1st phase H I A for the

Environmental Authorisation (EA) process and application for Renewal of existing Mining Right for

Sereti Coal, Arnot Colliary

July 2023.

General view of the cemetery.

Project coordinator: - Shangoni management services.

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"Of the earth, for the earth"

SHANGONI
Management Services (Pty) Ltd

Report prepared by: -

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Declaration of independence.
This report has been compiled by Siegwalt Kūsel and Sidney M Miller. We declare that as independent consultants we have no business, financial, personal or other interest in the proposed development project, application or appeal in respect of which the appointment was made other than fair remuneration for work performed in connection with the activity or application.

Provisional indemnity.
We Siegwalt Kūsel and Sidney M Miller hereby declare that all reasonable steps were taken to identify the heritage resources on the property under investigation. For obvious reasons heritage remains that occurs/occurred underground cannot be vouched for. In the event of such remains being uncovered during the mining operations work should be stopped and a heritage practitioner or the heritage authorities must be informed. The cost of such new investigation will be for the account of the client.

	
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[Note that a copy of the report must be lodged with SAHRA as stipulated by the NHRA (Act No. 25 of 1999), Section 38 (particularly subsection 4).]

Contents

List of acronyms.

AIA	Archaeological Impact Assessment.		HMF	Heritage Management Framework.
ASAPA	Association of Southern African Professional Archaeologists.		AIA	Archaeological Impact Assessment.
BAR	Basic Assessment Report.		HMP	Heritage Management Plan.
BP	Before Present.		ICOMOS	International Council on Monuments and Sites.
BIF	Banded iron formation.		LIA	Late Iron Age.
CFP	Chance Finds Procedure.		LMS	London Mission Society.
CRM	Cultural Resources Management.		LOM	Life of Mine.
DEA	Department of Environmental Affairs.		LSA	Later Stone Age.
EAA	Environmental Authorisation Application.		MPRDA	Mineral and Petroleum Resources Development Act (No. 28 of 2002)
EAP	Environmental Assessment Practitioner.		MSA	Middle Stone Age.
EIA	Early Iron Age.		NCP	Northern Cape Province.
ESA	Early Stone Age.		NEMA	National Environmental Management Act (No. 107 of 1998)
ECO	Environmental Control Officer.		NHRA	National Heritage Resources Act (No. 25 of 1999)
EMPr	Environmental Management Programme.		PHRA	Provincial Heritage Resources Authority.
EIA	Environmental Impact Assessment.		SAHRA	South African Heritage Resources Agency.
FLS	Fellow of the Linnean Society.		SAHRIS	South African Heritage Resources Information System.
GIS	Geographic Information System.		SIOM	Sishen Iron Ore Mine.
GPS	Global Positioning System.		TOR	Terms of Reference.
HIA	Heritage Impact Assessment.		YA	Years Ago.

Archaeological remains can be defined as any features or objects resulting from human activities, which have been deposited on or in the ground, reflecting past ways of life and are older than 100 years.

Conservation as used in this report in relation to heritage resources, "includes protection, maintenance, preservation and sustainable use of places or objects so as to safeguard their cultural significance" ***(National Heritage Resources Act (NHRA) 1999: Act 25:2iii).***

Cultural significance means aesthetic, architectural, historical, scientific, social, spiritual, linguistic or technological value or significance" ***(NHRA 1999: Act 25:2(vi).)***

Development means any physical intervention, excavation, or action, other than those caused by natural forces, which may in the opinion of a heritage authority in any way result in a change to the nature, appearance or physical nature of a place, or influence its stability and future well-being" ***(NHRA 1999: Act 25:2(viii).)***

Heritage: Heritage resources have lasting value in their own right and provide evidence of the origins of South African society. They are limited and non-renewable. The National Heritage Resources Act section 32, p. 55 defines these as "An object or collection of objects, or a type of object or 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".

1. Executive summary.

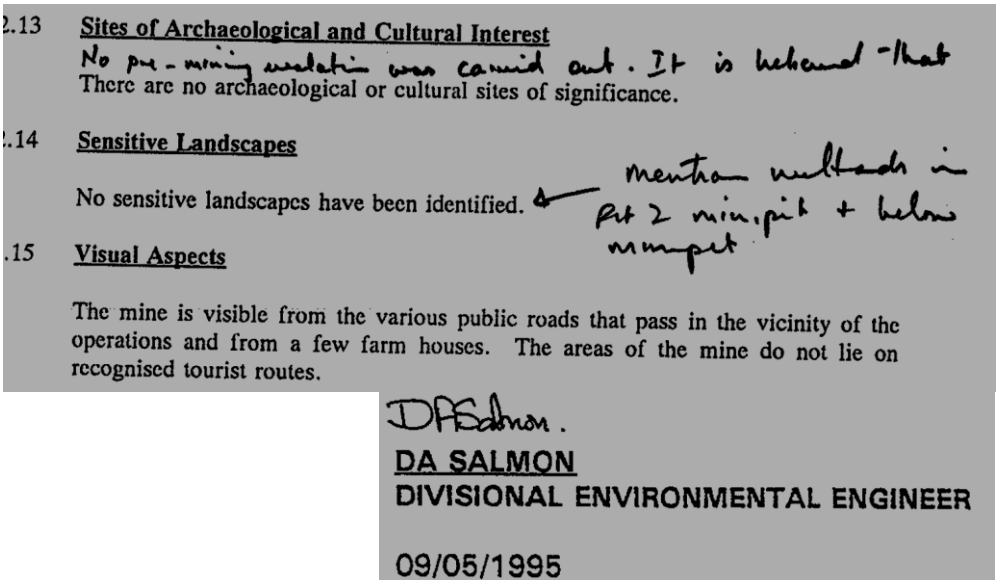
Sereti Coal, Arnot Colliary, has appointed Shangoni Management Services as environmental consultant for their application to re-instate a Mining Right Licence on their properties near Arnot Power Station. The Power Station was commissioned in the early 1970' and was originally supplied with coal from sources at present unknown. Between 1993 and 1995 an EMPR was presented to the authorities for a Mining Right Licence on the farm Boschmanspruit, which was granted, and this mine became the main source of fuel for the Power Station.

The Colliary now need to expand their operations onto the farm Tweefontein and are applying for a renewal for a Mining Right Licence to cover both properties.

For this application the present HIA has to cover two separate properties.

1. The original application on Boschmanspruit stated that there was no archaeological or cultural sites, and most of the surface area was effectively removed during the last 30 years. It is safe to reason that there is still no heritage remains present within the mining rights licence area on this property.

Quote from 1993-5 application



2.13 **Sites of Archaeological and Cultural Interest**

No pre-mining evaluation was carried out. It is believed that There are no archaeological or cultural sites of significance.

2.14 **Sensitive Landscapes**

No sensitive landscapes have been identified. ← mention wetlands in Pit 2 min.pit + below min.pit

.15 **Visual Aspects**

The mine is visible from the various public roads that pass in the vicinity of the operations and from a few farm houses. The areas of the mine do not lie on recognised tourist routes.

DFSalmon.

DA SALMON
DIVISIONAL ENVIRONMENTAL ENGINEER

09/05/1995

2. The 2023 fieldwork undertaken on the 27th of June 2023 on the farm Tweefontein revealed a number of issues of importance.

2.1. There is a large cemetery containing between 40 to 60 graves present on the eastern border of the property. Owing to vegetation covering the whole burial ground, and the condition of the graves, it was difficult to establish the exact number. What was clear, is that some of the graves are still being tended to, implying living relatives.

The implication therefore is a second phase study to determine the extent of the burial ground, the number of graves and the community involved with the cemetery. This information can then be utilized in decisions for either relocation or a perimeter zone that implies access for community members.

It is suggested that a company, **proficient in grave relocations,** is appointed to undertake this second phase study.

2.2. Below the farmyard a fountain was noted that appears to have been enlarged over time and water channelled from it. It is still emitting a reasonable amount of water. Taking in account that most, if not all, fountains utilized on farmland in the past, has disappeared. This is a rare local heritage item.

Furthermore it is known that in some cultures it is preferable to inhume departed loved ones near water. The cemetery mentioned in 2.1 is directly below this spring and may therefore also have spiritual context linked to the spring.

The implication therefore is that a second phase study should be undertaken to clarify the status as a heritage remain that should be protected or not.

2.3. The fact that the 1960's European farmyard is at present occupied by at least four different family groups, has implications for re-settlement of these people. It may also be that some are related to deceased buried in the cemetery.

This is not strictly a heritage issue, but will in time become an item to deal with.

3. This Phase 1 Heritage Impact Assessment (HIA) was conducted for the 2023 proposed re-application for a Ming Right Licence on the property of Sereti Coal, Arnot Colliary. The authors of this report are confident that the heritage resources, of the property under review, were adequately documented and assessed during the Phase 1 HIA.

Siegwalt U Kūsel & Sidney M Miller.

2. Terms of Reference.

Shangoni Management Services (Pty) Ltd (Shangoni) appointed S. U. Küsel and S.M. Miller as independent specialists to conduct a Phase 1 HIA. This HIA is conducted for the re-application for a Mining Right Licence by Sereti Coal, Arnot Colliary, on their properties Boschmanspruit and Tweefontein. This company is mainly focussed on coal extraction for supply to Arnot Power Station.

2.1. Their property consists of two components. *(See figure below.)*
2.1.1. The existing mine on Boschmanspruit.
The mine on Boschmanspruit has been in operation for thirty years under a Mining Right Licence. It therefore follows that there are no heritage remains to be reported on this property.
2.1.2. A new component on Tweefontein.
This property has, as far is known, not previously been surveyed for heritage remains.
It will then be the focus of the current fieldwork.

3. Study Area *([1]).*

Figure 1. *Map showing the existing mine on the farm Boschmanspruit and the new portion on Tweefontein. For all GPS data see Addendum 6.* ***(Google Earth 2023.)***

[1] See Addendum 6 for detailed description of the specific study areas to be impacted. It is derived and compiled from KMZ images supplied by Shangoni Management Services.

4. Assessment Methodology.

4.1. Methodology.

Prior to conducting the site assessment, a desktop survey of existing literature on the wider region was conducted to assess the heritage context. These included published research articles, unpublished reports, and other online information. The SAHRIS data base was also accessed for previous heritage reports that relate to the general region of the survey. The heritage resources associated with the original Arnot Colliary is captured in the *original 1993 to 1995 EMPr for the application of its existing Mining Right License*

The relevant topographical and historical maps were sourced, and consulted for pointers to possible heritage resources. The study area is covered by a series of aerial photography data sets that can be used to assess the occupations of this particular landscape. Historical articles were also systematically scrutinised to identify potential sites, areas of disturbance and vegetation or geological anomalies, and for any evidence of structural remains, or likely areas for archaeological features.

Prior to the field work all maps and diagrams of the proposed mine infrastructure provided by the Client were mapped and plotted on Google Earth and high-resolution aerial imagery, and converted to .gpx format. The data were transferred to the ***mobile App GPS HD (Motion X)*** to allow for geo-referencing during the field survey via Ipad and Iphone.

GPS coordinates were recorded with a ***Garmin e-Trex 30 (Datum WGS84) ([2]).***

4.2 Surveyed area *([3]).*

The project site was visited on the 27th of July 2023. Only the Tweefontein area was surveyed as the existing mine has been operational for 30 year and was initially reported to be void of heritage resources.

The total study area the Tweefontein components is proximately 410 ha in extent, most of which, over a long period of time, being exposed to continuous dry-land maize farming.

The study area and immediate surrounds were systematically searched and inspected by vehicle and on foot to identify any potential areas that could contain heritage resources.

At crucial points such as the "cemetery" special attention was given.

[2]See Addendums 9 & 10, Track logging data and, the GPS locations of Track Log PHOTOS.
[3] See Addendum 12, Location of the research areas. (Separate document.)

5. Legislative Framework.

5.1 National Heritage Resource Act (NHRA).

The National Heritage Resources Act (NHRA) ***(Act No. 25 of 1999)*** is the primary legislative act dealing with the conservation and management of heritage resources. In brief the Act aims to promote good management of the national estate, and to enable and encourage communities to nurture and conserve their legacy so that this may be bequeathed to future generations.

The NHRA clearly defines the national estate and sets out principles for the management of heritage resources, determines the constitution, powers, functions, and duties of heritage authorities and provides a framework for the enforcement of the Act. All sites, heritage resources and archaeological remains are protected in terms of the National Heritage Resources Act (NHRA) Act No. 25 of 1999: -

> • *All archaeological remains, artefactual features, and structures older than 100 years and historical structures older than 60 years are protected by the National Heritage Resources Act (NHRA)* ***(Act No. 25 of 1999, section 35).*** *No archaeological artefact, assemblage, or settlement (site) may be moved or destroyed without the necessary approval from SAHRA.*
>
> • *Human remains older than 60 years are protected by the National Heritage Resources Act Section 36. Human remains that are less than 60 years old are protected by the Human Tissue Act* ***(Act 65 of 1983 as amended).***

The following sections of the South African Heritage Resources Act, 1999 ***(Act 25 of 1999)*** must be noted: -

> *In terms of section 3 (1 & 2) of the NHRA, heritage resources of South Africa that are of cultural significance or other special value for the present community and for future generations and are considered part of the national estate and fall within the sphere of operations of heritage resources authorities include: -*
>
> *(a) Places, buildings, structures and equipment of cultural significance;*
> *(b) Places to which oral traditions are attached or which are associated with living heritage;*
> *(c) Historical settlements and townscapes;*
> *(d) Landscapes and natural features of cultural significance;*
> *(e) Geological sites of scientific or cultural importance;*
> *(f) Archaeological and palaeontological sites;*
> *(g) Graves and burial grounds, including: -*
> *(i) Ancestral graves;*
> *(ii) Royal graves and graves of traditional leaders;*
> *(iii) Graves of victims of conflict;*
> *(iv) Graves of individuals designated by the Minister by notice in the Gazette;*
> *(v) Historical graves and cemeteries; and*
> *(vi) Other human remains which are not covered in terms of the Human Tissue Act, 1983* ***(Act No. 65 of 1983);***
>
> *(h) Sites of significance relating to the history of slavery in South Africa;*
> *(i) Movable objects, including: -*

> *(i) Objects recovered from the soil or waters of South Africa, including archaeological and palaeontological objects and material, meteorites and rare geological specimens;*
> *(ii) Objects to which oral traditions are attached or which are associated with living heritage;*
> *(iii) Ethnographic art and objects;*
> *(iv) Military objects;*
> *(v) objects of decorative or fine art;*
> *(vi) Objects of scientific or technological interest; and*
> *(vii) books, records, documents, photographic positives and negatives, graphic, film or video material or sound recordings, excluding those that are public records as defined in section 1 (xiv) of the National Archives of South Africa Act, 1996* ***(Act No.43 of 1996).***

Without limiting the generality of subsections (1) and (2), 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.

5.2. Grading and field rating *([4]).*
Section 7 of the NHRA distinguishes between three grades of declared (formally protected) heritage resources.

• **National (Grade I):** Heritage resources with qualities so exceptional that they are of special national significance.

• **Provincial (Grade II):** Heritage resources which, although forming part of the national estate, can be considered to have special qualities that make them significant within the context of a province or a region. All other heritage resources in the province are by default Grade II.

