Cultural Heritage Impact Assessment:

Phase 1 Investigation for a Proposed Extension of Pit 1 and Pipeline from Dorstfontein West to Dorstfontein East and the Disposal of Discard into the Opencast Pit, north east of Kriel, eMlahleni Local Municipality, Nkangala District Municipality, Mpumalanga

For

Project Applicant	**Environmental Consultant**
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Executive Summary

This report contains a comprehensive heritage impact assessment investigation in accordance with the provisions of Sections 38(1) and 38(3) of the *National Heritage Resources Act* (Act No. 25 of 1999) (NHRA) and focuses on the survey results from a cultural heritage survey as requested by SRK Consulting (Pty) Ltd. The survey forms part of an Environmental Impact Assessment (EIA) and Environmental Management Plan (EMP) for Environmental Authorisation for the proposed extension of Pit 1, the pipeline from Dorstfontein West to Dorstfontein East and the disposal of discard into the opencast pit, in terms of the National Environmental Management Act (Act 107 of 1998)(NEMA). The application area comprises the farms Dorstfontein 71 IS (Portions 2, 3 and 8), Welstand 55 IS (Portions 4, 5, 11, 13 and remainder of portion) and Rietkuil 558 IS (Remainder of portion) situated in the eMlahleni Local Municipality and Nkangala District Municipality in Mpumalanga.

Site No	Site Type	Field Rating of Significance	Direct Impacts	Significance of Impact before Mitigation	Significance of Impact after Mitigation	Proposed Mitigation
1	Historical farmhouse complex	Generally protected B: Medium significance	None, peripheral to Pipeline Alternative 3			• Maintain a buffer zone of 100 metres during construction and mining phase
2	Modern farmhouse & structures	-	None, peripheral to Pit 1 expanding area			• None
3	Graveyard	Generally protected A: High significance	High Pipeline Alternative 1	64	20	• Fenced off and gate installed • Maintain a buffer zone of 100 metres during construction and mining phase
4	Graveyard	Generally protected A: High significance	High Pipeline Alternative 1	64	20	• Fenced off and gate installed • Maintain a buffer zone of 100 metres during construction and mining phase
5	Graveyard	Generally protected A: High significance	None, peripheral to Pipeline Alternative 1 & 2			• Fenced off and gate installed • Maintain a buffer zone of 100 metres during construction and mining phase
6	Historical farmhouse complex	Generally protected C: Low significance	None, peripheral to Pipeline Alternative 1			• Maintain a buffer zone of 100 metres during construction and mining phase
7	Farm worker houses and livestock kraal	-	None, peripheral to Pipeline Alternative 3			• None
8	Graveyard	Generally protected A: High significance	None			• None
9	Historical power line	Generally protected B: Medium significance	High Pipeline Alternative 1 Pipeline Alternative 3 Expansion Pit 1	64	20	• Maintain a buffer zone of 10 metres during construction and mining phase

No Stone Age or Iron Age settlements, structures, features, assemblages or artefacts were recorded during the survey.

Although a total of nine sites were recorded during the survey only seven sites are older than 60 years and are therefore protected under the NHRA (Act No. 25 of 1999). A total of four graveyards (Sites 3, 4, 5, and 8) were recorded as well as two farmhouse complexes (Sites 1 and 6) and a historical power line (Site 9) (consisting of several pylons). Note two sites are not older than 60 years, namely the farmworker home complex (Site 7) and a modern farmhouse complex (Site 2)

Please note that from a heritage perspective the following detailed recommendations are made:

Proposed development	Proposed mitigation measures
Pit 1 extension	Monitor and control the mining activities to prevent impact on the historical power line pylons (Site 9) If impact cannot be prevented a Phase 2 study is required followed with a destruction permit application from SAHRA
Discard dump	No impact on heritage resources and my proceed
Pipeline Alternative Route 1	Direct impact during construction on graveyards (Sites 3 and 4) Change the trajectory of the proposed route If impact cannot be prevented a Phase 2 study (social consultation exhumation and reburial of the graves) will be required followed with a permit application from SAHRA Direct impact during construction on the historical power line pylons (Site 9) If impact cannot be prevented a Phase 2 study is required followed with a destruction permit application from SAHRA
Pipeline Alternative Route 2	Social consultation with I&Ps that live near this route
Pipeline Alternative Route 3	Direct impact during construction on the historical power line pylons (Site 9) Change the trajectory of the proposed route If impact cannot be prevented a Phase 2 study is required followed with a destruction permit application from SAHRA

Final recommendation:

- Pipeline Alternative Route 2 the preferred option from a heritage perspective;
- The Extended Pit 1 may proceed taking account the power line pylons (Site 9) on the southern periphery
- The proposed discard dump may proceed

Also, please note:

If the exhumation and reburial of the graveyards are envisaged it will entail social consultation and permit application. Other legislative measures which may be pertinent include the Removal of Graves and Dead Bodies Ordinance (Ordinance No. 7 of 1925), Regulations Relating to the Management of Human Remains (GNR 363 of 22 May 2013) made in terms of the National Health Act No. 61 of 2003, Ordinance on Exhumations (Ordinance No. 12 of 1980) as well as any local and regional provisions, laws and by-laws that may be in place. Note that unmarked graves are by default regarded as older than 60 years and therefore falls under the NHRA (Act No. 25 of 1999, Section 36).

Archaeological deposits usually occur below ground level. Should archaeological artefacts or skeletal material be revealed in the area during development activities, such activities should be halted, and a university or museum notified in order for an investigation and evaluation of the find(s) to take place **(*cf*. NHRA (Act No. 25 of 1999)**, Section 36 (6)).

Definitions and abbreviations

Midden: Refuse that accumulates in a concentrated heap.
Stone Age: An archaeological term used to define a period of stone tool use and manufacture
Iron Age: An archaeological term used to define a period associated with domesticated livestock and grains, metal working and ceramic manufacture

LIA:	Late Iron Age sites are usually demarcated by stone-walled enclosures
NHRA:	National Heritage Resources Act (Act No. 25 of 1999)
SAHRA:	South African Heritage Resources Agency
SAHRIS:	South African Heritage Resources Information System
PHRA-G:	Provincial Heritage Resources Authority - Gauteng
GDARD:	Gauteng Department of Agriculture and Rural Development
HIA:	Heritage Impact Assessment
DMR:	Department of Mineral Resources
I&APs:	Interested and Affected Parties

I, Francois Coetzee, hereby confirm my independence as a cultural heritage specialist and declare that I do not have any interest, be it business, financial, personal or other, in any proposed activity, application or appeal in respect of the listed environmental processes, other than fair remuneration for work performed on this project.

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1. Introduction and Terms of Reference

SRK Consulting (Pty) Ltd was contracted by Exxaro Coal (Pty) Ltd an independent environmental consultant to undertake the EIA process and EMP for Environmental Authorisation for the proposed extension of Pit 1, the pipeline from Dorstfontein West to Dorstfontein East and the disposal of discard into the opencast pit, in terms of the National Environmental Management Act (Act 107 of 1998)(NEMA). The application area comprises the farms Dorstfontein 71 IS (Portions 2, 3 and 8), Welstand 55 IS (Portions 4, 5, 11, 13 and remainder of portion) and Rietkuil 558 IS (Remainder of portion) situated in the eMlahleni Local Municipality and Nkangala District Municipality in Mpumalanga. A Cultural heritage Impact Assessment (HIA) was requested by SRK Consulting on behalf of the client to evaluate the potential impact of the proposed diamond prospecting activities.

2. Objectives

The general objective of the cultural heritage survey is to record and document cultural heritage remains consisting of both tangible and intangible archaeological and historical artefacts, structures (including graves), settlements and oral traditions of cultural significance.

As such the terms of reference of this survey are as follows:

- Identify and provide a detailed description of all artefacts, assemblages, settlements and structures of an archaeological or historical nature (cultural heritage sites) located on the study area,
- Estimate the level of significance/importance of these remains in terms of their archaeological, historical, scientific, social, religious, aesthetic and tourism value,
- Assess any impact on the archaeological and historical remains within the area emanating from the development activities, and
- Propose recommendations to mitigate heritage resources where complete or partial conservation may not be possible and thereby limit or prevent any further impact.

3. Description of Physical Environment of Study Area

The heritage survey focussed on an area situated north east of Kriel, Mpumalanga Province.

Farm Name(s) and Portions	The following portions and farms: Dorstfontein 71 IS: Portions 2, 3 and 8 Welstand 55 IS: Portions 4, 5, 11, 13 and remainder of portion Rietkuil 558 IS: Remainder of portion
Size of Survey Area	Approximately 1500 hectares
Magisterial District	eMlahleni Local Municipality Nkangala District Municipality
1:50 000 Map Sheet	2629AB
1:250 0000 Map Sheet	2628
Central Coordinates of the Development	29.335540°E 26.199570°S

Table 1: Physical Environment

The survey area falls within the Grassland Biome, particularly the Mesic Highveld Grassland Bioregion and more specifically the Eastern Highveld Grassland (Gm 12) (Mucina & Rutherford 2006). The survey area is located approximately 5 km north east of Kriel and 28 km from Bethal. The region is characterised by plains with slightly undulating hills,

supporting open grassland. The area between Dorstfontein West and East (within which the proposed pipeline route will be located) is dominated by cultivated dryland and grazing land. As such, this area is largely disturbed by existing mining activities especially since 2007. No rivers and other tributaries run through the survey area. However, the Dorstfontein West Mine is bordered by a small stream in the south, flowing in a westerly direction, away from the mine. Note that the Olifants River is situated just over 12 km north of the project footprint and the Steenkoolspruit River flows to the west. Infrastructure consists of the R544 and R547 to the west/southwest of the project area, however, several dirt roads provide access to the area; as well as power lines, fences, and extensive agricultural fields (both used and fallow).

