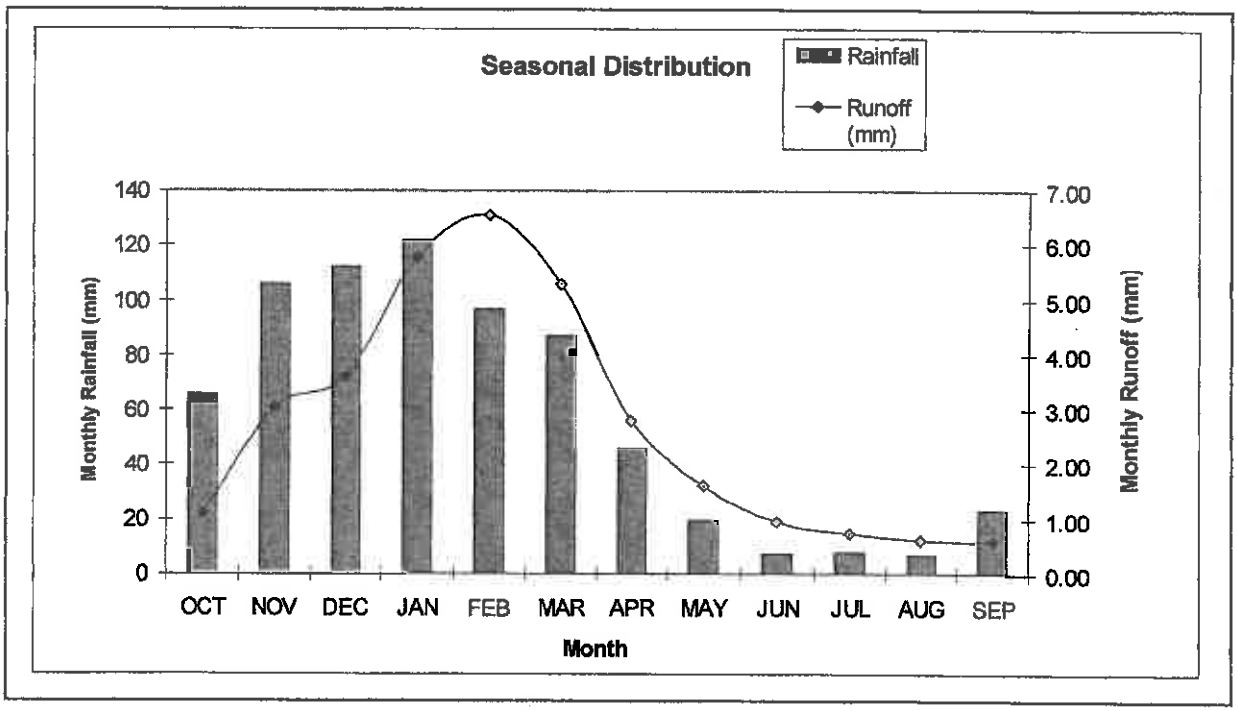

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Note: No actual stream flow data was obtained.

Relevant cumulative flows for return periods for the study area are illustrated in **Table 4** below.