• **Local (Grade III):** Other heritage resources worthy of conservation. The Grade III tier is further split into three sub-categories, with IIIa = high, IIIb = medium and IIIc = low local significance. ***(SAHRA 2005/2007, 2016; Wiltshire 2013: 325).*** Grading is intended to allow for

[4] ***See Addendum 11, Grading and impact, for results of grading evaluation.***

the identification of the appropriate level of management for any given heritage resource. Grade I resources are intended to be managed by the national heritage authority. Provincial heritage resources authorities would manage Grade II sites. Grade III resources would be managed by the relevant local planning authority ***(Wiltshire 2013: 325).*** These bodies are responsible for grading, but anyone may make recommendations for grading. ***Unfortunately, only a few Provincial Heritage Resources Authorities (PHRAs) are fully functional.***

While grading is actually the responsibility of the heritage resources authorities, all reports must include Field Ratings for the site(s) discussed (proposals for grading), to comply with section 38 of the national legislation ***(SAHRA Draft Minimum Standards 2016: 25–26): -***

> **a) Proposed Field Rating/Grade 1 National Resource:** This site is considered to be of Field Rating/Grade I and must be nominated as such (mention must be made of any relevant international ranking), a protected buffer zone must be proposed, these sites must be maintained in situ and a CMP must be recommended for the in-situ conservation of the site;
>
> **b) Proposed Field Rating/Grade II Provincial Resource:** This site is considered to be of Field Rating/Grade II and must be nominated as such, a protected buffer zone must be considered, these sites must be maintained in situ and a CMP must be recommended for the in-situ conservation of the site;
>
> **c) Proposed Field Rating/Grade IIIA Local Resource:** The site must be retained as a heritage register site **(High significance)** and so mitigation as part of the development process is not advised, a protected buffer zone must be considered, these sites must be maintained in-situ and a CMP must be recommended for the in-situ conservation of the site;
>
> **d) Proposed Field Rating/Grade IIIB Local Resource:** This site could be mitigated and (part) retained as a heritage register site **(High/Medium significance).** Mitigation of these sites must be subject to a formal permit application process lodged with the relevant heritage resources authority;
>
> **e) Proposed Field Rating/Grade IIIC Local Resource:** These are sites have been assigned a **Low field rating** which, once adequately described in the Phase I Assessment, may be granted destruction authorisation at the discretion of the relevant heritage authority outside of the formal permitting process, ***(with regard to section 38(8)*** cases. This will be subject to the granting of the Environmental Authorisation.

5.3. National Environmental Management Act, 1998 ***(Act 107 0f 1998).***

The NEMA and subsequent regulations provide for co-operative, environmental governance by establishing principles for decision-making on matters affecting the environment, institutions that will promote co-operative governance and procedures for co-ordinating environmental functions exercised by organs of state; and all matters connected therewith.

The content of the Specialist Report must be in accordance with the specifications of NEMA EIA Regulations ***(GNR 982 of 4 December 2014),*** with specific reference to ***Appendix 6: Specialist Reports*** and must contain the following: -

(a) Details of: -

(i) The specialist who prepared the report; and
(ii) The expertise of that specialist to compile a specialist report including a curriculum vitae;

(b) A declaration that the specialist is independent in a form as may be specified by the competent authority;

(c) An indication of the scope of, and the purpose for which, the report was prepared;
(d) The date and season of the site investigation and the relevance of the season to the outcome of the assessment;

(e) A description of the methodology adopted in preparing the report or carrying out the specialised process;

(f) The specific identified sensitivity of the site related to the activity and its associated structures and infrastructure;

(g) An identification of any areas to be avoided, including buffers;

(h) A map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;

(i) a description of any assumptions made and any uncertainties or gaps in knowledge;

(j) a description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives on the environment;

(k) Any mitigation measures for inclusion in the EMPr;

(l) Any conditions for inclusion in the environmental authorisation;

(m) Any monitoring requirements for inclusion in the EMPr or environmental authorisation;

(n) A reasoned opinion: -
(i) As to whether the proposed activity or portions thereof should be authorised;
(ii) If the opinion is that the proposed activity or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan;

(o) A description of any consultation process that was undertaken during the course of preparing the specialist report;

(p) A summary and copies of any comments received during any consultation process and where applicable all responses thereto; and

(q) Any other information requested by the competent authority.

5.4. International treaties, conventions and charters.
South Africa is signatory to a number of international agreements, which have implications for heritage conservation and management including the World Heritage Convention that

places certain obligation on the state and civil society for the management of heritage resources.

South Africa as a member of the United Nations Organization for Education, Science and Culture **(UNESCO)** subscribes to and takes part in a number of the subsidiary programs including the International Council of Museums **(ICOM),** International Committee for Monuments and Sites **(ICOMOS)** and various other international conservation bodies under the umbrella of **UNESCO.**

Of these the most important and pertinent is the ICOMOS Charter for the Conservation of Places of Cultural Significance, commonly known as the Burra Charter **(2009, 2013).** Although first adopted in 1979, the Charter remains current with the latest version adopted in October 2013. The Charter is considered to be the international blueprint on the conservation of places of cultural significance. The Burra Charter accordingly sets the international standard for standard of practice for those who provide advice, make decisions about, or undertake works to places of cultural significance, including owners, managers and custodians. ***(Australian ICOMOS Charter for places of Cultural Significance 2013).***

6. Archaeological and Historical Context.

6.1 The Stone Age archaeology.
(For full description see Addendum 3.)

Unfortunately, as far a known, the harsh environment of the Eastern Transvaal inhibited long term habitation to hunter-gatherer societies throughout the entire Stone Age. During the last two millennia though, the influx of Agro-Pastoralist peoples and European pioneers marginalised the potential hunting grounds of "the first peoples" encountered by them.

Although it is known, through amongst other resources farm names in the region, that there was a noticeable presence of Hunter-Gatherers. This through the prefix "Boschman-"coupled to fountains, streams, hills and similar natural phenomena to compile farm names. Owing to the very late Hunter-Gatherers' ephemeral lifestyle of seasonal and regional migration very little traces can be found of their passing through the present study area.

No Stone Age heritage remains were encountered during the fieldwork.

6.2 The Iron Age.
(For full description see Addendum 3.)

Agro-pastoral farmers moved into the Southern African region during the period since circa 2000 YA. The term Iron Age is widely used to describe the Agro-pastoral (mixed farming) way of life associated with speakers of Bantu languages that contrasted with the Stone Age hunter-gatherer lifestyle ***(Huffman 2007).*** The Iron Age within sub-Saharan Africa has been divided into the Early Iron Age (AD 200–900), Middle Iron Age (AD 900–1300) and Late Iron Age (AD 1300–1840) ***(Huffman 2007; Kusel 2009).***

Early Iron Age sites mainly occur in northern and eastern Limpopo Province, as well as along the Kwa-Zulu Natal coastal region sited on soils compatible to early farming practices

Middle Iron Age sites mainly occur in northern and eastern Limpopo Province, as on soils compatible to early farming practices including large cattle assemblages. During this period trade with and trade routes to the eastern coast on the Indian Ocean becomes prominent in South Africa.

Later Iron Age sites occur in the Northern-, Gauteng-, Free State-, Gauteng-, Lesotho-, Kwa-Zulu Natal-, Swaziland- Mozambique- and Limpopo Provinces. , as well as along the Kwa-Zulu. Owing to continuous civil war sites can comprise from a handful of families to the mega-"cities" of Celonskraal, Khaditshwene and the large "kraals" of the AmaZulu Kings.

Apart from normal environmental conditions for their farming practises, vegetation in the form of trees become very important for construction and energy. This then limits settlement in areas of low tree density, such as the Easter Highveld in Mpumalanga. Added to this is the extremely cold winters that occur there. From this reality one find LIA occupation mainly north and west of Middelburg, north and east of Belfast, south and west of Heidelberg and south and east of Ermelo. No LIA occur on the region of the study area.

No Iron Age heritage remains were encountered during the fieldwork.

Historical Period. ***([5])***

Mzilikazi was originally a lieutenant of Shaka but had a quarrel with him in 1823 and rebelled. Rather than face ritual execution, he fled northwards with his followers. He first travelled to Mozambique but in 1826 he moved west into the Transvaal and initiated the period known as the *Mfecane.* In the Transvaal his army easily overpowered the large peaceful Tswana, Sotho and other communities, that have over several centuries inhabited and populated this region of abundance.

From the Travels and diaries of Campbell, Burchell and Moffat we get a very clear view that Agro-Pastoralist's never lived south of Kuruman or any-were in the research area. This is also confirmed by the British establishing a range of "Native Reserves" between the 1870's and 1901 *([6]).*

6.4 The missionary endeavour.

Missionary work in the region was mainly undertaken by the British London Missionary Society, the French and the Americans. For a fuller account ***see Addendum 5, The Mission Stations of Griquatown, Kuruman and Mosega.***

6.5 The mining history. ***([7])***

The mining history and current mining operations are not extensively discussed for the purpose of this report. Early mention by missionaries mentions the Asbestos Mountains, but this was never extensively exploited owing to its remote location and eventual health hazard.

The vast lime reserves were only started to be mined after the arrival of the railroad in the region. The Lime Acres mine south of Postmansburg have been utilized by PPC for many decades, while AfriSam has during the last few decades heavily invested in lime/cement production in the Lichtenburg area.

of 709 million tons of ore grading 64.2% iron metal.

[5] For fuller details see Addendum 6, Historical cameos from the greater region.
[6] For fuller details see Addendum 4, Historical cameos from the greater region.
[7] For fuller details see Addendum 8, Ecological milieu including Geology and Vegetation.

7. Previous HIAs.

See Addendum 8 for some reports.

Archaeological Impact Assessments (AIAs), Heritage Impact Assessments (HIAs) and academic publications on the prehistory and historical period generated a data base for the general area. These sources demonstrate an ephemeral cultural landscape with no Iron Age or little saturation historical permanent settlement with utilization of the local resources only from limited Stone Age peoples, from the recent past.

A desktop study of existing literature on the wider region was conducted to assess the heritage context. The SAHRIS data base was also accessed for previous heritage reports that relate to the general region of the survey, especially for coal mining licence applications. No Iron Age and few historical era sites have been recorded but none occur on the site under investigation. On the other hand, important stratified ESA sites do occur in the area but only a few disturbed Later Stone Age open-air sites have been found around the numerus Pan Water Sources.

8. Findings.

For full description see Addendums 6 and 7.

This Phase 1 Heritage Impact Assessment (HIA) was conducted for the 2023 proposed re-application of a Mining Right Licence for Sereti Coal on the Arnot Colliary.

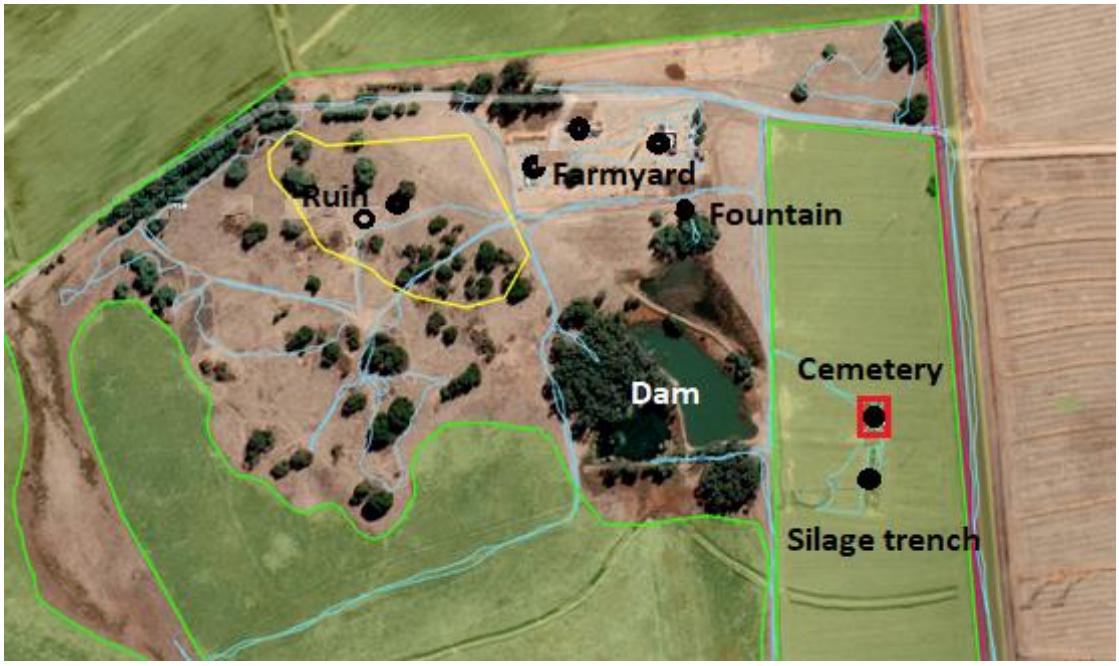


Figure 2. *Above is a Google Earth image with track logging detail overlaid showing heritage remains and points of interest encountered during fieldwork.* ***(Annotation S.U Küsel 2023.)***

RESEARCH FINDS						
Icon	**Degrees south**	**Degrees east**		**Icon**	**Degrees south**	**Degrees east**
Farmhouse				Fa	25°54'1.32"S	29°44'59.18"E
Out-buildings				O	25°54'2.15"S	29°44'55.17"E
Site of demolished labourer dwellings				D	25°54'3.04"S	29°44'50.09"E
Silage trench				S	25°54'12.25"S	29°45'7.46"E
Fountain				Fo	25°54'3.65"S	29°45'0.76"E
Cemetery				C	25°54'10.14"S	29°45'7.67"E

Figure 3. *Table of GPS coordinates of research finds.* ***(S.M. Miller 2023.)***

8.1. Cemetery.

There is a large cemetery containing between 40 to 60 graves present on the eastern border of the property. Owing to vegetation covering the whole burial ground, and the condition of the graves, it was difficult to establish the exact number. What was clear, is that some of the graves are still being tended to, implying living relatives.

The implication therefore is a second phase study to determine the extent of the burial ground, the number of graves and the community involved with the cemetery. This information can then be utilized in decisions for either relocation or a perimeter zone that implies access for community members.

The site is afforded a field rating of **Grade IIIA or IIIB Local Resource, of Medium to High significance.** This site could be mitigated and (part) retained as a heritage register site **(High/Medium significance).** Mitigation of these sites must be subject to a formal permit application process lodged with the relevant heritage resources authority.

It is suggested that a company, **proficient in grave relocations,** is appointed to undertake a second phase study, and then engage in negotiations with Sereti Coal, Shangoni and SAHRA on the issue of relocation or protection by a buffer zone as well as access for family.

This study can run in tandem with the second phase study for the fountain.

8.2. Fountain.

Below the farmyard a fountain was noted that appears to have been enlarged over time and water channelled from it. It is still emitting a reasonable amount of water. Taking in account that most, if not all, fountains utilized on farmland in the past, has disappeared. This is a rare local heritage item.

Furthermore it is known that in some cultures it is preferable to inhume departed loved ones near water. The cemetery mentioned in 8.1 is directly below this spring and may therefore also have spiritual context linked to the spring.

The site is afforded a field rating of **Grade IIIA or IIIB Local Resource, of Medium to High significance.** This site could be mitigated and (part) retained as a heritage register site **(High/Medium significance).** Mitigation of these sites must be subject to a formal permit application process lodged with the relevant heritage resources authority.

The implication therefore is that a second phase study should be undertaken to clarify the status as a heritage remain that should be protected or not.

This study can run in tandem with the second phase study for the cemetery.

8.3. Farmyard.

The age of the brick and mortar buildings on the farmyard possibly date to the 1960's but it is difficult to date it correctly. However, it is of no outstanding heritage merit and can be graded as **Grade IIIC Local Resource:** This site has been assigned a **Low field rating** which. As it is sufficiently described in this Phase I Assessment's photographic documentation in Addendum 7, it may be granted destruction authorisation at the discretion of the relevant heritage authority outside of the formal permitting process.

8.4. Present occupants of the farmyard.

The farmyard is at present occupied by at least four different family groups, has implications for re-settlement of these people. It may also be that some are related to deceased buried in the cemetery.

This is not strictly a heritage issue, but will in time become an item to deal with.

9. Impact Significance Rating.

See Addendum 9 for calculations.