The Dorstfontein Mine is located in the Highveld climatic region of South Africa, which is a summer rainfall area. Temperature classifications for the region are hot in summer and mild to warm in winter, with significant diurnal fluctuations. Climate Data was obtained from the South African Weather Service (SAWS) and databases of WR2005. The local climate can be described as semi-arid high-veld conditions, with warm summers and moderate dry winters. Average daily summer temperatures of approximately 27°C are experienced, while peak temperatures of up to 36°C do occur. Average daily winter temperatures are approximately 4°C, with minimum temperatures reaching around -4°C. The number of days when heavy frost occurs is however, limited and freezing of wet soils, frost heave and permafrost do not occur (SAWS, 2017)

Current Zoning	Agricultural (crop cultivation) Livestock grazing (pastoralism) Residential and industrial mining
Economic activities	Farming and mining
Soil and basic geology	The mining area was classified as wetlands. This is typical of the sandy soils derived from the underlying sandstone formations pipeline route, the situation is fairly similar, with approximately six wetland crossings identified. The land type is the area is Bb4 and Bb5. These soils are Plinthic catena with dystrophic and/or mesotrophic, red soils not widespread, upland duplex and margalitic rare soils. The depth of these soils is between 450 mm and 700 mm. The majority of the study area is underlain by Karoo Supergroup sedimentary rocks of the Vryheid Formations of the Ecca Group. These are largely comprised of sandstone, shale, and coal seams. The available geological maps covering the study area did not indicate any major structural features such as faults or fractures. Limited tectonic activity is recognised within the study area.
Prior activities	Extensive coal mining Crop and livestock farming
Socio Economic Environment	Emalahleni Local Municipality has a population density of 148 people per km² and a population growth rate of 3.6% between 2001 and 2011. The Emalahleni Local Municipality population density is nearly two times higher than that of the Nkangala District Municipality, which has a density of 78 people per km². From 2001 to 2011, the number of formal dwellings in the Emalahleni Local Municipality, the Nkangala District Municipality and Mpumalanga Province had increased by 23.1%, 9.3% and 20.0% respectively. The employment rate in the study area (46.7%) is superior to both

	NDM (40.7%) and the province (37.5%). However, unemployment levels in the study area (25.0%) are poor when compared with those of the Nkangala District Municipality (18.0%) and the province (17.0%). There is also a large percentage of the working population currently not economically active (24.0%). This would indicate high levels of dependency on household members who are employed and vulnerability to poverty where breadwinners cease to be employed. Average individual monthly income in the study area was as per that in both the province and NDM, around R2 400. This is low; but, considered to be above the World Banks' poverty line ($1 a day) and just above the South African minimum wage, which is currently R 2 340 a month.
Evaluation of Impact	An evaluation of the impact of the development on heritage resources relative to the sustainable social and economic benefits NHRA (Act No. 25 of 1999, Section 38(3d)): **Positive**

Table 2: Socio-economic environment

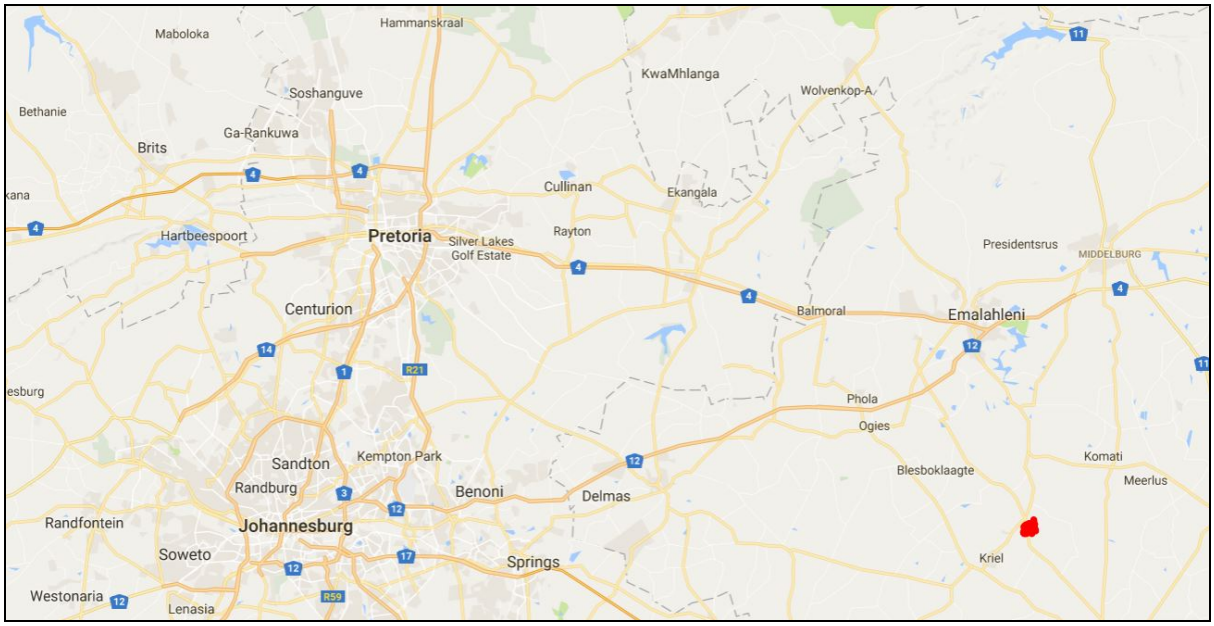

Figure 1: Regional context of the survey area north east of Kriel (indicated by the red area)

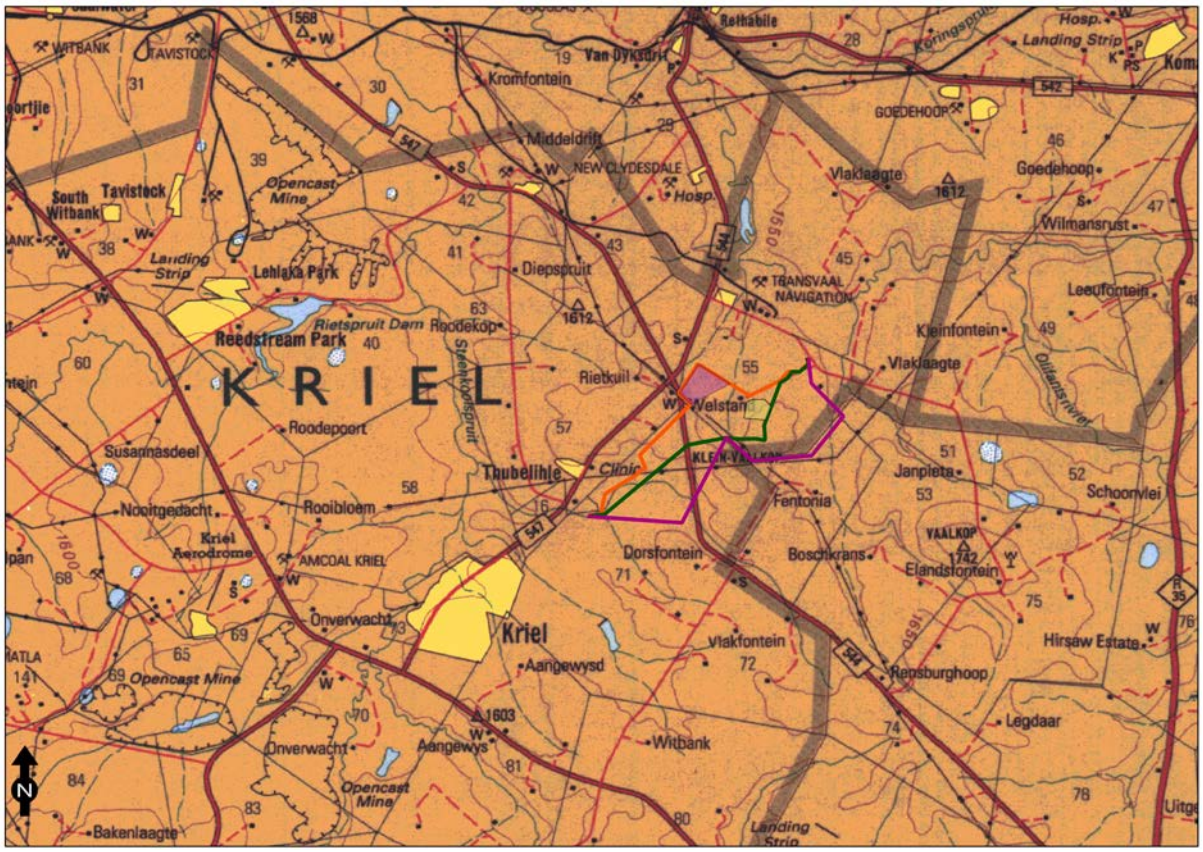

Figure 2: Local context of the survey footprint (1:250 000 Map 2724)