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	%MAR	Mil m^3	%MAR	Mil m^3	%MAR	Mil m^3
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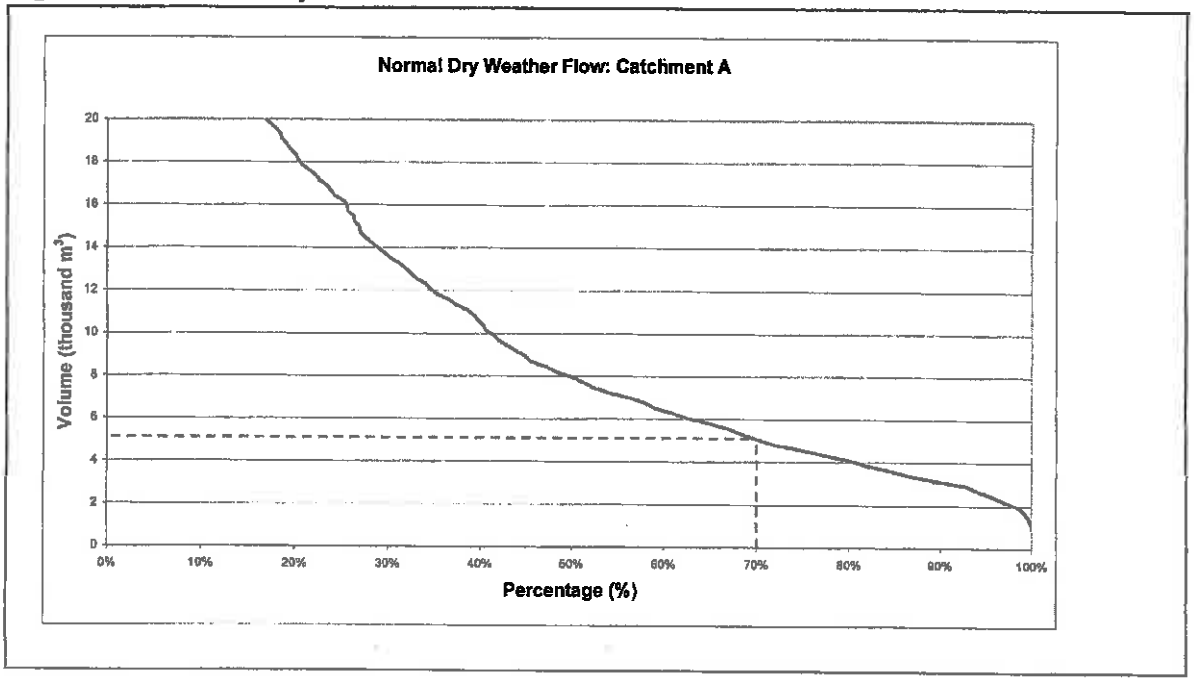
1.4 Normal Dry Weather Flow

The normal dry weather flow is defined as that flow that is exceeded 70% of the time.
Figure 2 illustrate the flow duration curves for the catchment, for all months. Based on the flow duration curve, the flows exceeded 70% of the time, or the normal dry weather flows, for the relevant catchments were determined. On the basis of the annual curve, the normal dry weather flow for the catchment is equal to:

- 5,070 m^3/year.

It is quite possible that at least some of this simulated flow would not appear as surface runoff in the channel, but would be lost to bed and bank seepage.

Figure 4: Normal Dry Weather Flow



1.5 Drainage Densities

The drainage density is the quotient of the total stream length within a catchment and the catchment area. The 1:50 000 scale topographic maps were used to determine the drainage densities and are summarised in **Table 6.**

Table 6: Drainage Densities

Description	Drainage Density (km/km^2)
Study Area	1.96
* Refer to Figures in the attached appendices.	

1.6 Impacts of Proposed Activities.

1.6.1 Proposed water storage dam

The proposed water storage dam will be used as a water feature and will thus serve a recreational purpose. This dam should be located away from the road servitude and from the road foundation. This is to prevent the road foundation being saturated, thus preventing settlement of the road.

The proposed water storage facility (dam) may have a small impact on the water quality due to an increase in water temperature and evaporative losses. Eutrophication may also occur. The anticipated impact on the Mean Annual Run-off (MAR) has not been determined yet, as no detailed design has been formalised. Seepage and evaporative losses should be taken into account during the design phase.

It is proposed that this dam be designed as a storm water attenuation dam that will release storm water run-off emanating from the catchment in a controlled manner downstream. The spillway should be sized in such a way to prevent the dam from overtopping and to protect the dam wall.

An alternative option would be an off-channel storage dam.

1.6.2 Increased Run-off from surface areas.

Increase in run-off and flow velocities are expected as a result of the increased impermeable surface areas and mitigation measures should be implemented to prevent the degradation of

the watercourses. Soil conservation measures should be implemented at identified areas. Storm water collection and conveyance systems should be engineered designed.
The property should also be cleared from exotic and invader plant species, which is especially found near or in the watercourse. Water, which is currently being used by this type of vegetation, may be made available for the ecology and downstream users.

1.7 References

- Lynch, S.D. 1994. Raster (grid) Rainfall database of annual, monthly and daily rainfall for Southern Africa .WRC Report 1156/1/04

- Midgley, D.C., Pitman W.V., Middleton, B.J. 1994. Surface Water Resources of South Africa 1990. WRC Report No 298/1.1/94, Volume 1 and Appendices

- Smithers, J.C. and Shulze, R.E., 2000b. Design rainfall and flood estimation in South Africa. WRC Report No 1060/1/03