9.1. Cemetery and Fountain.

ENVIRONMENTAL IMPACT RATING/PRIORITY					
PROBABILITY	MAGNITUDE				
	1 Minor	2 Low	3 Medium	4 High	5 Major
5 Almost Certain	Low	Medium	High	High	High
4 Likely	Low	Medium	High	High	High
3 Possible	Low	Medium	Medium	High	High
2 Unlikely	Low	Low	Medium	Medium	High
1 Rare	Low	Low	Low	Medium	Medium

Figure 4. *From the impact assessment tables in Addendum 9 and the impact summary table above, it is evident that the impact of the cemetery and fountain will be of High Environmental Significance without mitigation.* ***(Compiled S.M. Miller 2023.)***

9.1. Cemetery and Fountain.

ENVIRONMENTAL IMPACT RATING/PRIORITY					
PROBABILITY	MAGNITUDE				
	1 Minor	2 Low	3 Medium	4 High	5 Major
5 Almost Certain	Low	Medium	High	High	High
4 Likely	Low	Medium	High	High	High
3 Possible	Low	Medium	Medium	High	High
2 Unlikely	Low	Low	Medium	Medium	High
1 Rare	Low	Low	Low	Medium	Medium

Figure 5. *From the impact assessment tables in Addendum 9 and the impact summary table above, it is evident that the impact of the farmyard buildings will be of Low Environmental Significance.* ***(Compiled S.M. Miller 2023.)***

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13_UCD6802_Appendix M_HIA.pdf

Addendum 1. Natural Environment, Geology and Vegetation.

This Addendum is not supposed to be a scientific description of the natural environment of the study area. It is rather to be seen as a canvas or milieu that supports environmental factors that influenced human habitation in the research area over time. This then assist to determine resource that were present for fruitful living conditions for a variety of populations that developed, peaked and eventually disappeared from existence over time.

It also sets the parameters for the purpose of the heritage impact study, such as mineral deposits proposed to be reclaimed and expected development ideas envisioned by a "client". These proposed effects then has to be assessed in terms of legislation regulating impact on general human life.

1. Geology.

1.1.1. General Southern African Geology.

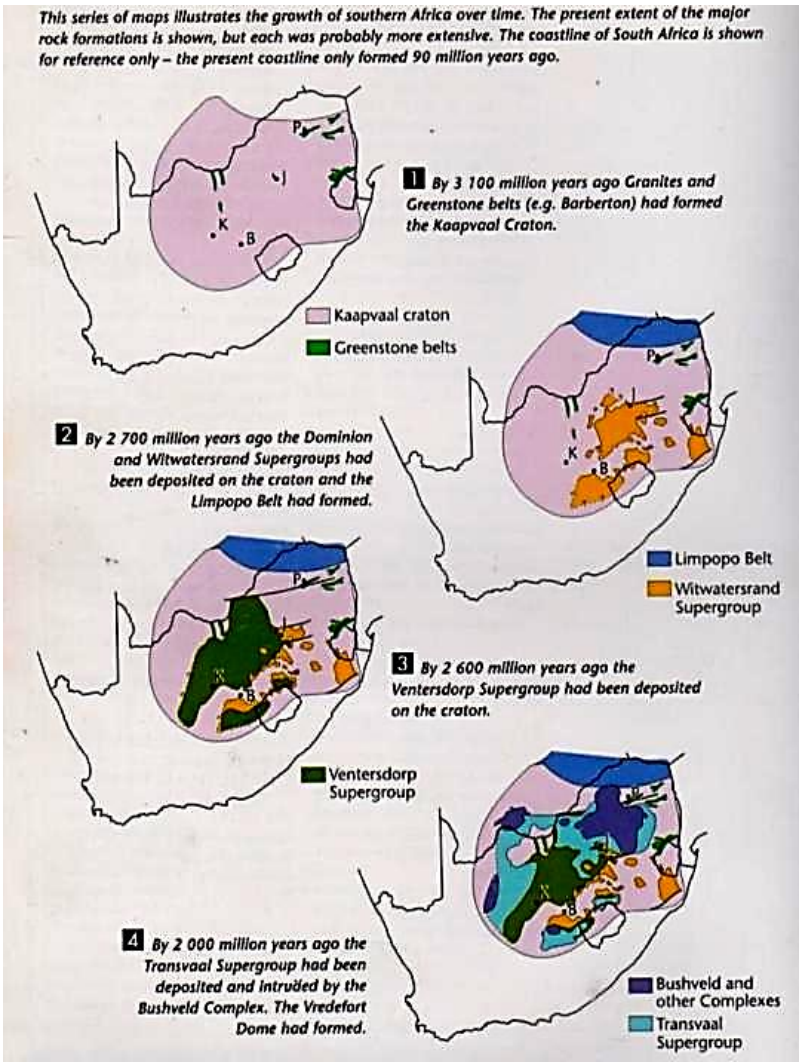

Figure 6. *Left is illustrated the formation of the South African geological substructure between 3100 million years ago and 2000 million years ago.* ***(McCarthy & Rubidge: 334****.).*

In our present study area, the Kaapvaal Craton had formed and the Transvaal Super-group had been deposited. The Bushveld Complex had appeared and the Vredefort meteorite impact had occurred. P in the figure marks Pretoria now Tshwane, west of the study area.

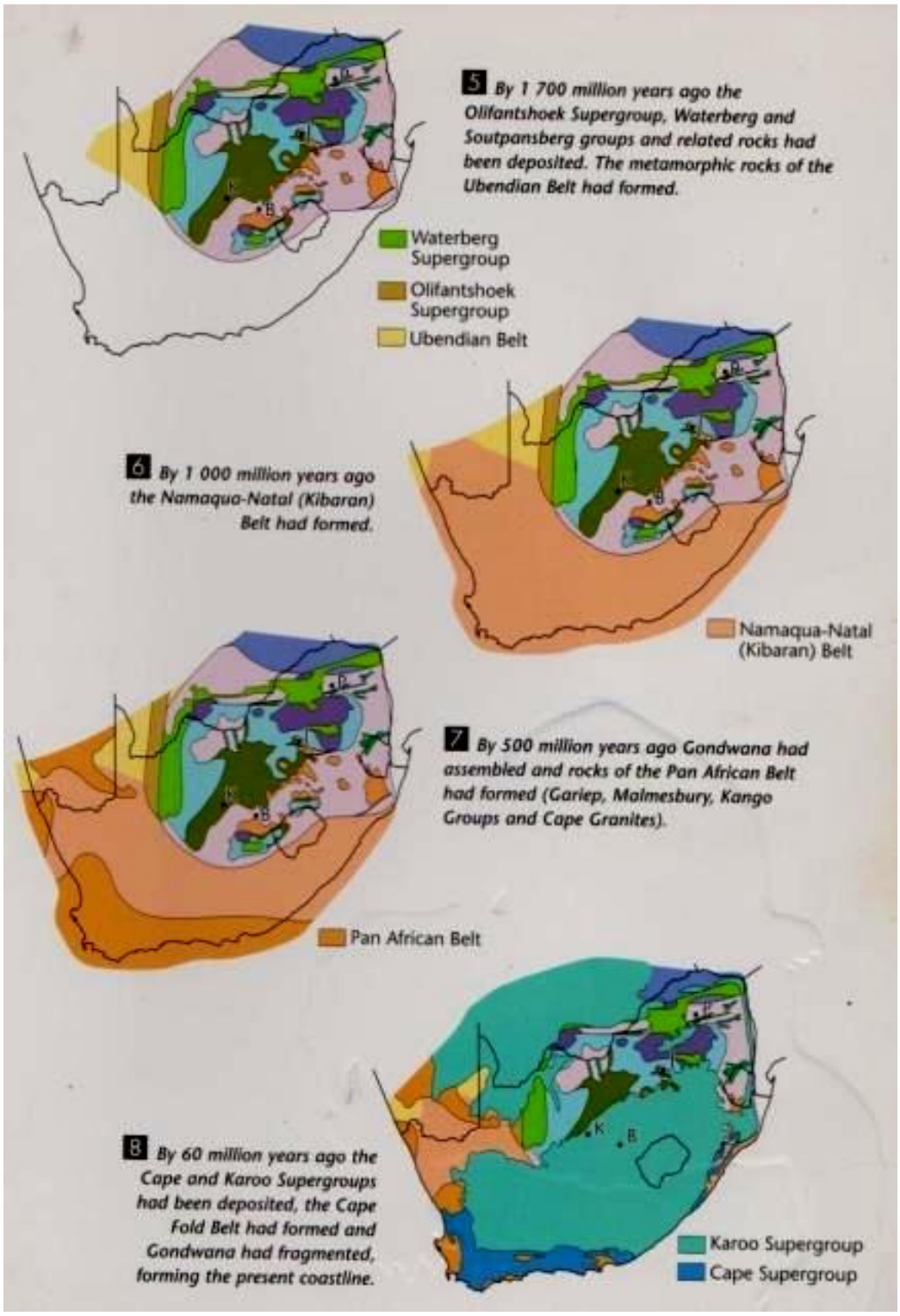

Figure 7 *Above is illustrated the formation of the South African geological substructure between 2000 million years ago and 60 million years ago.* ***(McCarthy& Rubidge: 335.)***

As can be seen above it is only the Karoo Super-group that had `any further significant impact on the study area. P, in the illustrations, marks Pretoria, now Tshwane, and west of the study area

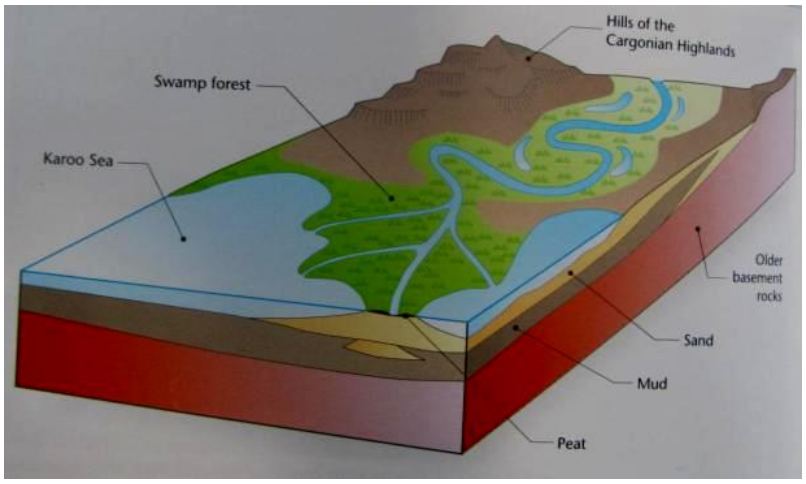

Figure 8. *Schematic explanation of the formation of peat deposits on the shores of the Karoo Sea according to* ***McCarthy and Rubidge, page 200.***

Africa in general and Southern Africa in particular is fortunate to contain evidence of almost all of the geological information regarding the alterations in earth geology over nearly 3 500 million years including the oldest known oceanic crust, consisting of komatiite in the lower Onverwacht Group in Barberton. The only two older rock groups known today can be found in Canada (Granites circa 4100 million years?) and in Iceland (Sedimentary material circa 3 900 million years) as these early periods the earth's crust has been in a continuous process of reshaping owing to plate tectonic movement.

Geologists' uses terms such as the Kaapvaal Craton, the Pangean continent and Gondwanaland that encompasses hundreds of millions of years, but for our present study the geological under-build is fortunately less complex. Apparently within the last 600 million years, as Gondwana drifted from the Antarctic region northwards, and as the ice covering continued to melt, an inland sea was formed between the Cargonian Highlands in the north and the Falkland Plateau in the south, and became linked to the open sea apparently similar to the Black sea. Deposits from the higher areas filled up the Karoo Sea over time forming what is formally known as the Ecca Group sedimentary deposits.

During the time of the formation of the Cape Super group though, it appears as if land plants were tentatively establishing themselves out of the primeval seas. It therefore followed that by the time of the emergence of the Southern Gondwana from underneath the ice sheets, several large tree-like plants had already evolved, and terrestrial life were firmly on its way to utilize the new environment. A great number of plants were to quickly colonise the extensive swamp-like deltas that were feeding into the Karoo Sea from the north.

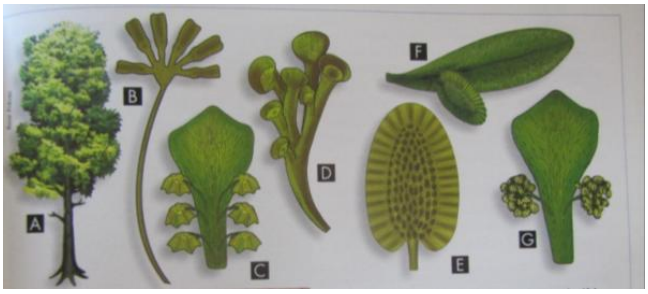

Figure 9 *Reconstruction of Glossopteris.*

Glossopteris (A) and its diversity of seed-bearing organs (B to F) and pollen producing organs comprising clusters of sacs attached to scale leaves. (G) (McCarthy and Rubidge, 219)

Glossopteris as the dominant tree species, with a large number of other plants were soon so prolific and abundant in these extensive swamps that dead vegetation accumulated faster than it could decay, and thick accumulations of peat were formed, which ultimately converted into coal.

The formation of coal.

When recycling of vegetation does not occur, which usually happens if it is growing in water, the organic material accumulates to form peat layers. Over time these layers can be buried under sediments. In the case of the Karoo Basin, rivers draining into the basin along its northern margin formed a series of channels and deltas with well-vegetated margins, which formed extensive swamps.

These swamps were periodically drowned by subsidence, and the peat layers were buried beneath sediment, only to reform as the water again became shallower. In this way multiple peat layers were deposited. Peat contains about 50% carbon, the rest being made-up mainly of oxygen and hydrogen. Once peat is buried beneath sediment, it is compressed and slowly heated. Oxygen and hydrogen are expelled as water, and carbon content increases.

Ultimately the process leads to the conversion of peat into coal. Low heat and pressure results in brown coal or lignite**.** With higher temperatures and pressures bituminous coal and anthracite may also be formed which contains much higher percentages of carbon. During formation, peat contains a certain percentage of fine sediment generally referred to as 'mud'.

This is retained in the carbonisation process and when coal is burnt is a leftover in the form of ash. Coal in a mine often appears to have a multicoloured banded and or layered structure. This is often the result of a variety of plant types that contributed to the peat layers owing to climatic changes.

Figure 10. *This mining pit illustrates the separation of coal seams by pale-coloured sedimentary rock as described in the text.* ***(McCarthy and Rubidge, 201)***

1.1.2. Arnot Colliary specific.

The Coal deposits of the eastern Transvaal Highveld is a very complex geological structure that originated during the Carboniferous Era. However is has been and still is a very large National Resource for South Africa. It is not only the dynamo that generates vast quantities of Southern Africa's electricity requirements, but is also a supply of an export product that produce valuable revenue for the country. To understand some of the local geology we quote from the geological report in the 1993 EMPr that formed the basis for the original Mining Licence application. For the full report see the original application. Attached in PDF format

Quote

The lithologies found in the Arnot Coalfield are part of the Permian-age Vryheid Formation and Dwyka Formation of the Ecca Group. The sediments of the Karoo Supergroup were deposited on an irregular pre-Karoo Basement. The sub-surface distribution of the sediments and coal seams is partly dependant on the basement topography. Local basement highs cause the thinning and pinching out of the N° 1 Coal Seam and the N° 2 Coal Seam, particularly in the eastern and northern parts of the mining area. The stratigraphy and associated coal seams have a gentle regional dip from the north east to the south west. The depth to the top of the N° 2 Coal Seam depends largely on the local surface topography, reaches a maximum depth of 80 metres on the eastern boundary of the mining area. Incision by the Olifants River and associated tributaries have eroded significant areas of the original extent of the coal seams. In general the N° 2 Coal Seam sub-outcrops along all the incised valleys. The depth to the top of coal in the sub-outcrop areas is typically 10 metres, but varies between 4 and 20 metres in depth due to weathering variations. In the topographically elevated areas the N° 5 Coal Seam and N° 4 Coal Seam are present some 30 metres stratigraphically above the N° 2 Coal Seam.