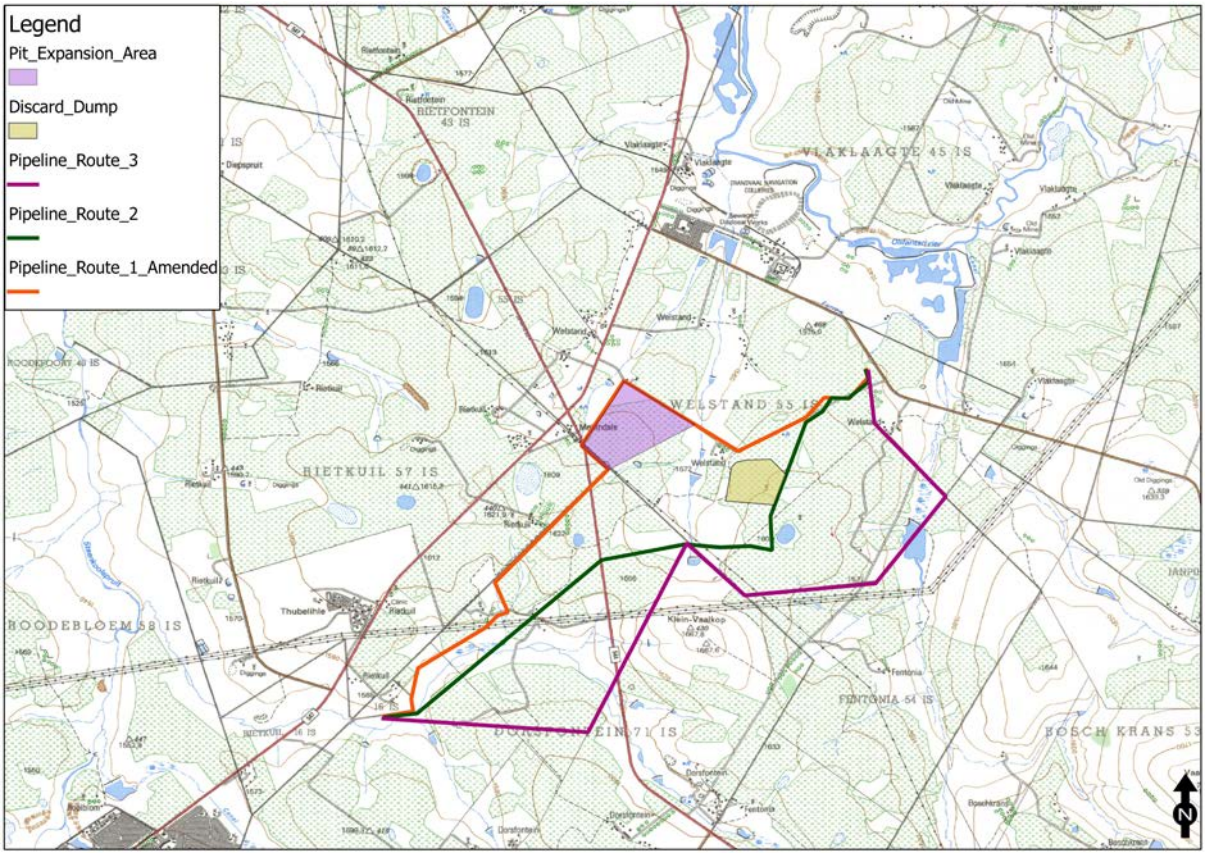

Figure 3: The survey area as indicated on the 1:50 000 topographic map 2629AB

Figure 4: Detail of survey area as indicated on Google Earth Pro (2017)

Figure 5: Existing mining infrastructure

Figure 6: Existing mining infrastructure

Figure 7: General view of the central section indicating agricultural fields surrounding the mine

Figure 8: General view of the current opencast mining operation

Figure 9: General view of the southern section of the survey area (fallow agricultural fields)

Figure 10: South eastern section of the survey area with existing mining dumps and agricultural fields

4. Proposed Project Description

Exxaro has an approved Environmental Management Programme (EMPr) for the Dorstfontein East Mine from the Department of Mineral Resources (DMR), reference number (MP 30/5/1/2/2/51MR). Dorstfontein East is currently mining two opencast pits (Pit 1 and Pit 2). The opencast production rate has been determined at a constant rate of 3 mtpa of RoM equating to an overall coal extraction of 21 million tons RoM. RoM from the opencast pits is transported via conveyors to the plant. Discard is conveyed from the plant to the discard dump located between Pit 1 and Pit 2.

Exxaro now plan to expand the opencast mining of Pit 1 in a North Western direction of approximately 85 Hectares, ensuring a constant RoM of 3 mtpa. In addition to this, Exxaro would like to relay a pipeline from the Dorstfontein West Mine to the Dorstfontein East Mine of approximately 11 km for the transportation of process water which will be recycled.

Blasting of overburden and the coal will be conducted by a dedicated drilling and blasting crew. Each blast is designed for optimal fragmentation and minimum environmental impact by an appointed Blast Engineer. Surrounding property owners will be informed of the blasting procedures and schedules in advance in and around the mining area. Blasting boards at access routes to construction areas will be updated 24 hours prior to the blast, displaying details regarding the time and date of the blast. An exclusion zone on 500 m will be in place for the life on the mine.

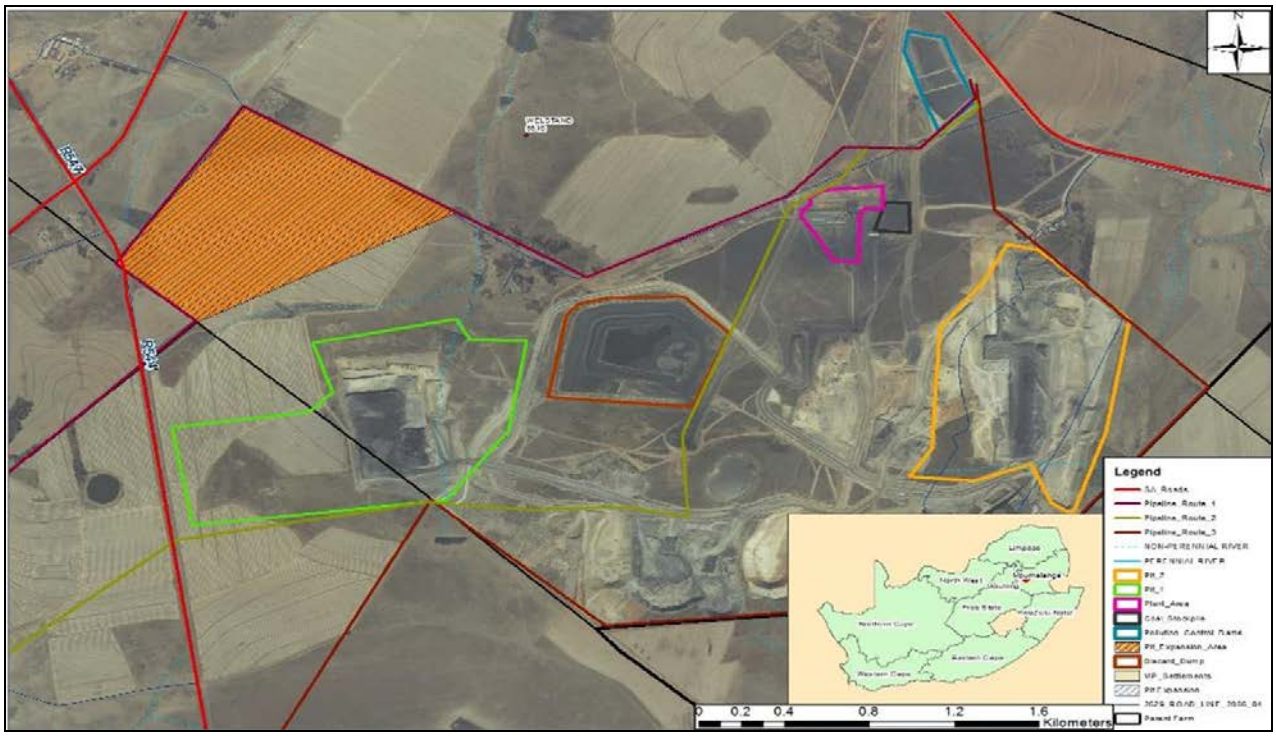

Figure 11: Layout and location of the proposed Pit Extension

The proposed pipeline will be approximately 11 km in length with an internal diameter of 250 mm. This will equate to a peak throughput exceeding 120 litres per second. The pipeline will be constructed from the Dorstfontien West to the Dorstfontien East Mine. The pipeline will be used for the transportation of process water to Dorstfontien East to be recycled in their operations. This pipeline will assist Exxaro to optimise their water management between the two mines.

It is anticipated that the Mine expansion and Pipe construction will include the following infrastructure and activities:

- Selective vegetation clearance would be required for the extension of the Pit 1 expansion and the footprint of the pipeline;
- Stripping and stockpiling topsoil and sub-soil and the establishment of a topsoil stockpile area and berms;
- Mining of the Pit 1 expansion area (Including blasting);
- Erection of the pipeline;
- The development of a maintenance road along the pipeline route;
- Loading, hauling and transportation of ROM, product and materials;
- The dredging, excavation and moving of soil, sand and rock from the non-perennial streams for the erection of the pipeline;
- Erection of pipe racks and culvert at the stream crossings;
- Operation of storm water control systems; and
- The establishment of construction camps by contractors and the operation of earth moving vehicles and equipment.

4.1 Alternative mining of Pit 1

Two opencast pits are currently mined on the eastern side and western side of the resource area with mining taking place both in the 2 and 4 seams. Dorstfontein Mines is now planning to extend its operations on the western side of the mine referred to as Pit 1 Extension. In

Alternative 1 the opencast method of mining will continue as normal from the existing Pit 1 until the planned pit is depleted. The Pit 1 extension will follow with a slight change in the mining direction until the complete Reserve is depleted. Alternative 2 is to mine the Pit 1 extension by means of opencast methods on the right hand side (right hand side of the igneous intrusion-sill break through) North Eastern side of the Pit 1 extension and to mine the left hand side North Western of the Pit 1 extension by means of conventional mechanised underground mining using continuous miners.

4.2 Alternative pipeline routes

Three alternative pipeline routes have been identified for the proposed Dorstfontein Expansion Project. All three routes, to some extent, use existing roads and infrastructure corridors. This is particularly true of Route 1, which makes use of existing farm and mine roads and crosses the R544. As such, Route 1 is the preferred route, as it does not dissect as many of the surrounding cultivated farms, which is the case for both Routes 2 and 3. Importantly, all three routes are in close proximity to or dissect agricultural fields, however it has been assumed that the majority of the pipeline infrastructure will be buried.