The general lithology of the Vryheid Formation in areas situated stratigraphically below the N° 4 Coal Seam consists of a weathered upper soft overburden zone and a lower sequence of interbedded shale, siltstone and minor sandstone with occasional channel gritstones. The nature of the hard overburden at a particular locality varies significantly, consisting of differing proportions of shale, siltstone and sandstone. Coarse-grained sandstone and grit units are present immediately below the N° 4 Coal Seam, to above the N° 2 seam, sometimes with scour effects in the N° 2 seam. The stratigraphy above the N° 4 Coal Seam is characterised by coarse-grained sandstone and grit units.

The soft overburden zone consists of varying proportions of the topsoil, sub-soil, clay and claysand. The nature of the soft overburden depends largely on the composition of the original lithology, with the clay being derived from the weathering of shale and siltstone, while the claysand is derived from the weathering of the sandstone units. The clay zones tend to have a high soil moisture carrying capacity. The topsoil is typically a well developed loamy soil horizon, but is poorly developed in areas with sandstone outcrops. These outcrop areas tend to occur where the topographic surface dips towards a pan or stream course. In the valley areas hydromorphic clays predominate. The transition between soft overburden and unweathered hard overburden is

Unquote

1.2. Vegetation.

It is important to note that Acocks original study dates back to the 1950's predating the commencement of really large scale maize production, as well as the extensive coal mining operations of the last 30 odd years that effectively altered much of the original specie-

diversification. However, in combination with precipitation and temperature brackets, it created a very specific environment that dictated specific zones for specific Fauna to be present

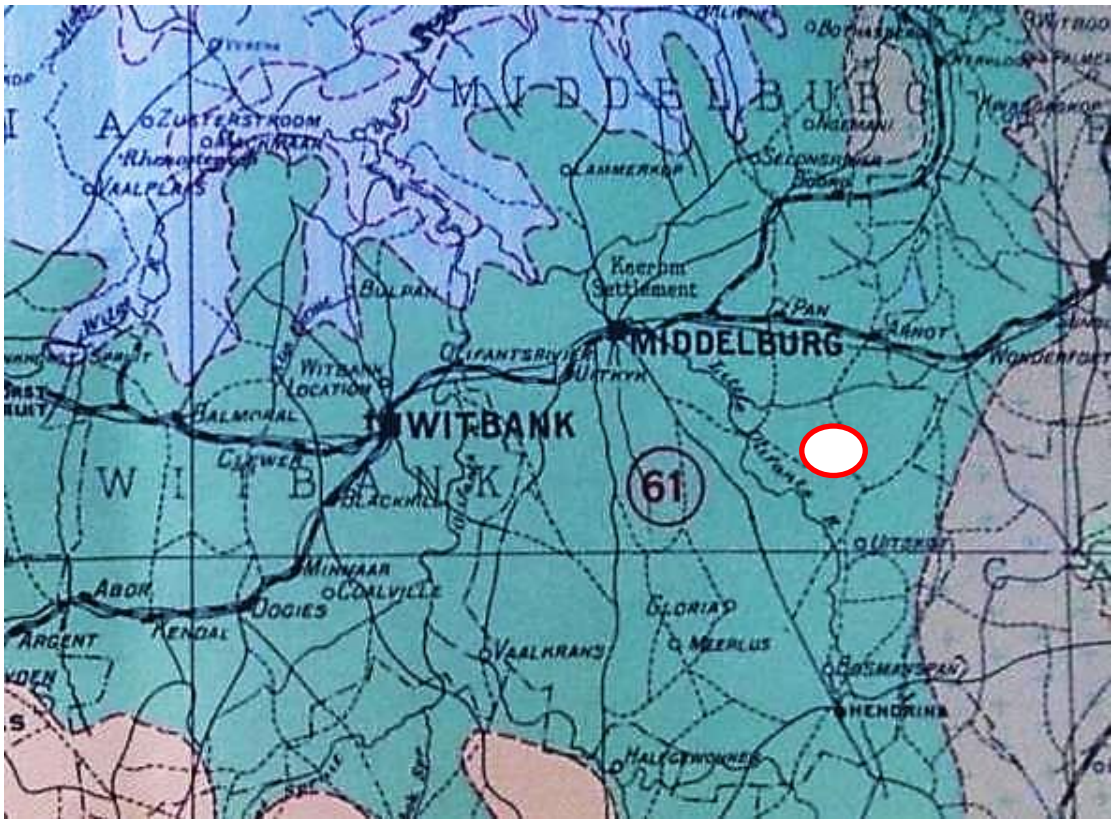

Figure 11. *A portion of Acocks's map of the Veldt Types of South Africa produced by the Botanical Research Institute and the Department of Agricultural Technical Service of the Republic of South Africa.[8] Red circle shows location of the Study area in veld zone 61.*

Veld zone Type 61 is described by Acocks on page 112 as the BANKENVELD which he also classifies loosely as a FALSE GRASSLAND type. This Bankenveld appears to have been an open savannah type of ***Acacia caffra*** character, and still is along its northern boundary. Sour bushveld regularly occurs on rocky outcrops and hills. It is a sparse and tall tufted type with the forbs playing an important part, and is extremely sour. In this case there are three variations, 61a the Western variation on sandy plains, 61b the Central variation of the Witwatersrand region, high-lying, largely stony country, with rolling topography, and finally 61c the Eastern Variation, on sandy plains, but wetter than the Western and Central Variations.

The present study area falls in the Eastern variation 61c. This is described as a very flat sandy country. On the rocky outcrops the veld resembles the Central Variation as it does along the northern margin, being transitional to Sour Bushveld. Rainfall varies from 600 to 750 mm in the summer and altitudes vary from 1350 to 1700 m above sea level. The dominant six grass

[8] The present author is well aware of the 2006 publication of Mucina, L. & Rutherford, M.C. (eds). "The vegetation map of South Africa, Lesotho and Swaziland." Strelitzia 19, South African National Biodiversity Institute. But Acocks's work was done a half a century ago since when much has changed in environmental matters, and relates more appropriately in heritage studies.

species are *Tristachya leucothrix, Eragrostis racemosa, Heterpogon contortus, Trachypogon spicatus, Digitaria tricholaenoides* and *Themeda triandra.*

[9]

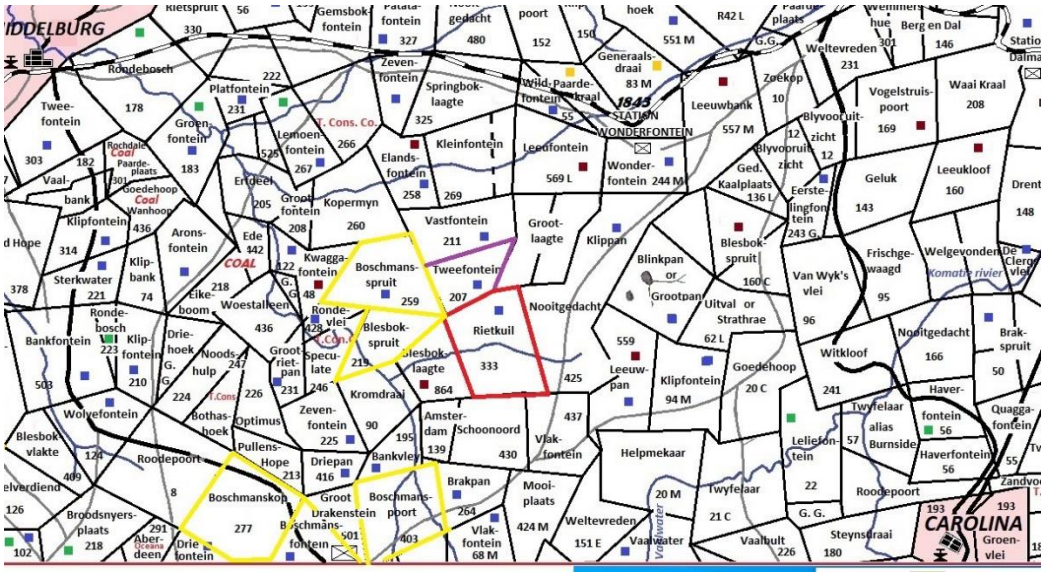

Figure 12. *Excerpt from* ***sheet 5 of the Jeppe Map of 1899.*** *The farm names illustrate the environmental character of the area surrounding the study area. It is a rather wet environment and the Fauna represented illustrate the difficulties for a Stone Age hunting society. Hartebeest, Wildebeest, Eland, Lion, Hyena, Rhino, Elephant, Hippos and Bees.*

The environmental factors of geology, vegetation, precipitation, temperature crated a rather bleak setting of open, cold in winter and wet in summer, plains with very little wooded vegetation that could support large Iron Age communities for basic firewood requirements. The soil was also not conducive to traditional Iron Age crop production that inhibited permanent or semi-permanent settlement of larger family or community groups. Also there were large tracks of land surrounding the Eastern Highveld that supplied soils and firewood and more compatible temperature zones.

As a matter of fact, this kind of environment was nearly ideal for small bands of mobile Hunter-Gatherers, apart from possibly the cold winters. In a strange way this is hen also reflected with many farms in the area contains the prefix “Boesman-“, linked to “-Fontein”, “-Krans” “, “-Spruit”, “-Pan” and several more for the naming of many of the properties in he area

1.3. Impact of geology and vegetation on fieldwork.

Apart from some excessive grass growth in the cemetery environmental factors had a low impact on field-work observation and quality.

The real impact on preservation of heritage remains were the long and ongoing maize productions, mining operations and infrastructure related to mining.

[9] ***For a more complete list see Acocks page 114.***

Addendum 2. The southern African chronological sequence

2.1. Southern African chronological sequence.

The following table provides an overview of the southern African chronological sequence, the main attributes associated with a particular period, and cultural groups associated with each of the periods.

The southern African chronological sequence		
Cultural period and approximate ages	Cultural groups	Technological attributes and tool types
Earlier Stone Age (ESA) >2 m—>200 000 ya	Early hominins Australopithecines Homo habilis Homo erectus archaic Homo sapiens	Large cutting tools (LCTs), scrapers and flaked forms. Some use of flaked bone as tools
Middle Stone Age (MSA) 20 000 ya	Archaic and fully modern Homo sapiens	A reduction in tool size. Blades, convergent points and awls made on prepared core types to produce uniform tool forms, also scrapers and other tool types. Flaked products were often further shaped through secondary retouch to produce a range of formal tool types. Decorative items, body ornaments and ochre use become apparent. Rare engravings and rock art.
Later Stone Age (LSA)	Homo sapiens San hunter-gatherers Khoekhoe herders	An extended range of microlithic tool types, often used as inserts for bow-andarrow hunting. Characteristic tools include scrapers, borers, and arrow heads. Ostrich eggshell (OES) beads and flasks — sometimes decorated— are prolific. Trade/barter items include glass, iron and copper beads, and pigments. Leather working, basketry, bone implements and armatures for arrows are common. Bowand-arrow hunting and snaring. San and herder ceramics. Domestic animals: sheep, goats, cattle and dogs. Rock art. Polished stone tools and grooved stones used to shape different bone implements
Early Iron Age (EIA) c. AD 200—c. AD 900	Bantu-speaking African farming communities	Distinct pottery styles for the various pottery expressions, metal working, subsistence agriculture, domestic animals, trade and barter. Upper and lower grinding stones.
Middle Iron Age c. AD 900—c. AD1300	Bantu-speaking African farming communities	Distinct pottery for the various ethnic groups, metal working, subsistence agriculture, domestic animals, trade and barter

Late Iron Age (LIA) c. AD 1300 – c. AD 1840 Stone-walled LIA sites: c. AD 1640—c. AD1840	Bantu-speaking African farming groups and Europeans	Characteristic pottery traditions associated with each of the main divisions, metal working, subsistence agriculture, domestic animals, trade and barter. Upper and lower grinding stones and other stone implements. Farmer rock art. Stone-walled settlements.
Colonial Period c. 1650	Bantu-speaking African farming groups and Europeans	Historical structures, industrial metals, glass, porcelain and ceramics
Historical Period c. 1850	Various African groups, groups of mixed origin and Europeans	Historical structures, industrial metals, glass, porcelain and ceramics

2.2. Synthesis of cultural succession.

2.2.1 Stone Age Archaeological traces in the form of mostly stone tools suggest a widespread presence for tool producing Plio-Pleistocene hominins in southern Africa. The South African Stone Age sequence is chronologically divided into the Earlier Stone Age (ESA), the Middle Stone Age (MSA) and the Later Stone Age (LSA) based on the concept of techno- or industrial complexes. Each of the subdivisions is formed by a group of industries where the assemblages share attributes or common traditions (Deacon & Deacon 1999; McNabb et al. 2004; Hardaker 2011; Lombard et al. 2012; Dusseldorp et al. 2013).

The australopithecines were gradually displaced by Homo habilis, a genus that evolved into the more advanced Homo ergaster/erectus by 1.8 million years BP. The large stone cutting tools (LCTs) associated with these hominins form part of the Oldowan and Acheulean industries of the ESA. Most ESA localities with stone tools in South Africa are associated with the hominin species known as Homo erectus, and the more recent ESA assemblages with archaic Homo sapiens (Barham & Mitchell 2008). By >250 000 years BP, the large cleavers and handaxes (large cutting tools or LCTs of the ESA were discontinued and replaced by a larger variety of smaller tools and weapons of diverse shapes and sizes and made by using different techniques. The MSA typologies following on the ESA represent greater specialization in the production of stone tools, in particular flake, blade and scraper tools and also in a more extended range of specialized, formal lithic tool types (Thackeray 1992; Wadley n.d., 1993, 2005, 2013a, 2013b, 2015, 2016; McBrearty & Brooks 2000van der Ryst 2006; Mitchell 2008; Wadley et al. 2009; Macdonald & Wilkins 2010; Van der Ryst & Küsel 2013).

These changes in technology mark the beginning of the MSA. The MSA is known for typically prepared centripetal cores that delivered specific convergent/pointed flakes and a range of flake blades (Soriano et al. 2007). Flaked products often retain the characteristic faceted striking platform that derives from this technique. Several other core types were also used to produce blank forms. Many of these were shaped by secondary trimming to produce a range of formal tool types. This period is moreover characterized by regional lithic variability, evidence for symbolic signalling, polished bone tools, portable art and decorative items. The main developments during the MSA are cognitive, cultural and physical modernity (Wadley 2013a, 2013b, 2015, 2016; Chazan 2020; Feathers et al. 2020).

The MSA, which lasted almost half a million years, is associated with early modern humans with complex cognition, novel behaviours and transformative technologies. During the MSA early humans still settled in the open near water sources but also in caves and shelter localities. The MSA marks the transition from the more archaic Homo species to anatomically modern humans, Homo sapiens sapiens (Jurmain et al. 2013). It is now generally accepted that the MSA was fully replaced by a mostly microlithic LSA marked by a series of new technological developments and cultural innovations (Wadley 2013a, 2013b). The LSA is marked by a series of technological innovations, social transformations and also noticeable demographic changes (Mitchell 2002a).

The transition from the MSA to the LSA is vague. Dates proposed for the transitional period range from around 60/40 000 – 20 000 years ago based on a series of dates obtained through diverse dating methods, palaeoclimatic inferences as well as lithic technologies and diagnostic tool types as artefactual markers of a particular period. The major changes comprise the replacement of MSA lithic technologies by LSA microlithic stone-working traditions and more widespread signs of symbolic and ritual activity in the form of art and decorative items, specifically objects made for personal adornment, such as pendants and the ubiquitous ostrich (Struthio camelus) eggshell (OES) beads (Mitchell 2002a; Forssmann 2013; Mitchell 2016).

During the LSA small (microlithic) tools, bone tools and weapon armatures and a range of decorative items as well as rock art were produced. Hunter-gatherer societies (and the later San) relied to a large extent on bow-and-arrow hunting with poisoned tips, and also snaring. Veld foods and medicinal plants were gathered. Ceramics were used and/or produced by hunter-gatherers and Khoekhoe herders towards the terminal phases of the LSA over a period of around 2000 years. Many of these stone tools and other material cultural items were still manufactured and used when the first Europeans settled in southern Africa in the 17th century AD. Information recorded about the lifestyles of the Khoekhoe herders and the San (Bushmen) at the time of the arrival of Europeans provides some insight into the immediate past history of these indigenous people. Evidence for Stone Age communities within the broader region comprises the complete sequence of the southern African Stone Age (Mason 1962).

2.2.2 Rock Art. Thousands of painted and engraved sites dating from the LSA have been documented throughout Southern Africa and many more are still being found every year. Paintings and engravings were also executed on loose slabs of stone and some were used as markers for storage pits and in burials. Rock art in the form of paintings, but in particularly the many and diverse categories of engravings on the Highveld, is not well represented in the general region (Mason 1962, 2002; RARI Wits Database Moodley 2008).

2.2.3 Settlement by African farmers. The migrations into southern Africa and the expansion of Early Iron Age (EIA) African farming societies are apparent from AD 400 onwards. Pioneer Sotho-Tswana and other ethnic groups settled in semi-permanent villages, cultivated a range of crops, raised livestock, made ceramic containers, mined ore and smelted metals and engaged in trade or barter. Our understanding of EIA sites relies heavily on ceramic assemblages as the most archaeologically visible remains of the EIA cultures (Küsel 2012).The Late Iron Age was accompanied by aggregations of large numbers of communities (Huffman 2007, 20017, 2020; Boeyens 2003, 2016) that were often marked by extensive stonewalled settlements, or enclosures demarcated with poles and brushwood

Addendum 3. Archaeological and Historical context of the study area.

6.1 The Stone Age archaeology.

Early Stone Age (ESA), Middle Stone Age (MSA) and Later Stone Age (LSA) Lithics occur widely within the greater region of Northwest-, Limpopo-, Mpumalanga- and Gauteng Provinces. The materials used for the stone tools derived from a variety of geological materials.

Important sites include the Sterkfontein complex, the Wonderboom Acheulean site, the Makapaan Caves complex, The Pietersburg complex, the Echo Caves complex and similar.

Several rock art and engraving sites that date to the LSA are present in the wider region. These include engravings along the Vaal River and a multitude, complex and divers painted heritage along the Limpopo and into the Pilgrims Rest area.

Unfortunately, as far a known, the harsh environment of the Eastern Transvaal inhibited long term habitation to hunter-gatherer societies. During the last two millennia though, the influx of Agro-Pastoralist peoples and European pioneers marginalised the potential hunting grounds of "the first peoples".

These areas include the desert areas of Namibia and Botswana, the inhospitable Drakensberg mountain range and finally the cold Eastern Transvaal Highveld. Owing to the very late Hunter-Gatherers' ephemeral lifestyle of seasonal and regional migration very little traces can be found of their passing through the present study area.

6.2 The Iron Age.

Agro-pastoral farmers moved into the Southern African region during the period circa 2000 YA. The term Iron Age is widely used to describe the Agro-pastoral (mixed farming) way of life associated with speakers of Bantu languages that contrasted with the Stone Age hunter-gatherer lifestyle ***(Huffman 2007).*** The Iron Age within sub-Saharan Africa has been divided into the Early Iron Age (AD 200–900), Middle Iron Age (AD 900–1300) and Late Iron Age (AD 1300–1840) ***(Huffman 2007; Kusel 2009).***

Although these divisions are somewhat arbitrary, they are useful in defining broad-based cultures, changing world views and technological advances. The term Iron Age is widely used in the South African context to describe the agropastoral (mixed farming) way of life associated with speakers of Bantu languages that contrasted with the Stone Age hunter-gatherer lifestyle ***(Huffman 1980, 1989, 2007, 2017, 2020).***

Agropastoral lifestyles are characterized by the production of both crops and retaining domestic herds and may be implicit in a lifestyle that occasionally included annual or seasonal migration to compensate for depletion of local resources.

Broadly speaking, the Iron Age can be separated from the preceding Stone Age in terms of distinguishing characteristics that included a reliance on food production through agriculture

or animal husbandry, a settled village life, the manufacture of large quantities of pottery in distinct styles and, in particular, metal-working ***(Mitchell 2002).***

The evidence accumulated to date strongly suggests that the Iron Age and the associated settlement of farming communities in the sub-continent can most convincingly be explained in terms of population movement from further north. Within the South African context this model is largely based on ceramic typology, with the most widely used approach being the model developed by Tom Huffman ***(Mitchell 2002).***

Most important though is the availability of suitable soils for crop production and sufficient and constant yearly precipitation to allow farming independent of irrigation

6.2.1 The Early Iron Age.

There are several Early Iron Age (EIA) settlements, where ceramics diagnostic of the Doornkop facies, exist in the Eastern Lowveld, especially in the Steelpoort Valley. ***(Van Schalkwyk 2007a; Huffman & Schoeman 2002).*** Archaeologists' knowledge of EIA sites and cultural remains in Southern Africa is based on a relatively small statistical sample from a handful of sites, located mainly in the Eastern bushveld of South Africa, and by no means comprehensive. The current body of archaeological data demonstrates that EIA communities were essentially subsistence farmers with the dominant crops being millets and sorghums, although cucurbits, groundnuts and beans were also produced. There is no known Early Iron Age site near the present study area.

6.2.2 The Middle to Late Iron Age.

Around a 1000 ya the Mapungubwe State, that dominated large portions of the Northern Transvaal, Eastern Botswana, Southern Zimbabwe and limited portions of present-day Mozambique regulated life in the larger region until its final demise around 800 ya. From then on various Sotho, Tswana and Ndebele African farming communities inhabited the land to the east of the dry Kalahari. These included the Bahurutsi, Northern Sotho, Venda and Ndzundza Ndebele. ***(Mönnig 1963, 1978; Bergh 1990; Van der Ryst & Meyer 1999). Kusel (2006a, 2006b, 2008, 2012)*** provides detail on the origin of the first Sotho–Tswana groups and on the rise of the Pedi Empire during the reign of successively Thulare, Sekwati and Sekhukhune in the Eastern Transvaal. From the end of the eighteenth century and the early nineteenth century the area directly east of the present research area is also highly impacted upon by the raids from the south-east, most notably by the notorious Mzilikazi. This rebellious general of Chaka was finally expelled from the region by the Boer forces of Potgieter circa 1836-1838. Although some of the local indigenous peoples accepted this change of occupiers, Many Tshwane peoples, especially Sechele, eventually decided to seek the protection of the British Crown to the north of the study area, to eventually form what is today known as Botswana

6.3 The Historical Period. ***([10])***

The Historical Period in this region took a vastly different road than what happened to the areas to the east. European (Boer) Settlers were in fact no different in need for land than the indigenous peoples they forcibly ejected from the higher rainfall bushveld and highveld regions to the north, north-east, east and south-east.

Therefore, the first interest by Europeans (especially the British) became apparent after the discovery of diamonds along the Orange and Vaal Rivers in the 1870's, and the eventual discovery of the Kimberly mines ***(In Roberts 1984, Kimberly Turbulent City),*** that led to the

[10] For fuller details see Addendum 6, Historical cameos from the greater region.

first South African War and the establishment of the Bechuanaland Protectorate. ***(Sir Charles Rey, 1988.)***

Before this the only first historical event that impacted on the region was the formation of the Gruiqua peoples loosely called ***"Nation"***, from an array of mixed peoples between the later 18th century and middle 19th century. The original highly mobile Khoi or Khoe-Khoe or rather, first nation peoples, that lived nomadic lifestyles centred around animal husbandry were supplemented by escaped slaves of mixed race from the Cape Colony. This combination easily slipped into a simplified "European/Dutch/Boer" lifestyle outside the borders and control of the Cape Colony.

But over time they acquired valuable assets such as wagons, oxen, horses and "modern" rifles and an insatiable want for cattle that was available from their Agro-pastoralist neighbours to the east in the higher rainfall areas. From the Dutch and British they learnt the value of "cavalry warfare" and frequently raided eastwards until the arrival of Mzilikazi.

Mzilikazi was originally a lieutenant of Shaka but had a quarrel with him in 1823 and rebelled. Rather than face ritual execution, he fled northwards with his followers. He first travelled to Mozambique but in 1826 he moved west into the Transvaal and initiated the period known as the *Mfecane.* In the Transvaal his army easily overpowered the large peaceful Tswana, Sotho and other communities, that have over several centuries inhabited and populated this region of abundance.

During his reign of a decade or more, his only enemies were his own people from Natal, now, after the death of Chaka under Dingaan, and the Griqua to the west. After the arrival of the Potgieter trek in 1836, and his first defeat at Vegkop south of the Vaal River, the end of his struggle-hold was not long to come about. Both the earlier diaries of Moffat and the Smith expedition of 1836 gives us a clear view of his harassment by the Gruiqua and the Boers and by 1836 he was finally expelled from the Transvaal.

From the Travels and diaries of Campbell, Burchell and Moffat we get a very clear view that Agro-Pastoralist's never lived south of Kuruman or any-were in the research area. This is also confirmed by the British establishing a range of "Native Reserves" between the 1870's and 1901 *([11]).*

6.4 The missionary endeavour.

Missionary work in the region was mainly undertaken by the British London Missionary Society, the French and the Americans. For a fuller account ***see Addendum 5, The Mission Stations of Griquatown, Kuruman and Mosega.***

6.5 The mining history. *([12])*

The mining history and current mining operations are not extensively discussed for the purpose of this report. Early mention by missionaries mentions the Asbestos Mountains, but this was never extensively exploited owing to its remote location and eventual health hazard.

The vast lime reserves were only started to be mined after the arrival of the railroad in the region. The Lime Acres mine south of Postmansburg have been utilized by PPC for many

[11] For fuller details see Addendum 4, Historical cameos from the greater region.

[12] For fuller details see Addendum 8, Ecological milieu including Geology and Vegetation.

decades, while AfriSam has during the last few decades heavily invested in lime/cement production in the Lichtenburg area.

of 709 million tons of ore grading 64.2% iron metal.

.2. Prehistoric occupation –the Iron Age.

The Iron Age in southern Africa is represented by the arrival of Agro-pastoralist peoples from central Africa. These people were different to the Stone Age people in the sense that they were true farmers with the capacity to work a range of metals, build dwellings and manufacture ceramics.

Between the fourth century and the ninth century these people were isolated in the Bushveld regions of Southern Africa from international contact and trade. In general these peoples never chose to live on the Transvaal Highveld, negating them from expected inhabitants of the area under investigation.

Between the ninth century and the sixth century traders from the east came by sea faring vessels to coastal ports such as Zanzibar, Sofala (Beira), Mozambique Island and Lorenco Marques (Maputo). Their search for African products such as gold, copper, tin ivory, rhino horn, skins and last but not least "Black Ivory" (slaves) in trade for cloth, glass beads and a variety of trinkets had a huge impact on the organization of the indigenous tribes. Eventually this lead to the formation of "States" such as Mapungubwe and Great Zimbabwe. As in the case of the earlier group the people of this period also preferred the Bushveld areas and never settled on the Highveld, also neglecting them as expected inhabitants of the area under investigation.

Then, after 1499, the circumnavigation of Southern Africa by Dias and Da Gama, Europeans carrying the flag of Christianity, the previous trade with the East was brought to an end. This led to the breakdown of the former "states" and a general period of turmoil, as well as an increase in populations. This pressure forced groups to inevitable migration to climates and environments previously neglected. By the late eighteenth century there were Iron Age people living in the Suikerbosrand, Pretoria, Heidelberg, Machadodorp etc., today referred to as the Goyia and Koni peoples. But still they evaded the area under investigation owing to the harsh winter conditions, also neglecting them as expected inhabitants of the area under

On the properties evaluated no Iron Age remains were observed

8.3. Historic occupation *(See Bergh, J.S. (edt.) 1998 and Erasmus, B.P.J. 1995)*

The British occupation of the Cape, their problems with the free ranging Boers, the continuous wars with the Xhosa and the emancipation of slaves in 1836 set in motion a far reaching migration of whit pioneers from the Cape east and northwards that would forever change the political and demographical face of Southern Africa. Between 1836 and 1844 a large portion of the colony decided to look for their 'land of providence' away from the 'yoke' of the British Crown. This handful of people 'defeated' Dingane and Mzilikazi and claimed for themselves the lands of Kwa Zulu-Natal, the Free State and the Transvaal. By 1855 white pioneer towns and communities were established north of the Vaal River at De Clercq's Dorp, Potchefstroom, Rustenburg, Wakkerstroom, Ohrigstad, Lydenburg, Zoutpanbergdorp, Heidelberg, Vredenburg, Rustenburg, Pretoria and Zeerust.

But soon the 'delivered' black population of the Transvaal realised that the hand of the new master were no different to that of Mzilikazi and became taciturn and aggressively fought back for their freedom and their land. Sekwati and Sekhukhune, Mokopaan, Makhado, Maloboch, Modjadji, Mogoba, and their respective nations made life untenable for the small white community and much blood was shed.

On the other hand Africa took its own toll on the white pioneers in the form of Malaria, the Tsetse Fly, the Runderpest, floods and droughts, swarms of locusts and many more. Amongst themselves bitter political and religious discontent prevailed amongst the white pioneers, and they still were held in the grip of economic supply of life-necessities by British traders. Soon also the boon of African wildlife resources dwindled as all big game was hunted nearly to extinction by 1870. The end of the 'good' life in the Transvaal was nearly over.

Unfortunately for all inhabitants of this area 'free of the Yoke of the British Crown' a new era came into play. Diamonds were discovered in the Northern Cape, gold in the Witwatersrand, and many other minerals such as iron, lead silver, tin, copper all over the Transvaal. These temptations were too big for the greed of the likes of Rhodes and Oppenheimer and by 1881 the British were back to wrest the wealth from the inhabitants of the Transvaal. As the initial annexation of the Transvaal occurred before the real Witwatersrand gold fields were discovered it was at most a messy affair with Amajuba and Potchefstroom posting two serious blood noses for the Crown that were represented by only an expeditionary force. But soon the 'delivered' black population of the Transvaal realised that the hand of the new master were no different to that of Mzilikazi and became taciturn and aggressively fought back for their freedom and their land. Sekwati and Sekhukhune, Mokopaan, Makhado, Maloboch, Modjadji, Mogoba, and their respective nations made life untenable for the small white community and much blood was shed.

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After the realisation of the extent of the Transvaal Gold fields though, the British were back in force in 1899 and in three years the two northern states of the Orange Free State and the Transvaal were pulverised into submission and the extraction of gold became the paramount business in the north. As this could not be accomplished without energy, 'modern technology' and transport, the coal deposits of the Transvaal Highveld became the next target of exploitation by the British to fuel the extraction of the glistening metal. This again needed men to work the mines, they had to be sheltered and fed and so the snowball ran its course.
Historical towns closest to Wonderfontein Colliery include Middelburg and Belfast.

Middelburg is one of the oldest towns that were established by the Voortrekkers in the previous Transvaal. The town was established on the farms of Klipfontein and Keerom on the banks of the Klein Olifants River in 1859. It is generally accepted that Middelburg's name is derived from the fact that the Transvaal Republic established the town midway between Pretoria and Lydenburg.

The choice for Middelburg's location was not well accepted by the inhabitants and it was moved to the farm Sterkfontein. Here, a town was established and named Nasaret (Nazareth). However, the name did not appeal to the local community and its original name was reinstated. Middelburg temporary served as the seat of the Transvaal Republic after the siege of Pretoria during the Second Anglo Boer War.