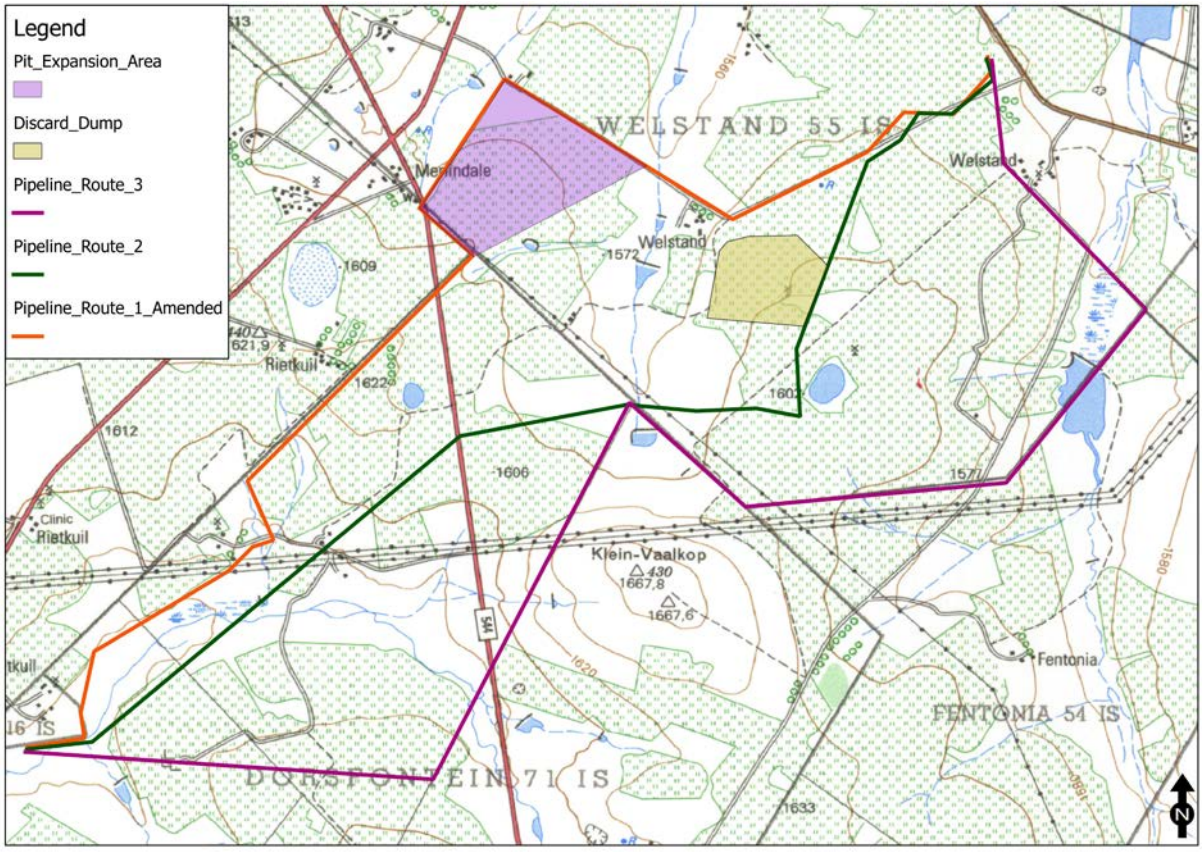

Figure 12: Detail layout of the proposed alternative pipeline routes, Pit 1 extension and discard dump areas

5. Legal Framework

APPLICABLE LEGISLATION AND GUIDELINES USED TO COMPILE THE REPORT	REFERENCE APPLIED
The Constitution of the Republic of South Africa (Act No. 108 of 1996)	
The National Environmental Management Act (Act No. 107 of 1998)	Section 4 (b) Section 24 Section 28

The National Water Act (Act No. 36 of 1998)	Section 21 (a)(b)
Regulation 2, Appendix 2 of Governmental Notice Regulation (GNR) 982	Appendix 2 (a-l)
Air Quality Act (Act No. 39 of 2004)	Section 21
National forestry Act, Act of 34 of 1998	-
The National Heritage Resources Act (Act No. 25 of 1999)	Section 38, 34, 35, 36
Conservation of Agricultural Resources Act (Act No. 85 of 1983)	
Mineral and Petroleum Resources Development Act (Act No. 28 of 2002)	
The National Water Act (Act No. 36 of 1998);	Section 2
Mine Health and Safety Act (Act No. 29 of 1996) (MHSA)	
Biodiversity Act (Act 10 of 2004)	
National Infrastructure Plan	
Mpumalanga Provincial Growth and Development Strategy	

Table 3: Legal framework

- Section 38 of the NHRA (Act No. 25 of 1999) stipulates that the following activities trigger a heritage survey:

Development criteria in terms of Section 38(1a-e) of the NHRA (Act No. 25 of 1999)	**Yes/No**
Construction of road, wall, powerline, pipeline, canal or other linear form of development or barrier exceeding 300m in length	Yes
Construction of bridge or similar structure exceeding 50m in length	No
Development exceeding 5000 m^2 in extent	Yes
Development involving three or more existing erven or subdivisions	No
Development involving three or more erven or divisions that have been consolidated within past five years	No
Rezoning of site exceeding 10 000 m^2	Yes
Any other development category, public open space, squares, parks, recreation grounds	No

Table 4: Activities that trigger Section 38 of the NHRA

- Field rating system as recommended by SAHRA:

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

Table 5: Field rating system to determine site significance

- Heritage resources have lasting value in their own right and provide evidence of the origins of South African society and they are valuable, finite, non-renewable and irreplaceable.

- All archaeological remains, features, structures and artefacts older than 100 years and historic structures older than 60 years are protected by the relevant legislation, in this case the **National Heritage Resources Act (NHRA) (Act No. 25 of 1999, Section 34 & 35)**. The Act makes an archaeological impact assessment as part of an EIA and EMPR mandatory (see **Section 38**). No archaeological artefact, assemblage or settlement (site) may be moved or destroyed without the necessary approval from the **South African Heritage Resources Agency (SAHRA)**. Full cognisance is taken of this Act in making recommendations in this report.

- Cognisance will also be taken of the Mineral and Petroleum Resources Development Act (Act No 28 of 2002) and the National Environmental Management Act (Act No 107 of 1998) when making any recommendations.

- Human remains older than 60 years are protected by the NHRA, with reference to Section 36. Human remains that are less than 60 years old are protected by the Regulations Relating to the Management of Human Remains (GNR 363 of 22 May 2013) made in terms of the National Health Act No. 61 of 2003 as well as local Ordinances and regulations.

- With reference to the evaluation of sites, the certainty of prediction is definite, unless stated otherwise.

- The guidelines as provided by the NHRA (Act No. 25 of 1999) in Section 3, with special reference to subsection 3, and the Australian ICOMOS (International Council on Monuments and Sites) Charter (also known as the Burra Charter) are used when determining the cultural significance or other special value of archaeological or historical sites.

- A copy of this report will be submitted on SAHRIS as stipulated by the National Heritage Resources Act (NHRA) (Act No. 25 of 1999), Section 38 (especially subsection 4) and the relevant Provincial Heritage Resources Authority (PHRA).

- Note that the final decision for the approval of permits, or the removal or destruction of sites, structures and artefacts identified in this report, rests with the SAHRA (or relevant PHRA).

6. Study Approach/Methodology

Geospatial information (ESRI shapefiles) on the proposed prospecting areas was supplied by SRK Consulting. The most up-to-date Google Earth images and topographic maps were used to indicate the survey area. Topographic maps were sources from the Surveyor General. Please note that all maps are orientated with north facing upwards (unless stated otherwise).

The basic strategy during this survey was to survey all the portions of the farms that form part of the application, especially the three alternative pipeline routes. The area was surveyed by conducting a pedestrian (foot) survey at selected areas and intuitive survey techniques. However the area is characterised by demarcated ploughed agricultural fields and fallow lands with the result that most of these farms are clearly divided into accessible blocks.

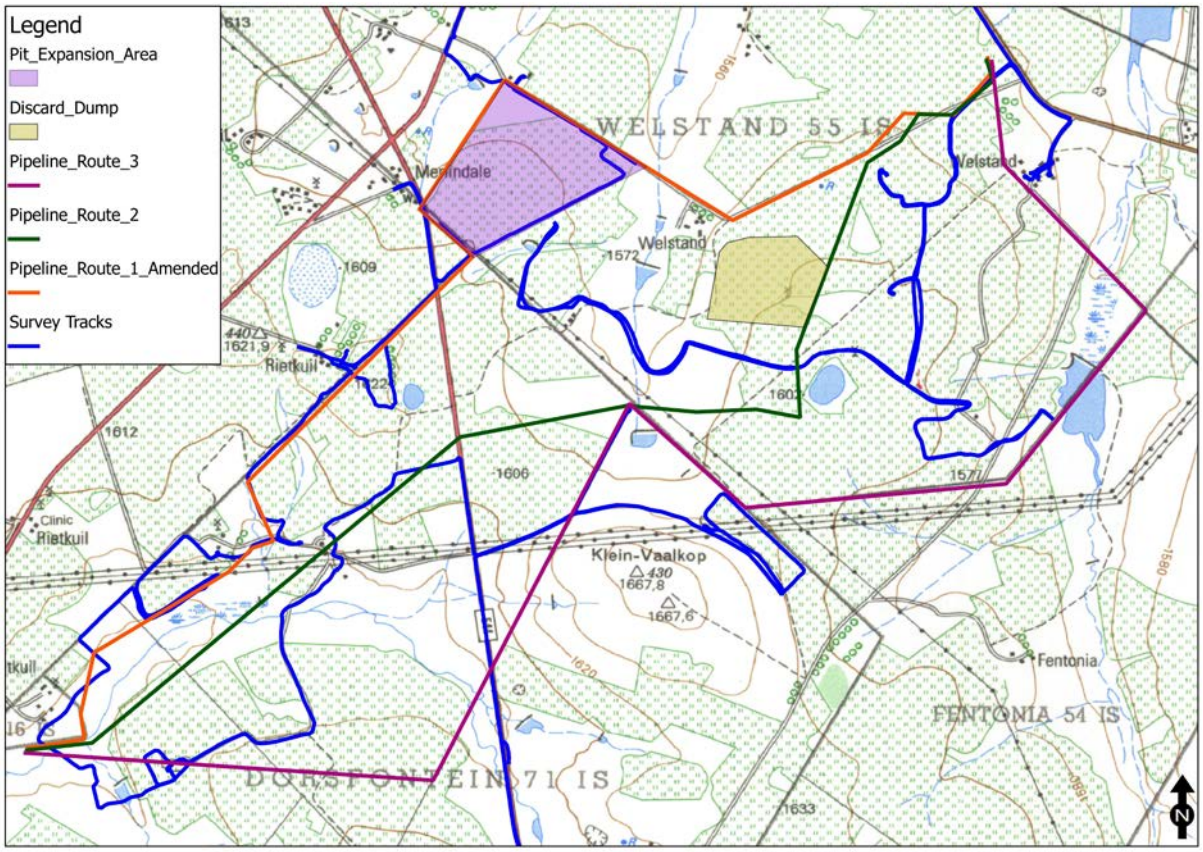

Figure 13: Recorded survey tracks for the project

6.1 Review of existing information/data

Additional information on the cultural heritage of the area was sourced from the following records:

- National Mapping Project by SAHRA (which lists heritage impact assessment reports submitted for South Africa);
- Environmental Potential Atlas (ENPAT)
- Online SAHRIS database;
- National Automated Archival Information retrieval System (NAAIRS)
- Maps and information documents supplied by the client; and
- Surveys conducted in the vicinity of the survey area (Huffman 1996, Pistorius 2008, Van der Walt 2014 and Van Vollenhoven 2009).