Belfast was founded on 30 June 1890. Farmer Richard O' Neil bought the farm Tweefontein near where the expected railway line between Pretoria and Lourenço Marques in Mozambique would run. He set up a store and applied for permission to lay out a village. He named it Belfast in honour of the city in Ireland from where his father had immigrated. The railway reached the village in 1894 and the first village council took office in 1902.

6.1. The first contact with people of the interior.

6.2. The disappearance of the 1808 exploration expedition led by Dr Andrew Cowan.
In 1808 one of the most expensive expeditions, with the most ambitious agenda, set out from Cape Town for the Portuguese Fort at Delagoa Bay in southern Mozambique. Under the leadership of Dr Andrew Cowan of the 83rd Regiment.

The expedition crossed the Orange River safely and, after a short sojourn at the Klaarwater mission station, set off for the Kuruman river where Malibongwe, the king of the baTlhaping, had his capital. Two previous expeditions from the Cape had visited the baTlhaping prior to this time but once past them the Cowan expedition, with approximately another 1000 kilometers between it and its destination, would be in what, from the colonial perspective, was virgin territory.

The expedition failed to arrive at Delagoa Bay and, barring a letter written on Christmas Eve and sent from the Molopo River near modern Mafikeng (Mahikeng), was not heard from again. In the two centuries since its disappearance, the fate of Cowan and his men has been the subject of on-going debate and speculation, which due to a lack of concrete evidence has been necessarily inconclusive. Recently, however, Cowan's journal of the first leg of his journey has been rediscovered in an archive in Northern Ireland, along with several letters written by him en route.

It has been turned into a readable book in 2014 by Hazel Crampton *The side of the sun and the moon. Andrew Cowan 1678 – 1808?*

6.6. The Wars of Mzilikazi.

His plans were however interrupted by the arrival at *Mosega*, the capital of the Bahurutsi leader Mokgatla, of a *group of French missionaries intending to establish a mission station among the Bechuana tribes.* These men were loosely acquainted with Robert Moffat which caused Mzilikazi to pause in what otherwise would have been an immediate expulsion ahead of a large-scale military campaign. Instead, the missionaries were summoned to Mzilikazi's royal kraal, although only one, *Jean Pierre Pellissier*, actually made the journey.

Mzilikazi had for the first time directly requested a Christian mission to his territory, which of course delighted Pellissier, although as the two toured the surrounding countryside under an aura of mutual friendship the intuitive Frenchman began to suspect that it was less the spiritual renewal that Mzilikazi sought than access to gunpowder and shot.

6.6.4. The war with the settlers.

In the mean-while wider events underway on the continent would continue to limit the amount of space and time remaining in history for men like Mzilikazi to build and develop their political existence. Global European expansion worldwide was entering an accelerated phase at the end of the great Age of Exploration. A complex chain of events had been set in motion in Europe as the Old-World powers sought wider global influence, a processes that in one way or another would result in the comprehensive dispossession of indigenous people worldwide, but in particular the black man of Africa.

Meanwhile, and closer to home, Mzilikazi received a courtesy call from the *Association for the Exploration of Central Africa* as it made its way south on its return journey. Having in the meanwhile spent a great deal of time brooding on the menace of armed incursions crossing the Vaal River he had for the first time in his reign decided upon a strategy of treaty and diplomacy. He therefore requested that his visitors expedite the safe passage south of an amaNdebele embassy that would present a request for peace and goodwill to the authorities in the Cape. This was agreed to and done, and a few weeks later a meeting was held between Mzilikazi's regent and chief counsellor uMncumbata and the British Governor at the Cape Sir Benjamin D'Urban. The result was a treaty of peace and co-operation that was agreed to and signed in March of 1836. This was of course merely a symbolic gesture on behalf of His Majesty rather than any diplomatic nuptial of substance, but it is interesting to note that no sooner was the ink of uMncumbata's mark dry on the document than the vanguard of the *Great Trek* was reaching the symbolic barrier of the Vaal River.

The first group to cross and proceed north journeyed under the leadership of Louis Trichardt. This was an ill-fated expedition that slipped

The story of Vegkop is one of the epics of both white and black South African history. Although quiet confidence characterized both sides, the spectacle of a laagered fortification brimming with the feared sight of gun barrels, and for the Boer the sight of a distant line of savage foot soldiers, schooled in storm force and genocide, and themselves in a situation of profound isolation, must have stirred the bowels in a manner that even Christian fortitude could hardly have relieved.

In the nervous silence of the moment, with a soft wind blowing over the veld, the vast assembly of amaNdebele fighters dropped to their haunches and waited in silence. The Boer horsemen trotted forward, and a brief and vastly unequal standoff ensured, before in a moment the amaNdebele were on their feet, a drum roll of spears and shields echoed with a virile challenge, and with a roar and a hiss the phalanx of warriors surged forward.

In the aftermath of Vegkop Boer strength was consolidated under the combined leadership of Hendrik Potgieter and newcomer Gerrit Maritz. Throughout November and December of 1836, the two men labored to assemble a force sufficient to mount an attack, and if possible depose the amaNdebele from north of the Vaal River. By early January 1837 the task had been completed, and a large and heterogeneous force of *Boer, Griqua and allied black tribesmen*

crossed the Vaal and made its way towards the largest of the amaNdebele military cantonments.The Mission Stations of Botshabelo and Sekukuneland a.

Addendum 4. Arnot Power Station

BRIEF HISTORY

Named after the farm on which it is situated, Arnot power station was ESCOM's first modern, large generation station. ESCOM bought the farm Rietkuil from its original owners Mr Oosthuizen, Mr Venter, Mr Visser, Mr Brough, Mr Henning, Mr Streicher and Mr Greef. The Project was financed with approval of Capital Expenditure Management, and the Eskom Design and Construction Department was responsible for the design. **Sufficient water and, especially, coal in the Rietkuil area ensured the location of Arnot power station in that particular location.**

Construction commenced in 1968. The excavations of the foundations were about 60/70 feet deep. The last of six units was commissioned in 1975. Unit 3 was the first to go on load (9 May 1971 at 23:00). The next units came into commercial operation respectively: unit 2 – 10 September 1971, unit 1 – 21 July 1972, unit 4 – 19 July 1974, unit 5 – 10 July 1974 and unit 6 – 25 June 1975, at 21:45.Unit 3 was the first to be put on load on 19 May 1971, and Unit 6 the last unit to be completed, went on load in June 1975. Water consumption is 95 760 ML Ml/day and max total coal consumption reaches 25 000 tons tons/day.

Three units were mothballed in **1992 due to Eskom's surplus generating capacity at the time**. Arnot then ran only two of the remaining units, with one unit in cold reserve. These units, however, were recommissioned in December 1996, 1997 and 1998 respectively. This made the power station the first in South Africa to be re-commissioned after mothballing, becoming a six-pack station again.

During its years of operation, Arnot re-wrote the record books a number of times. Arnot was a winning station in terms of plant performance and was awarded the Jan H Smith trophy in 1987 and again in 1989. In July 1991 Arnot also celebrated an outstanding performance. The station broke the world record of 32 days by running six units continuously for 35days 14hours and 29minutes. (an achievement at the time).

In July 1981 intruders sabotaged the transformers at Arnot. They cut a hole in the security fence (a 7 feet wire netting) and blew up two of the transformers beyond repair. Professionals from the South African Police (Middleburg) investigated the site the next morning and disarmed another three limpet mines. No human fatality was recorded. After this incident, the fencing of all ESCOM power stations was electrified.

On the safety front, Arnot achieved three million man-hours without any disabling injury in 1986, 1990 and 1996 and four million man-hours in 1997. At the end of 1999 Arnot also boasted the lowest sick leave average of all Eskom power stations in the Generation Group.

Achievement of the Affirmative Action target of 50.82% at the end of 1999.

OTHER FUNCTIONS

Personnel cultural activities.
The Arnot AmaZulu Dancers won the Eskom Tribal Dance Competition in June 1988 for the second year consecutively, and left on a tour to Germany on 14 September 1988.

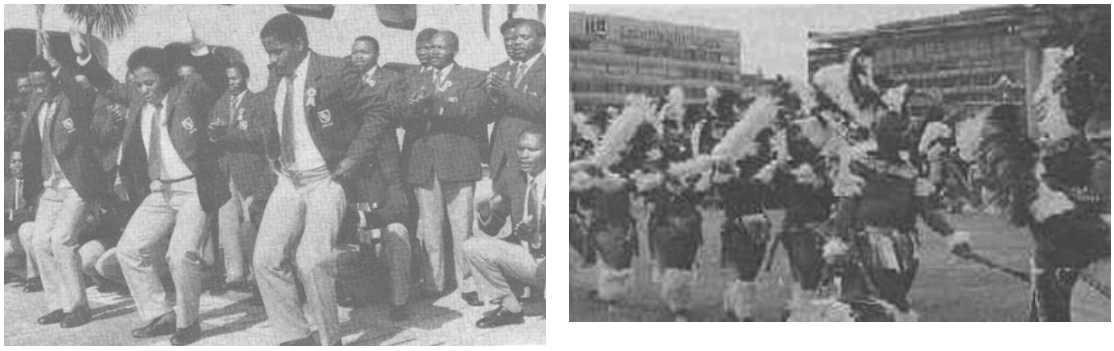

Figure 13. *Arnot AmaZulu Dancers on their return from Germany and performing in Germany.*

The Dog Training Centre at Arnot Power Station.
The Centre was originally opened in 1974 as part of the Protective Services Security Training Centre. This was also the year that the first patrol dogs were trained. In 1982, studies indicated that Eskom would need about 2 000 dogs for security purposes but the Centre was not equipped to handle such a large number of dogs. Roodeplaat Breeding Enterprises in Pretoria then began to train handlers and dogs. Unfortunately the quality of the training and the dogs did not meet Eskom standards. The Centre at Arnot was reopened in 1988. Seven bitches were imported from Germany in 1992 to improve the breeding stock, and since then rosettes and awards flooded the walls of the Centre.

The aim was not only to provide a service to Eskom but also to provide trained dogs for outside companies. Dogs were trained as patrol dogs and, later, in locating stolen copper cable.

Figure 14. *Guards and their dogs after their training session and on the Parade ground*

The dog centre walked off with excellent prizes in the National Show 94 of the German Shepherd Federation. This was the single largest German Shepherd Show until that time in South Africa, with 250 competitors. Lenhard Schweikert, one of the top breeders in Germany and a well-known international judge, judged the show. All the dogs were judged according to their build, work ability and presence. Eskom also took part in the South African Working

Dogs Invitation Stakes (SAWDIS) competition annually. In the 1990 SAWDIS competition the Eskom Team won the event with a score of 95 out of a possible 100. Fourteen teams participated including the South Africa Police (SAP), South African National Defence Force (SANDF), Johannesburg Consolidated Investments (JCI), Gold Fields, Bophuthatswana Police (BOP), BOP Prisons, South African Air Force (SAAF), Johannesburg City Council, Rand Water Board, SCAW Metals, Anglo American Gold Division, African Explosive and Chemical Industries (AECI SA) and Civilians. All of these were crack teams.

The SAWDIS competition grew in stature from its start as a team event for action dogs in 1976 with teams from the SA Army, SA Police, SA Prisons Service and the Civilians. It was specially devised to test the dogs and handlers for the ability and efficiency of the dog and the training capability of the handler.

In 1995 tails stopped wagging for the last time when the Dog Centre closed down after 21 years of breeding and training some of the top security dogs in the country.

The Security Training Centre at Arnot Power Station.
A lesser known fact was that that there was a large security training centre located at Arnot between 1968 and 1992 which was at first solely dedicated to the security personnel of ESCOM power generating facilities throughout South Africa, but soon non-ESCOM companies also had their security training met at Arnot. All trainees were non-European.

Figure 15. *Aerial View of the security training centre at Arnot Power Station.*
The security function started in Eskom in 1968, and in the same year the first security personnel were employed at Arnot, Hendrina, Camden and Ingagane power stations. The passing out parade was the culmination of a gruelling three-month course which included drill, physical training, law, criminal procedure, human relations, Eskom security, accident prevention, fire-fighting and dog-handling.

Figure 16. *Guards marching into the parade ground and showing their skills with weapons*

As a result of the introduction of the National Key-point Act (Act 102 of 1980) the Security Training Centre at Arnot, established in 1974, was registered in 1983 as a National Key-point training establishment. By this time various courses had already been developed to suit individual needs. All security personnel were trained within 12 months of their appointment. The training was work orientated and based on the individual's level of competence.

All guards at National Key-points carried weapons and radios. The National Key-points Act laid down standards for courses. Students had to obtain 60 percent in written examinations to qualify. Internal Eskom examinations in weapons handling (70%) and legal subjects related to the use of firearms were also held. The pass-mark in these was 100 percent

Officials who had completed the initial supervisor's course could decide in which of the three fields of intelligence, operations or training, they wished to advance.
During a period of one year 1080 officials were trained at Arnot (consisting of three Companies and twelve Platoons of thirty students) then the numbers were gradually reduced to 530.

During 1992 the training centre moved from Arnot power station to Wilge power station where the operation was finally closed down in October 1999. **Each Eskom site is now responsible for its own security training.**

Addendum 5. Location of the research areas.

5.1. Jeppe's 1899 Map of the Transvaal.

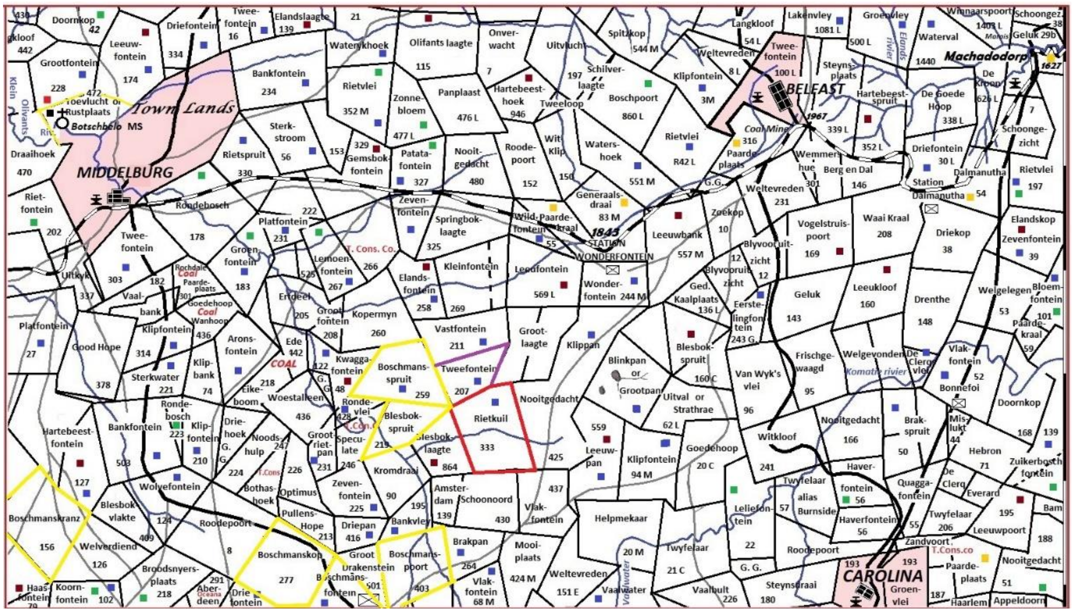

Figure 17. *Extract from sheet 5 of Jeppe's 1899 Map of the Transvaal showing region around Rietkuil and Boshmanspruit where the Arnot Power Station and Colliary is located.* ***(Annotation S.M.Miller. 2023.)***

5.2. The 1: 50000 Topographical maps of the area.

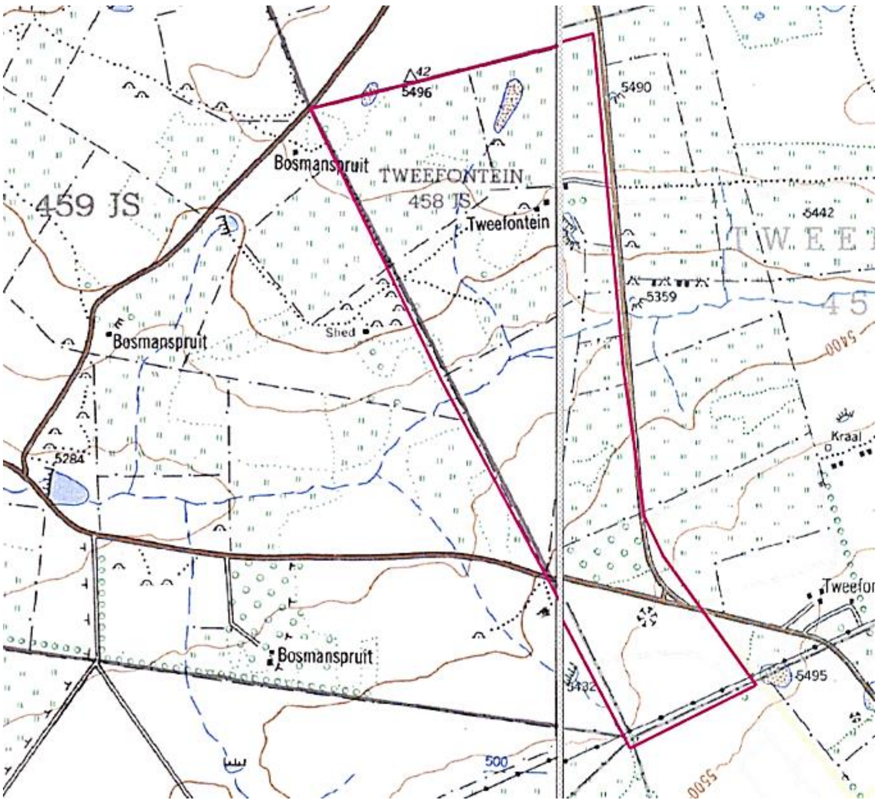

Figure 18.*The 2529DC 1967 & 2529 DD 1968 topographical maps.*

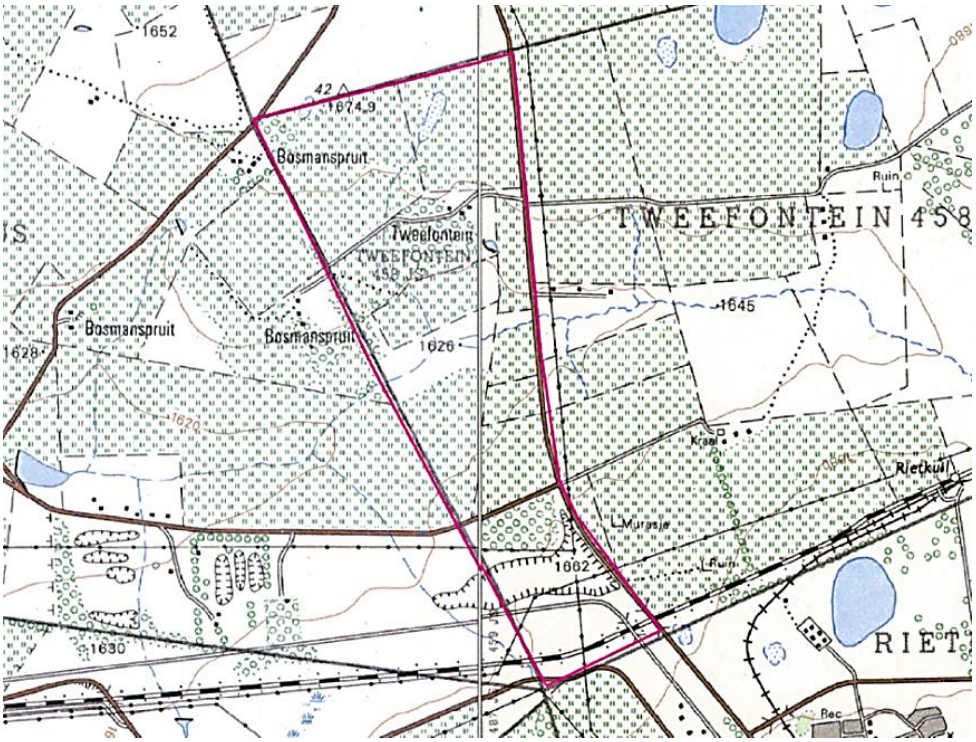

Figure 19. *The 2529DC 1984 & 2529 DD 1984 topographical maps.*

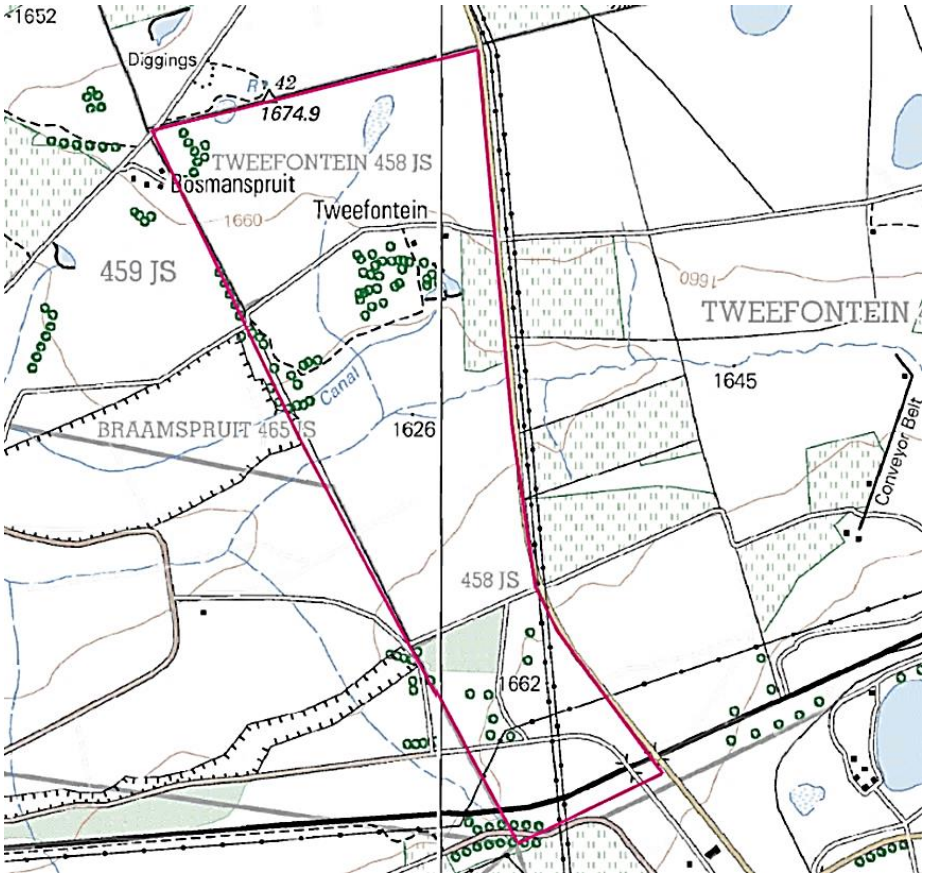

Figure 20.*The 2529DC & 2529 DD 2010 topographical maps.*

Addendum 6. Methodology and Track logging data.

4.1. Methodology.

Prior to conducting the site assessment, a desktop survey of existing literature on the wider region was conducted to assess the heritage context. These included published research articles, unpublished reports, and other online information. The SAHRIS data base was also accessed for previous heritage reports that relate to the general region of the survey (5).

The EMPr of 1993 was also consulted and is available elsewhere in Addendum 89989898. This states that there was no heritage resource identified at that time for the original Mingg Right application.

The relevant topographical and historical maps were sourced, and consulted for pointers to possible heritage resources. The study area is covered by a series of aerial photography data sets that can be used to assess the occupations of this particular landscape.

Historical articles were also systematically scrutinised to identify potential sites (8), areas of disturbance and vegetation or geological anomalies and for any evidence of structural remains, or likely areas for archaeological features.

Prior to the field work all maps and diagrams of the proposed study areas provided by the Client were mapped and plotted on Google Earth and high-resolution aerial imagery, and converted to .gpx format.

The data were transferred to the mobile App GPS HD (Motion X) to allow for georeferencing during the field survey via Ipad and Iphone.

<u>GPS coordinates were recorded with a Garmin e-Trex 30 (Datum WGS84) (10).</u>

4.2. Map and GPS coordinates.

Figure 21. *Google Earth image of application area.* ***(Google Earth 2023 annotated by S.M. Miller.)***

Icon	Degrees south	Degrees east		Icon	Degrees south	Degrees east
EXISTING MINING RIGHT AREA						
6	25°53'41.81"S	29°44'0.11"E		7	25°53'44.64"S	29°43'22.25"E
8	25°53'28.97"S	29°42'50.27"E		9	25°52'48.45"S	29°42'55.10"E
10	25°52'58.89"S	29°40'46.08"E		11	25°53'27.37"S	29°40'28.19"E
12	25°54'44.49"S	29°42'2.40"E		13	25°54'36.78"S	29°44'29.04"E
NEW RESEARCH AREA						
1	25°53'31.04"S	29°45'4.89"E		2	25°53'43.40"S	29°44'6.33"E
3	25°55'41.28"S	29°45'14.01"E		4	25°55'28.53"S	29°45'40.75"E
5	25°54'59.18"S	29°45'17.92"E				
RESEARCH FINDS						
Farmhouse				Fa	25°54'1.32"S	29°44'59.18"E
Out-buildings				O	25°54'2.15"S	29°44'55.17"E
Site of demolished labourer dwellings				D	25°54'3.04"S	29°44'50.09"E
Silage trench				S	25°54'12.25"S	29°45'7.46"E
Fountain				Fo	25°54'3.65"S	29°45'0.76"E
Cemetery				C	25°54'10.14"S	29°45'7.67"E

Figure 22. *Table of GPS COORDINATES of research area and existing mine and location of research finds.* ***(Compiled by S.M. Miller 2023.)***

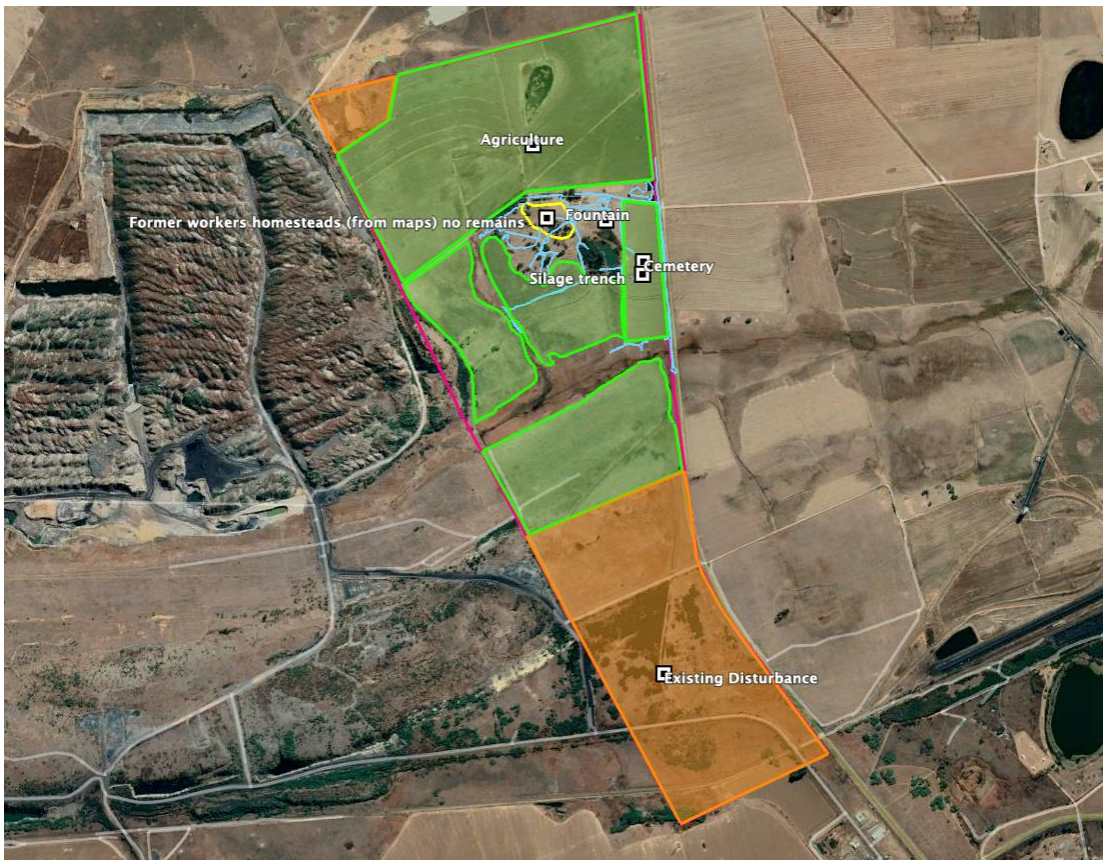

Figure 23. *Google Earth image with track logging superimposed on large scale.* ***(Google Earth 2023 annotated by S.U. Küsel.)***

Figure 24. *Google Earth image with track logging superimposed on areas where research finds were located.* ***(Google Earth 2023 annotated by S.U. Küsel.)***

Addendum 7. Photo recording.

Figure 25. *Existing farmstead viewed from the east.* ***(Photo S.U. Küsel 2023.)***

Figure 26. *Existing Farmstead viewed from the north.* ***(Photo S.U. Küsel 2023.)***

Figure 27. *Detail of old milking shed converted into modern garages and side view of rondavel.* ***(Photo S.U. Küsel 2023.)***

Figure 28. *Detail of outside rondavel (west) showing wooden sash (six over six) detail as well as advanced state of pending collapse.* ***(Photos S.U. Küsel 2023.)***

Figure 29. *Back of farmstead from the south west showing steel windows modern door and both IBR and corrugated- iron roofing. It appears as if the foundation consists of a heavily mortared stone construction that is modern, rather than "old style" un-mortared stone construction.* ***(Photo S.U. Küsel 2023.)***

Figure 30. *More detail of outside rondavel (east) showing older wooden door and frame detail as well as copper doorknob. Note again the advanced state of pending collapse.* ***(Photo S.U. Küsel 2023.)***

Figure 31. *Structures to the west of the farmstead.* ***(Photo S.U. Küsel 2023.)***

Figure 32. *Former farm shed for machinery and storage that was partially demolished and then crudely altered and converted. It is now inhabited to being a "dwelling".* ***(Photo S.U. Küsel 2023.)***

Figure 33. *Converted farm shed/ dwelling seen from the west. It is fully serviced with electricity, water and septic tank for waste-water disposal.* ***(Photo S.U. Küsel 2023.)***

Figure 34. *Wider view as previous figure. It apparently also serves as a "laundry" for the rest of the community inhabiting various parts of the old farmyard. Note elementary but effective, well-maintained fencing, also notable elsewhere on the farm-yard.* ***(Photo S.U. Küsel 2023.)***

Figure 35. *Associated with the converted shed, are two more dwellings.* ***(Photo S.U. Küsel 2023.)***

Figure 36. *These dwellings, often termed "shacks" or "squatter-dwellings" nevertheless house two families in relative "comfortable" conditions.* ***(Photo S.U. Küsel 2023.)***

(Note. This collection of families is an important factor to consider with-in the concept of "relocation for mining purposes" especially as there appears to be a connection to the large cemetery documented in this document.)