Several heritage surveys have been completed inside and outside the project footprint during the last few years. Although some of the sites fall outside the survey area, some do. These sites mostly consist of historical farmhouse complexes and associated graveyards. However, some sites occurred within the current mining area, but were probably mitigated some years ago. Nonetheless these earlier studies serves as a baseline of the type of heritage sites that generally occur in the region, especially since agriculture practices have been conducted for more than a century.

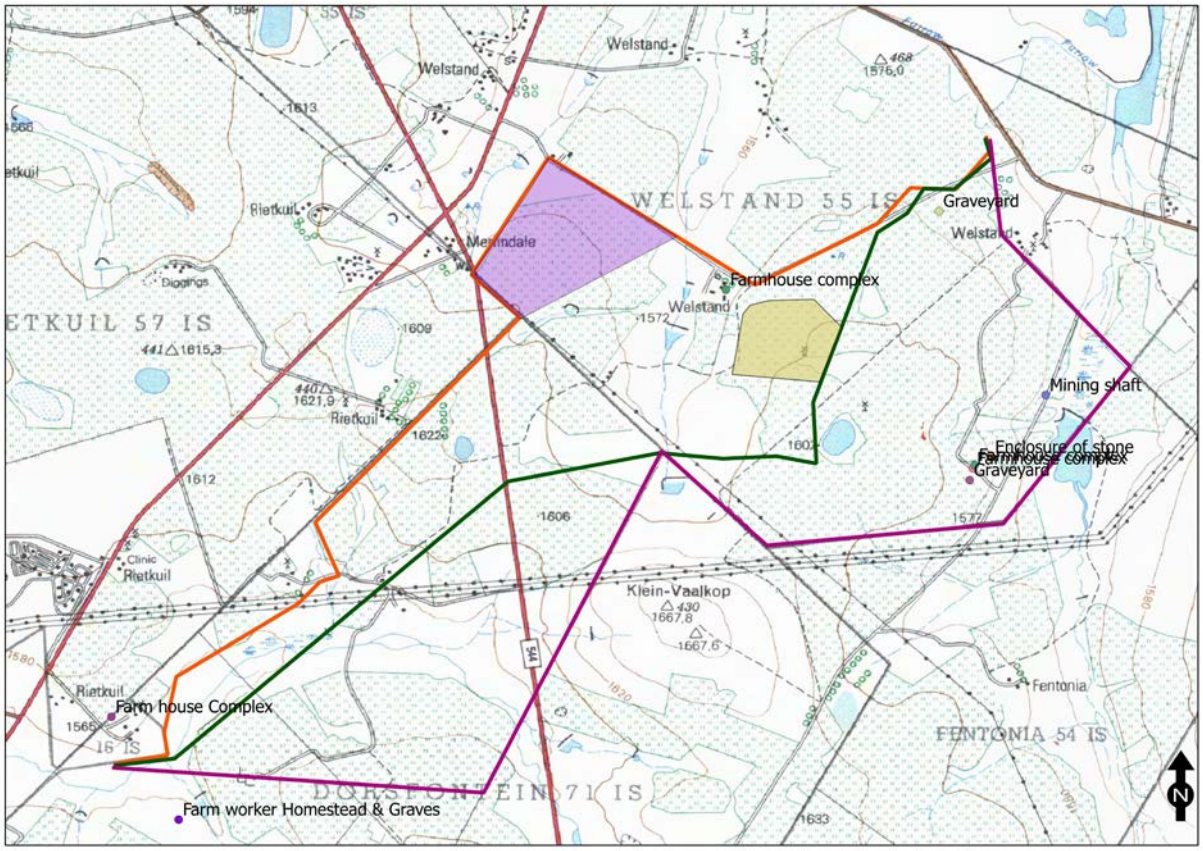

Figure 14: Various heritage sites recorded during earlier surveys (Huffman 1996, Pistorius 2008 and Van Vollenhoven 2009)

According to the Surveyor General's database the farm Rietkuil 57 IS was originally surveyed in 1870 (although the title deed dates to 27 January 1870 (granted to Mr M.C. Landsberg), the farm Dorstfontein 71 IS was originally surveyed in 1908 (although the title deed dates to 22 December 1869 (granted to Mr J.J. Prinsloo) and the farm Welstand 55 IS was originally surveyed in 1905 (although the title deed dates to 28 November 1879 (granted to Mr D.P. du Toit) (see Addendum 3).

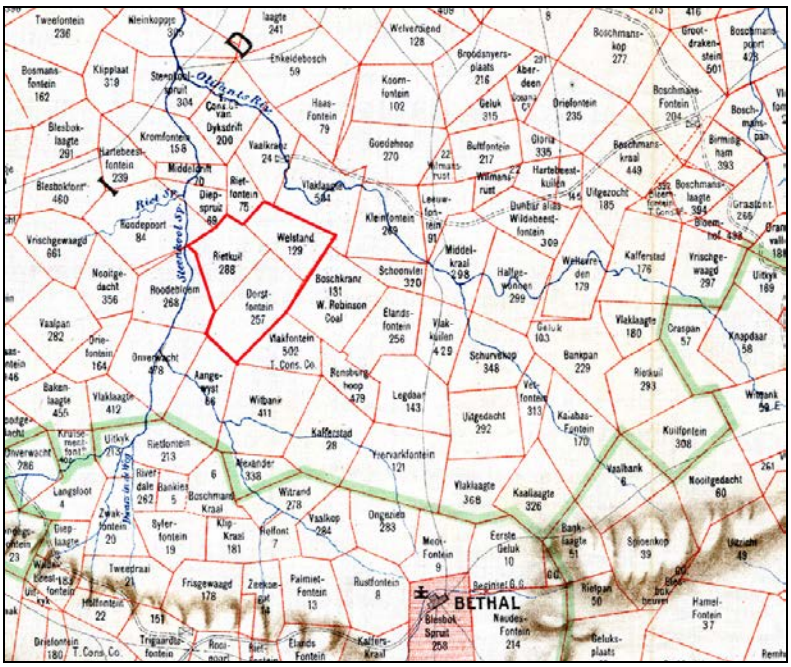

Figure 15: Jeppe's Map dating to 1899 clearly indicates the boundaries of the farms under investigation

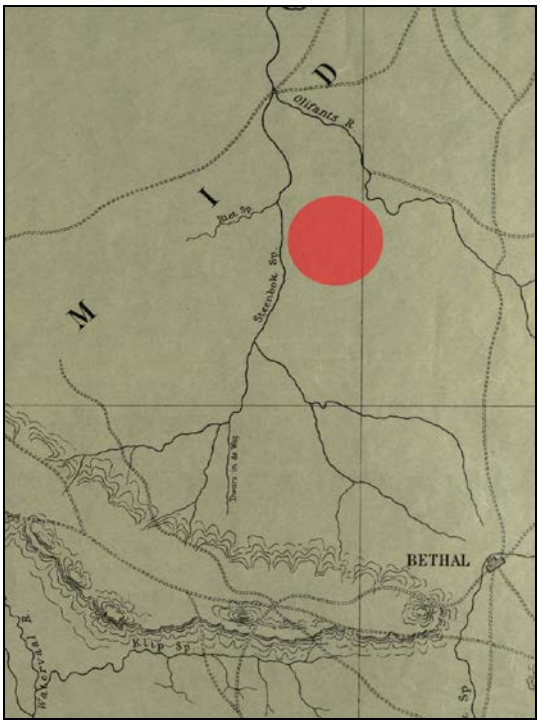

Figure 16: War Office Map indicating the probable location of the survey area as it was in 1900

6.2 Palaeontological sensitivity

The majority of the study area is underlain by Karoo Supergroup sedimentary rocks of the Vryheid Formations of the Ecca Group. These formations largely comprised of sandstone, shale, and coal seams. As a result the following palaeontological sensitivity map was extracted from the SAHRIS database and clearly shows a high sensitivity.

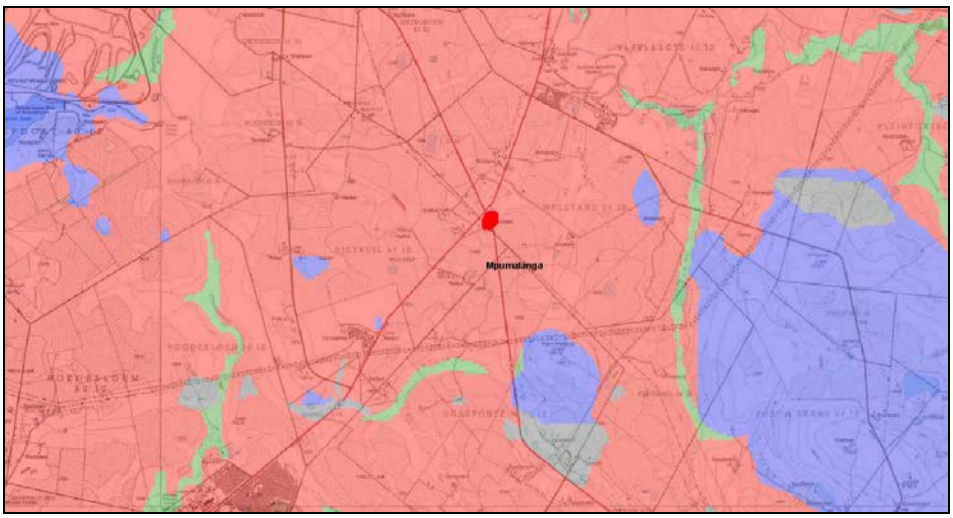

Figure 17: The survey footprint (red area) is located in a palaeontological high sensitivity zone

6.3 Site visits

The field survey was conducted on 1 June 2016.

6.4 Social interaction and current inhabitants

Two extended household dwellings were recorded which occur within the footprint of the proposed Pipeline Alternative 2. The dwellings are currently occupied by local farm workers and their families. Social consultation will have to be conducted with the I@APs, if Pipeline Alternative Route 2 is considered as a viable option.

Figure 18: Two farm worker house complexes near Pipeline Alternative 2

Figure 19: One of the dwellings currently occupied by local farm workers

6.5 Public Consultation and Stakeholder Engagement

The stakeholder engagement process forms an important part of the scoping phase of the project. The stakeholder engagement process is primarily aimed at affording I&APs and stakeholders the opportunity to gain an understanding of the proposed project. In addition, the purpose of consultation with the landowners, key stakeholders, and I&APs is to provide them with the necessary information about the proposed project so that they can make informed decisions as to whether the project will affect them, and provide the EIA team with local

knowledge of the area and raise concerns relating to the biophysical, socio-economic and cultural impacts that may arise.

Background information was sent to all I&APs on the proposed project which outlined the EIA process in the form of a letter. The letter gave the public the opportunity to register as I&APs. An advertisement was placed in the Witbank News on 5 May 2017.

6.6 Assumptions, restrictions, gaps and limitations

No severe physical restrictions were encountered as the survey area was fairly accessible. The survey area is however severely disturbed due to farming and mining activities. As a result not all areas were investigated in detail, as it was relatively easy to determine which areas will probably not yield archaeological and historical remains.

6.7 Methodology for assessment of potential impacts

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

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

- The degree to which the impact can be reversed;
- The degree to which the impact may cause irreplaceable loss of resources; and
- The degree to which the impact can be mitigated.

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

S = (E+D+M) x P; where:
S = Significance weighting
E = Extent
D = Duration
M = Magnitude
P = Probability

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

7. The Cultural Heritage Sites

7.1. Isolated occurrences

Isolated occurrences are artefacts or small features recorded on the surface with no contextual information. No other associated material culture (in the form of structures or deposits) was noted that might provide any further context. This can be the result of various impacts and environmental factors such as erosion and modern developments. By contrast archaeological sites are often complex sites with evidence of archaeological deposit and various interrelated features such as complex deposits, stone walls and middens. However, these isolated occurrences are seen as remains of erstwhile complex or larger sites and they therefore provide a broad indication of possible types of sites or structures that might be expected to occur or have occurred in the survey footprint.

Throughout the survey the only isolated occurrence that was recorded is a multi-facetted Acheulian Earlier Stone Age (ESA) core tool. This surface find was recorded near the main mining pit in the north section of the survey area.

Figure 20: An example of an Acheulian handaxe (Earlier Stone Age) was recorded on the surface near the main open-cast pit

7.2 Heritage sites

A total of nine sites were recorded during the survey, however, only seven sites are older than 60 years and are therefore protected under the NHRA (Act No. 25 of 1999). As such a total of four graveyards (Sites 3, 4, 5, and 8) were recorded as well as two farmhouse complexes (Sites 1 and 6) and a historical power line (Site 9) (consisting of several pylons). Several of the pylons have been destroyed during mining activities. Note two sites are not older than 60 years, namely the farmworker home complex (Site 7) and a modern farmhouse complex (Site 2).

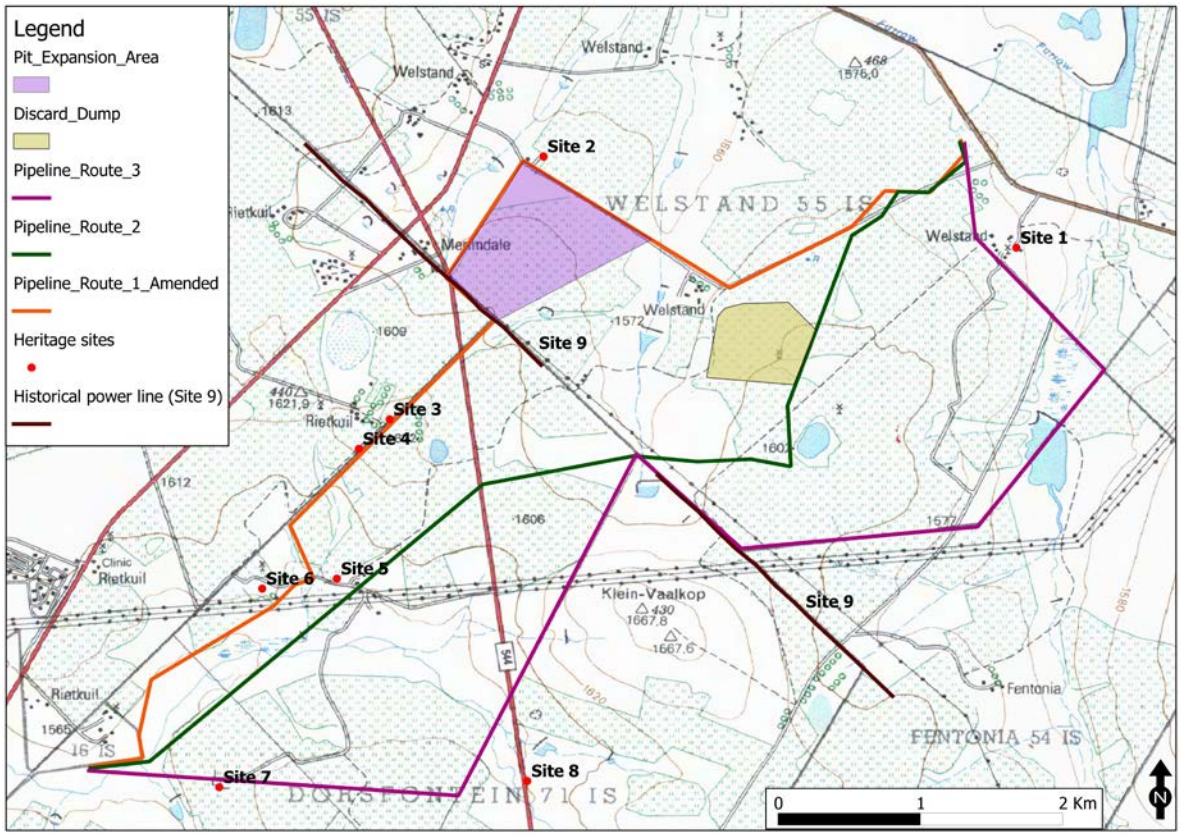

Figure 21: Location of the various recorded heritage sites

Figure 22: The location of individual pylons of a historical power line (Site 9)

8. Locations and Evaluation of Sites

Site No	Coordinates	Site Type	Field Rating of Significance	Impact	Proposed Mitigation
1	26.193523°S 29.364223°E	Historical farmhouse complex	Generally protected B: Medium significance	None, peripheral to Pipeline Alternative 3	• Maintain a buffer zone of 100 metres during construction and mining phase
2	26.187109°S 29.331012°E	Modern farmhouse & structures	-	None, peripheral to Pit 1 expanding area	• None
3	26.205577°S 29.320201°E	Graveyard	Generally protected A: High significance	High Pipeline Alternative 1	• Fenced off and gate installed • Maintain a buffer zone of 100 metres during construction and mining phase
4	26.207642°S 29.318044°E	Graveyard	Generally protected A: High significance	High Pipeline Alternative 1	• Fenced off and gate installed • Maintain a buffer zone of 100 metres during construction and mining phase
5	26.216761°S 29.316495°E	Graveyard	Generally protected A: High significance	None, peripheral to Pipeline Alternative 1 & 2	• Fenced off and gate installed • Maintain a buffer zone of 100 metres during construction and mining phase
6	26.217462°S 29.311251°E	Historical farmhouse complex	Generally protected C: Low significance	None, peripheral to Pipeline Alternative 1	• Maintain a buffer zone of 100 metres during construction and mining phase
7	26.231409°S 29.308235°E	Farm worker houses and livestock kraal	-	None, peripheral to Pipeline Alternative 3	• None
8	26.230972°S 29.329867°E	Graveyard	Generally protected A: High significance	None	• None
9	26.186580°S 29.314496°E 26.225042°S 29.355773°E	Historical power line	Generally protected B: Medium significance	High Pipeline Alternative 1 Pipeline Alternative 3 Expansion Pit 1	• Maintain a buffer zone of 10 metres during construction and mining phase

Table 6: Location and evaluation of sites

9. Management Measures

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

9.1 Objectives

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

The following shall apply:

- Known sites should be clearly marked in order that they can be avoided during construction activities.
- The contractors and workers should be notified that archaeological sites might be exposed during the construction activities.
- Should any heritage artefacts be exposed during excavation, work on the area where the artefacts were discovered, shall cease immediately and the Environmental Control Officer shall be notified as soon as possible;

- All discoveries shall be reported immediately to a heritage practitioner so that an investigation and evaluation of the finds can be made. Acting upon advice from these specialists, the Environmental Control Officer will advise the necessary actions to be taken;
- Under no circumstances shall any artefacts be removed, destroyed or interfered with by anyone on the site; and
- Contractors and workers shall be advised of the penalties associated with the unlawful removal of cultural, historical, archaeological or palaeontological artefacts, as set out in the NHRA (Act No. 25 of 1999), Section 51. (1).

9.2 Control

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

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

10. Recommendations and Conclusions

No Stone Age or Iron Age settlements, structures, features, assemblages or artefacts were recorded during the survey.