Figure 37. *Two views of the cemetery to the south east of the farmstead containing between 40-60 (?) graves. (Looking southeast towards the Arnot Power Station.* ***(Photos S.U. Küsel 2023.)***

The number could not be positively determined owing to vegetation and the state of repair of a large number of the graves that consist mainly of small cairns of irregular arranged stones. A significant number of the graves have been furnished with modern funeral headstones and grave markings. Although there are a few "new" headstones, some are in fact a reflection of older practices. These include some of older "carved natural rock", cement castings and cement crosses. The top image shows the extent of the cemetery while the bottom image reflects the severe mining and farming impact on the environment in general in the area.

Figure 38. *General impaired visibility of a majority of the older graves.* ***(Photo S.U. Küsel 2023.)***

Figure 39. *Two graves with markers and headstones from different eras, both well maintained.* ***(Photos S.U. Küsel 2023.)***

Figure 40. *Location of associated graves. (Photo S.U. Küsel.)*

It is important to note that the two graves documented above are located adjacent and being equally maintained by relatives in present time. This implies living relatives that need to be consulted bon both possible relocation and continued access in the case of non-relocation

Figure 41.*The above image demonstrate the confusion of unmarked graves, graves with cement crosses as markers and modern granite headstones that is present in the cemetery.* ***(Photo S.U. Küsel 2023.)***

Figure 42. *Typical inscriptions of "modern" headstones. Interesting to note absence of Christian bible references.* ***(Photos S.U. Küsel 2023.)***

Figure 43. *General view of central area of the cemetery.* ***(Photo S.U. Küsel 2023.)***

Figure 44. *Older and modern grave headstones that generally occur.* ***(Photos S.U. Küsel 2023.)***

Figure 45. *Final general view across the cemetery towards the northeast.* ***(Photo S.U. Küsel 2023.)***

Owing to the extent of the burial ground and the inhibiting vegetative cover, a second phase study will be necessary to properly estimate the extent of the burial ground, the number of graves and possible pointers to living relatives.

Figure 46. *Silage (kuil-voer) trench south of the cemetery.* ***(Photo S.U. Küsel 2023.)***

Note: Silage (or in Afrikaans "kuilvoer"), is wintertime fodder for livestock that is created in the summer by layering plant material, mainly grass, in trenches or similar underground structures by regulated fermentation.

Figure 47. *General views across the southern part of the study area.* ***(Photos S.U. Küsel 2023.)***

Above images shows the impact of long term ploughing and planting practices that occurred during the second half of the 20th century. The nearly universal practice of "dry-land" maize production in the region completely disturbed any possible heritage remains and created a vegetative landscape consisting of mainly monoculture invasive grass species.

Also refer to the data on the topographical maps in Addendum 5.

Figure 48. *View towards the south west demonstrating the same as mentioned above. Here though we see the general invasive impact of "Blackwattle" that was in the past planted as windbreaks, firewood and eventually for the production of charcoal.* ***(Photo S.U. Küsel 2023.)***

Figure 49. *View of the north western portion of the study area. Comments same as above.* ***(Photo S.U. Küsel 2023.)***

Figure 50. *Recent remains of a "campfire site" protected by newly placed loose stones and rocks.* ***(Photo S.U. Küsel 2023.)***

Seeing that there is alternative accommodation available nearby and no sign of a camp "site", one can assume that someone made a fire in daytime to generate some protection against the present winter cold. What is important though is that in a few years' time a stone circle as this may be incorrectly interpreted as "heritage remains".

Figure 51. *Views to the south west of the farmyard.* ***(Photos S.U. Küsel 2023**.)*

In some places like this two views of the area to the south west of the house where ploughing did not occur visibility for locating possible "small finds" were optimal. As none were found one can assume that generally the chance of finding such were negligible. Invasive vegetation such as "'Blue-gum" and "Blackwattle" may have possible impact on the location such "small finds"

Figure 52. *View south from the dam over old maize fields that created massive disturbed areas on the study area.* ***(Photo S.U. Küsel 2023.)***

Figure 53. *Final view of the main farmyard.* ***(Photo S.U. Küsel 2023.)***

Final view of the main farmyard from the north showing no connectivity to the electricity grid and the two "long-drop" WC facility's implies no wastewater disposal systems in the dwelling. As the water-tank is also not mounted on the water-tower, one can expect only a limited supply of water to the dwelling

Figure 54. *The fountain and furrow.* ***(Photo S.U. Küsel 2023.)***

To the south of the farmstead there is a located a fountain that shows enlargement and excavation that possibly occurred during the "European occupation" of the farm. It still emits a reasonable supply of water. Taking into consideration of the original farm name "Twee-fontein" (Two fountains) and its proximity to the location of the farmyard on the property, it is possible that this is one of the two original springs that occurred on the property. This then can be evaluated as a heritage resource of some standing.

Note: As it is known that thermal origins of springs and fountains in the area is rare one can safely assume that the source of this spring is from underground water still fed from precipitation in its catchment area. When one look at Google earth, the large surface body of water (pan) lying directly to the north is topographically nearly 30 meters below the fountain and thus not potentially its feeder source.

On the other hand to the east there is "Klip-pan" (rock- or stone Pan), "Blink-pan" (Shiny Pan) and "Groot-pan" (large Pan), all between 10 and twenty meters at a higher elevation that the fountain.

Furthermore, there has so far been no mining in the intervening land, making one or more of them a possible feeding source for the fountain.

Addendum 8. Heritage study/s prior to 2023.

Fourie, W. & Fourie, M.	2009.	Archaeological Impact Assessment Arnot Colliery Mine. Project of Exxaro on Portions 4 and 5 of the farm Mooifontein 448 JS and Portions 3 and 4 of the farm Tweefontein 458 JS, District Middelburg, Mpumalanga.
Hardwick, S.	2021.	Archaeological Impact Assessment for Proposed Arnot South Coal Mining Project, (Exxaro Coal Mpumalanga (Pty) Ltd.) Exxaro Coal Mpumalanga (Pty) Ltd) located near Hendrina, Mpumalanga Province. Digby Wells Environmental.

Addendum 9. Grading and impact.

9.1. Appropriate process to be followed.

9.1.1. Step 1: Determine the PROBABILITY of the impact by calculating the average between the frequency of the aspect, the availability of a pathway to the receptor, and the availability of the receptor. ***(Thus: Sum of the three column scores below ÷ 3.)***

Frequency of aspect/ impact	Score	Availability of pathway from the source to the receptor	Score	Availability of receptor	Score
Never known to have happened, but may occur.	1	A pathway to allow for the impact to occur is never available.	1	The receptor is never Available.	1
Known to happen in industry.	2	A pathway to allow for the impact to occur is almost never available.	2	The receptor is almost never available.	2
< once a year.	3	A pathway to allow for the impact to occur is sometimes available.	3	The receptor is sometimes available.	3
Once per year to up to once per month.	4	A pathway to allow for the impact to occur is almost always available.	4	The receptor is almost always available.	4
Once a month to Continuous.	5	A pathway to allow for the impact to occur is always available.	5	The receptor is always Available.	5

9.1.2. Step 2: Determine the MAGNITUDE of the impact by calculating the average of the factors below. **(Thus: Sum of all six column ratings below ÷ 6.)**

Source.								Receptor.			
Duration of Impact.	Score	Extent.	Score	Intensity.	Score	Destruction Effect.	Score	Reversable.	Score.	Significance of heritage.	Score.
Lasting days to a month.	1	Limited to the site.	1	Very small.	1	No loss.	1	Reversable	1	No/low significance Grade IIIC.	1
Lasting 1 month to 1 year.	2	Limited to site and immediate surroundings.	2	Small.	2	Small loss at local level.	2	Local impact but still reversible.	2	Medium local significance Grade IIIB.	2
Lasting 1 to 5 years.	3	Impacts ex-tend beyond site boundary.	3	Moderate.	3	Moderate loss at local level.	3	Partially Reversible.	3	High local significance Grade IIIA.	3
Lasting 5 years to	4	Impact on regional	4	Large	4	Regional loss	4	Potentially	4	High regional	4

Life of Organization		scale / adjacent sites						irreversible		significance Grade II (Provincial)	
Beyond life of Organization/ Permanent impacts	5	Extends nationally or globally	5	Very large	5	National loss	5	Irreversible	5	High National significance Grade II (National)	5

9.1.3. Step 3: Determine the SEVERITY of the impact by plotting the averages that were obtained above for Probability and Magnitude in the table below.

ENVIRONMENTAL IMPACT RATING/PRIORITY					
PROBABILITY	MAGNITUDE				
	1 Minor	2 Low	3 Medium	4 High	5 Major
5 Almost Certain	Low	Medium	High	High	High
4 Likely	Low	Medium	High	High	High
3 Possible	Low	Medium	Medium	High	High
2 Unlikely	Low	Low	Medium	Medium	High
1 Rare	Low	Low	Low	Medium	Medium

9.2. Impact of the finds during the present HIA field work.

9.2.1. Cemetery and Fountain.
Both a cemetery and a fountain associated with it was identified during the fieldwork as discussed in section 8 above in the main body of the report. They were graded as field rating IIIA and IIIB being of high to medium local significance.

As the mitigation of these two issues are co-dependant and will be treated as such in future second phase studies and mitigation processes, it will be evaluated together for its ENVIRONMENTAL IMPACT RATING/PRIORITY

Frequency of aspect/ impact	Score	Availability of pathway from the source to the receptor	Score	Availability of receptor	Score
Never known to have happened, but may occur.	1	A pathway to allow for the impact to occur is never available.	1	The receptor is never Available.	1
Known to happen in industry.	2	A pathway to allow for the impact to occur is almost never available.	2	The receptor is almost never available.	2

< once a year.	3	A pathway to allow for the impact to occur is sometimes available.	3	The receptor is sometimes available.	3
Once per year to up to once per month.	4	A pathway to allow for the impact to occur is almost always available.	4	The receptor is almost always available.	4
Once a month to Continuous.	5	A pathway to allow for the impact to occur is always available.	5	The receptor is always Available.	5
				Impact probability equals (5+5+5) ÷3=	5

Probability assessment of the cemetery and fountain results. **(Compiled by S.M. Miller 2023.)**

Source.								Receptor.			
Duration of Impact.	Score	Extent.	Score	Intensity.	Score	Destruction Effect.	Score	Reversable.	Score.	Significance of heritage.	Score.
Lasting days to a month.	1	Limited to the site.	1	Very small.	1	No loss.	1	Reversable	1	No/low significance Grade IIIC.	1
Lasting 1 month to 1 year.	2	Limited to site and immediate Surroun-dings.	2	Small.	2	Small loss at local level.	2	Local impact but still reversible.	2	Medium local significance Grade IIIB.	2
Lasting 1 to 5 years.	3	Impacts ex-tend beyond Site boundary.	3	Moder ate.	3	Modera te loss at local level.	3	Partially Reversible.	3	High local Significance Grade IIIA.	3
Lasting 5 years to Life of Organizat ion	4	Impact on regional scale / adjacent sites	4	Large	4	Regional loss	4	Potentiall y irreversib le	4	High regional significance Grade II (Provincial)	4
Beyond life of Organizat ion/ Permane nt impacts	5	Extends nationally or globally	5	Very large	5	National loss	5	Irreversib le	5	High National significance Grade II (National)	5
								Impact Magnitude equals (4+2+4+4+4+5) ÷ 6			4

Magnitude assessment of the cemetery and fountain results. **. (Compiled by S.M. Miller 2023.)**

ENVIRONMENTAL IMPACT RATING/PRIORITY					
PROBABILITY	MAGNITUDE				
	1 Minor	2 Low	3 Medium	4 High	5 Major
5 Almost Certain	Low	Medium	High	High	High
4 Likely	Low	Medium	High	High	High
3 Possible	Low	Medium	Medium	High	High
2 Unlikely	Low	Low	Medium	Medium	High
1 Rare	Low	Low	Low	Medium	Medium

From the impact assessment table above, it is evident that the impact of the cemetery and fountain will be of High Environmental Significance without mitigation. (Compiled by S.M. Miller 2023.)

9.2.2. Farmyard buildings

The age of the brick and mortar buildings on the farmyard possibly date to the 1960's but it is difficult to date it correctly. However, it is of no outstanding heritage merit and can be graded as **Grade IIIC Local Resource:** This sites have been assigned a **Low field rating** which. As it is sufficiently described in this Phase I Assessment's photographic documentation in Addendum 7, it may be granted destruction authorisation at the discretion of the relevant heritage authority outside of the formal permitting process.

Frequency of aspect/ impact	Score	Availability of pathway from the source to the receptor	Score	Availability of receptor	Score
Never known to have happened, but may occur.	1	A pathway to allow for the impact to occur is never available.	1	The receptor is never Available.	1
Known to happen in industry.	2	A pathway to allow for the impact to occur is almost never available.	2	The receptor is almost never available.	2
< once a year.	3	A pathway to allow for the impact to occur is sometimes available.	3	The receptor is sometimes available.	3
Once per year to up to once per month.	4	A pathway to allow for the impact to occur is almost always available.	4	The receptor is almost always available.	4
Once a month to Continuous.	5	A pathway to allow for the impact to occur is always available.	5	The receptor is always available.	5
				Impact probability equals (2+2+2) ÷3=	2

Probability assessment of the cemetery and fountain results. **(Compiled by S.M. Miller 2023.)**

Source.								Receptor.			
Duration of Impact.	Score	Extent.	Score	Intensity.	Score	Destruction Effect.	Score	Reversable.	Score.	Significance of heritage.	Score.
Lasting days to a month.	1	Limited to the site.	1	Very small.	1	No loss.	1	Reversable	1	No/low Significanc Grade IIIC.	1
Lasting 1 month to 1 year.	2	Limited to site and immediate Surroun-dings.	2	Small.	2	Small loss at local level.	2	Local impact but still reversible.	2	Medium local significance Grade IIIB.	2
Lasting 1 to 5 years.	3	Impacts ex-tend beyond Site boundary.	3	Moder ate.	3	Modera te loss at local level.	3	Partially Reversible.	3	High local Significance Grade IIIA.	3
Lasting 5 years to life of Organizat ion	4	Impact on regional scale / adjacent sites	4	Large	4	Regional loss	4	Potentiall y irreversib le	4	High regional significance Grade II (Provincial)	4
Beyond life of Organizat ion/ Permane nt impacts	5	Extends nationally or globally	5	Very large	5	National loss	5	Irreversib le	5	High National significance Grade II (National)	5
Impact Magnitude equals (2+1+2+2+4+1) ÷ 6											2

Magnitude assessment of the cemetery and fountain results. **(Compiled by S.M. Miller 2023.)**

ENVIRONMENTAL IMPACT RATING/PRIORITY					
PROBABILITY	MAGNITUDE				
	1 Minor	2 Low	3 Medium	4 High	5 Major
5 Almost Certain	Low	Medium	High	High	High
4 Likely	Low	Medium	High	High	High
3 Possible	Low	Medium	Medium	High	High
2 Unlikely	Low	Low	Medium	Medium	High
1. Rare	Low	Low	Low	Medium	Medium

From the impact assessment table above, it is evident that the impact of the farmyard buildings will be of Low Environmental Significance. (Compiled by S.M. Miller 2023.)

9.3. Risk Mitigation.

SAHRA (2007: 4) defines mitigation as '[t]he act or effort by a qualified heritage specialist appointed by a developer to lessen the impact of a development on heritage resources within or near the development footprint'. The authors of this report are confident that the heritage occurrences of the property under review were adequately documented and assessed during the HIA.

The HIA field study surveyed the surface only, a procedure than cannot locate buried archaeological and/or palaeontological sites. While not detracting by any means from the extensiveness of the fieldwork undertaken by the authors, it is necessary to point out that heritage resources located during the fieldwork do not necessarily represent all the possible heritage resources present within the area.

Various factors may account for this, such as ephemeral indications of graves, dense vegetation cover in some parts of the surveyed area, and the subterranean nature of certain archaeological sites that are buried through sediment accumulations.

Addendum 10. List of Figures.

List of Figures.