Although a total of nine sites were recorded during the survey only seven sites are older than 60 years and are therefore protected under the NHRA (Act No. 25 of 1999). A total of four graveyards (Sites 3, 4, 5, and 8) were recorded as well as two farmhouse complexes (Sites 1 and 6) and a historical power line (Site 9) (consisting of several pylons). Note two sites are not older than 60 years, namely the farmworker home complex (Site 7) and a modern farmhouse complex (Site 2)

Please note that from a heritage perspective the following detailed recommendations are made:

Proposed development	Proposed mitigation measures
Pit 1 extension	Monitor and control the mining activities to prevent impact on the historical power line pylons (Site 9) If impact cannot be prevented a Phase 2 study is required followed with a destruction permit application from SAHRA
Discard dump	No impact on heritage resources and my proceed
Pipeline Alternative Route 1	Direct impact during construction on graveyards (Sites 3 and 4) Change the trajectory of the proposed route If impact cannot be prevented a Phase 2 study (social consultation exhumation and reburial of the graves) will be required followed with a permit application from SAHRA Direct impact during construction on the historical power line pylons (Site 9) If impact cannot be prevented a Phase 2 study is required followed with a destruction permit application from SAHRA

Pipeline Alternative Route 2	Social consultation with I&Ps that live near this route
Pipeline Alternative Route 3	Direct impact during construction on the historical power line pylons (Site 9) Change the trajectory of the proposed route If impact cannot be prevented a Phase 2 study is required followed with a destruction permit application from SAHRA

Final recommendation:

- Pipeline Alternative Route 2 the preferred option from a heritage perspective;
- The Extended Pit 1 may proceed taking account the power line pylons (Site 9) on the southern periphery
- The proposed discard dump may proceed

Nature: No archaeological (both Stone Age and Iron Age) deposits, features, structures, assemblages or settlements were recorded. Four graveyards (Sites 3, 4, 5, and 8), two historical farmhouse complexes (Sites 1 and 6) and a historical power line (Site 9) (consisting of several pylons). Construction of a pipeline (three alternatives), expanding mining Pit 1 and discard dump.		
	Without mitigation	**With mitigation**
Pre-construction & Construction Phase		
Probability	Highly probable (4)	Improbable (2)
Duration	Very short term (1)	Very short term (1)
Extent	Limited to the site (1)	Limited to the site (1)
Magnitude	High (8)	Minor (2)
Significance of Impact	**40 (Medium)**	**8 (Low)**
Status (positive or negative)	Negative	Neutral
Operational (Mining) Phase		
Probability	Very probable (4)	Improbable (2)
Duration	Long term (4)	Long term (4)
Extent	Limited to the local area (2)	Limited to the local area (2)
Magnitude	Very high (10)	Low (4)
Significance of Impact	**64 (High)**	**20 (Low)**
Status (positive or negative)	Negative	Neutral
Decommissioning/Rehabilitation Phase		
Probability	Highly probable (4)	Improbable (2)
Duration	Very short term (1)	Very short term (1)
Extent	Limited to the site (1)	Limited to the site (1)
Magnitude	High (8)	Minor (2)
Significance of Impact	**40 (Medium)**	**8 (Low)**
Status (positive or negative)	Negative	Neutral
Reversibility	Low	Low
Irreplaceable loss of resources?	High	Low
Cumulative impacts and indirect impacts	Mining activities result in extensive heavy vehicle traffic, extraction of deposits, movements of heavy machinery which culminate in vibrations and dust which will indirectly affect the heritage remains. Blasting will be used during mining	
Can impacts be mitigated?	Yes, buffer zones are recommended	

Table 7: Significance of the impact

Also, please note:

If the exhumation and reburial of the graveyards are envisaged it will entail social consultation and permit application. Other legislative measures which may be pertinent include the Removal of Graves and Dead Bodies Ordinance (Ordinance No. 7 of 1925), Regulations Relating to the Management of Human Remains (GNR 363 of 22 May 2013)

made in terms of the National Health Act No. 61 of 2003, Ordinance on Exhumations (Ordinance No. 12 of 1980) as well as any local and regional provisions, laws and by-laws that may be in place. Note that unmarked graves are by default regarded as older than 60 years and therefore falls under the NHRA (Act No. 25 of 1999, Section 36).

Archaeological deposits usually occur below ground level. Should archaeological artefacts or skeletal material be revealed in the area during development activities, such activities should be halted, and a university or museum notified in order for an investigation and evaluation of the find(s) to take place **(*cf*. NHRA (Act No. 25 of 1999)**, Section 36 (6)).

11. References

Bergh, J.S. (ed.) 1998. *Geskiedenis Atlas van Suid-Afrika: Die Vier Noordelike Provinsies*. Pretoria: Van Schaik Publishers

Evers, M. 1981. The Iron Age in the Eastern Transvaal, South Africa. In Voigt (ed.) *Guide to the archaeological sites in the northern and eastern Transvaal*. Pretoria: Southern African Association of Archaeologists.

Huffman, T.N. 1996. Archaeological survey of Dorstfontein Coal Mines. Unpublished report.

Huffman, T. N. 2007. *Handbook to the Iron Age: the Archaeology of Pre-Colonial Farming Societies in Southern Africa*. University of KZN Press: Pietermaritzburg.

Inskeep, R.R. 1978. *The peopling of Southern Africa*. Cape Town: David Philip

Jeppe, F. 1899. Jeppe's Map of the Transvaal. London: Edward Stanford.

Mason, R.J. 1962. *Prehistory of the Transvaal*. Johannesburg. Witwatersrand University Press.

Mason, R.J. 1986. *The origins of black people of Johannesburg and the southern western central Transvaal, AD350 – 1880*. Johannesburg. University of the Witwatersrand Archaeological Research Unit, Occasional Paper 16.

Mönnig, H.O. 1967. *The Pedi*. Pretoria: J.L. van Schaik (Pty) Ltd.

Mucina, L. & Rutherford, M.C. 2010. The Vegetation of South Africa, Lesotho and Swaziland. *Strelitzia 19*. Pretoria: South African National Biodiversity Institute.

Naude, M. 1994. Rondavels and rondavel houses in the Transvaal. *Africana Society of Pretoria* (Vol 12): 24-31.

National Heritage Resources Act. Act No. 25 of 1999. Government Printer: Pretoria.

Ordnance Survey Office (Intelligence Division). 1900. Transvaal and Orange Free State: Bloemhof. War Office No. 1367. Southampton: War Office.

Office of the President. 27 November 1998. National Environmental Management Act (Act No. 107 of 1998). Government Gazette Vol 401 (19519). Pretoria: Government Printer.

Pistorius, J.C.C. 2008. A Phase 1 Heritage Impact Assessment (HIA) for Total Coal South Africa's (TCSA) proposed new expansion of the Dorstfontein Coal Mine (DCM) near Kriel on the Eastern Highveld in the Mpumalanga Province of South Africa. Unpublished report.

Rasmussen, R.K. 1977. *The Migrant Kingdom: Mzilikazi's Ndebele in South Africa*. London: Rex Collins.

SAHRA, 2005. Minimum Standards for the Archaeological and the Palaeontological Components of Impact Assessment Reports, Draft version 1.4.

South African Heritage Resources Agency (SAHRA). Report Mapping Project. Version 1.0, 2009.

Tyson, P.D. 1992. The climate of the last 2000 years in Southern Africa. *The Holocene*. Vol. 2.

Van der Walt, J. 2014. Archaeological Scoping Report For The Proposed Establishment Of The Umbani Coal-Fired Power Plant Near Kriel, Mpumalanga Province. Unpublished report.

Van Vollenhoven, A.C. 2009. Report on a Cultural Heritage Impact Assessment for the Dorstfontein Mine East Expansion Project Near Kriel, Mpumalanga Province. Unpublished report.

Van Warmelo, N.J. 1935. *A Preliminary Survey of the Bantu tribes of South Africa*. Department of Native Affairs. Ethnological Publications Vol V. Government Printer: Pretoria.

Viljoen, M.J. & Reinhold, W.U. 1999. *An introduction to South Africa's geological and mining heritage*. Mintek: Randburg.

Other Sources

Google Earth Pro 2017 (Images: June 2017)

http://www.sahistory.org.za/places/reneke (Accessed: June 2017)

National Archives (NAAIRS)

SWAS: www.weathersa.co.za/climate (accessed June 2017)

McMillan, A.A., Gillanders, R.J. and Fairhurst, J.A. 1999. *Building stones of Edinburgh*. Edinburgh: Edinburgh Geological Society.
http://earthwise.bgs.ac.uk/index.php/Building_stones_in_Edinburgh_from_the_Permian_and_Triassic_New_Red_Sandstone_of_Moray (accessed June 2017)

Addendum 1: Archaeological and Historical Sequence

The table provides a general overview of the chronological sequence of the archaeological periods in South Africa.

PERIOD	APPROXIMATE DATES
Earlier Stone Age	more than 2 million years ago to >200 000 years ago
Middle Stone Age	<300 000 years ago to >20 000 years ago
Later Stone Age (Includes hunter-gatherer rock art)	<40 000 years ago up to historical times in certain areas
Early Iron Age	c. AD 200 - c. AD 900
Middle Iron Age	c. AD 900 – c. AD 1300
Late Iron Age (Stonewalled sites)	c. AD 1300 - c. AD 1840 (c. AD 1640 - c. AD 1840)

< = less than; > = greater than

Archaeological Context

Stone Age Sequence

Concentrations of Early Stone Age (ESA) sites are usually present on the flood-plains of perennial rivers and may date to over 2 million years ago. These ESA open sites may contain scatters of stone tools and manufacturing debris and secondly, large concentrated deposits ranging from pebble tool choppers to core tools such as handaxes and cleavers. The earliest hominins who made these stone tools, probably not always actively hunted, instead relying on the opportunistic scavenging of meat from carnivore fill sites.

Middle Stone Age (MSA) sites also occur on flood plains, but are also associated with caves and rock shelters (overhangs). Sites usually consist of large concentrations of knapped stone flakes such as scrapers, points and blades and associated manufacturing debris. Tools may have been hafted but organic materials, such as those used in hafting, seldom preserve. Limited drive-hunting activities are also associated with this period.

Sites dating to the Later Stone Age (LSA) are better preserved in rock shelters, although open sites with scatters of mainly stone tools can occur. Well-protected deposits in shelters allow for stable conditions that result in the preservation of organic materials such as wood, bone, hearths, ostrich eggshell beads and even bedding material. By using San (Bushman) ethnographic data a better understanding of this period is possible. South African rock art is also associated with the LSA.

Iron Age Sequence

In the northern regions of South Africa at least three settlement phases have been distinguished for early prehistoric agropastoralist settlements during the **Early Iron Age** (EIA). Diagnostic pottery assemblages can be used to infer group identities and to trace movements across the landscape. The first phase of the Early Iron Age, known as **Happy**

Rest (named after the site where the ceramics were first identified), is representative of the Western Stream of migrations, and dates to AD 400 - AD 600. The second phase of **Diamant** is dated to AD 600 - AD 900 and was first recognized at the eponymous site of Diamant in the western Waterberg. The third phase, characterised by herringbone-decorated pottery of the **Eiland** tradition, is regarded as the final expression of the Early Iron Age (EIA) and occurs over large parts of the North West Province, Northern Province, Gauteng and Mpumalanga. This phase has been dated to about AD 900 - AD 1200. These sites are usually located on low-lying spurs close to water.

The Late Iron Age (LIA) settlements are characterised by stone-walled enclosures situated on defensive hilltops c. AD 1640 - AD 1830). This occupation phase has been linked to the arrival of ancestral Northern Sotho, Tswana and Ndebele (Nguni–speakers) in the northern regions of South Africa with associated sites dating between the sixteenth and seventeenth centuries AD. The terminal LIA is represented by late 18th/early 19th century settlements with multichrome Moloko pottery commonly attributed to the Sotho-Tswana. These settlements can in many instances be correlated with oral traditions on population movements during which African farming communities sought refuge in mountainous regions during the processes of disruption in the northern interior of South Africa, resulting from the so-called difaqane (or mfecane).

Late Iron Age settlements characterised by extensive dry stonewalls and dating from the 17th century do occur in the Mpumalanga region, particularly in the area between Lydenburg and Machadodorp (Mason 1962; Inskeep 1978; Evers 1981), but not close to the project area. Late Iron Age communities who contributed to this stone walled architecture were the Sotho, Pedi, Ndebele and Swazi. The stone building tradition that these indigenous groups established many decades before the first colonial settlers arrived, may have influenced the new arrivals to utilize the same resources that their predecessors did.

Ethno-historical Context

Difaqane (mfecane)

The period of upheaval known as the Difaqane (Mfecane) had widespread implications for the northern interior of South Africa. Mzilikazi, one of the generals of King Shaka of the Zulu kingdom left KwaZulu-Natal in 1820 and took his Khumalo clan north-westward on a journey which changed the face of the South African interior. He first reached to Pedi people north of the Olifants and Steelpoort Rivers and took over their land. A year later and after a lengthy sojourn the group arrived at the slopes of the Magaliesberg Mountains in the Pretoria area in about 1827. Mzilikazi established two military kraal or capitals. The one was situated on the Apies River called enDinaneni which was situated north-west of Pretoria on the road to Hartebeespoort Dam and enKungweni which was built along the Daspoort range of hills.

His main residence was on the south side of Meintjieskop, but he later moved to the north of the Magaliesberg Mountains, to a place named emHlahlandlela. This aggressive occupation of the land forced the local Ndebele (Ndzundza) groups to scatter and hide in mountainous areas. Later during the 1830s Mzilikazi moved further west to establish a capital at Gabeni, north of Zeerust where he subjugated various Sotho Tswana groups in the area. His power was only challenged in 1837 by a combined Boer, Tswana and Griqua force. Mzilikazi later migrated into Zimbabwe and established his next capital, Bulawayo (Rasmussen 1977).

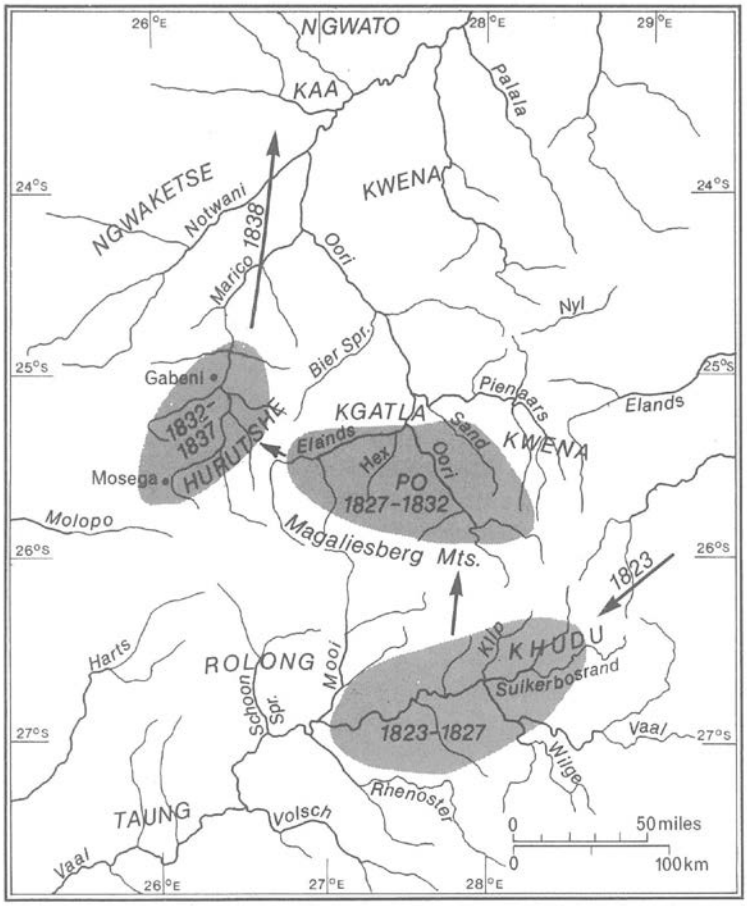

Figure 23: The location of the major spheres of influence of Mzilikazi from the early 1820s to late 1830s (after Rasmussen 1977)

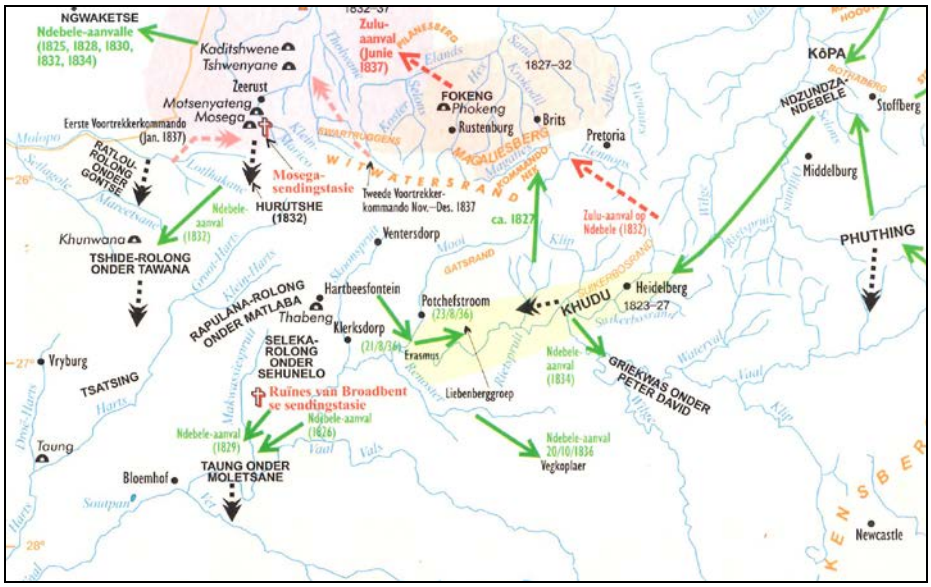

Figure 24: Movement of Mzilikazi's wariors relative to the survey area around Schweizer-Reneke (after Bergh 1998)

The Ndzundza Ndebele (Southern Ndebele of Nguni origin) also settled in Steelpoort River and oral history suggests an early (*circa* late AD 1500) settlement in the interior, to the immediate north of Pretoria, under their founder-ruler called Musi. The Ndzundza chieftaincy is believed to have eventually extended its boundaries along the catchment area of the Steelpoort River in the 1630s and settled here for the next 250 years (Van Vuuren 1995, Van Warmelo 1935). Several of these settlements (KwaSimkhulu, KwaMaza and Esikhunjini) are known through oral history and have been investigated archaeologically (see Schoeman 1997). We know of their chief Mabhogo who ruled from the 1840s, until his death in 1865 (Schoeman 1997:10). It is also known that both groups extended their political and economic influence to a large geographic area. Other groups who lived in the general geographic area of this survey include the BaKopa, the BaKoni, the BaRoka, the Phuting, the Swazi (Ndwandwe), and the Shangaan-Tsonga (we acted as intermediate traders with the east coast). Access to and control over this area might also have changed through time. In the 1820s the area was affected by the disruptive influence of the Zulu warrior Mzilikazi and later, during the middle and late 19th century the area underwent a process of settlement by white farmers which resulted in the establishment of fenced farms and formal towns.

Ndebele towns that have been investigated archaeologically include KwaSimkhulu (occupied circa AD 1600 – AD 1680s), KwaMaza (occupied circa AD 1675 – AD 1820; situated at the eastern foot of Bothasberg), Esikhunjini (occupied circa AD 1820 – AD 1835; on the north-eastern slopes of Bothasberg) and KoNomtjarhelo (capital Erloweni (Mapochstad) and an outlying site: UmKlaarmaak (near Spitskop) (occupied circa AD 1835 – AD 1883). We also know of several Pedi capitals that were also situated in the Steelpoort River valley.

After a period of conflict the Boer Republic (ZAR) signed a peace-treaty with the Pedi under their chief Sekwati on 17 November 1857. A Lutheran missionary of the Berlin Missionary Society, Alexander Merensky visited Sekwati in 1860 and later built a mission station in Gerlachshoop near Bopedi (Mönnig 1967:24-25). In the late 1850s negotiations between the Boers and the Pedi resulted in the purchase by the Boers of a large area below the southern escarpment of the Drakensberg.

Several trading routes associated with the gold trade are known. These routes connected the interior with the east coast to facilitate the export of alluvial gold and import of various commodities. Amongst others, one such route ran from Sabie, over the Drakensberg towards Lydenburg. From Lydenburg the route turned north-western towards Sekhukhune Land over the Grootdwars River and though the Steelpoortsdrif, up Magneethoogte, past Ramakokskraal, then along the Gompies River towards Platberg (De V. Pienaar 1990:55)

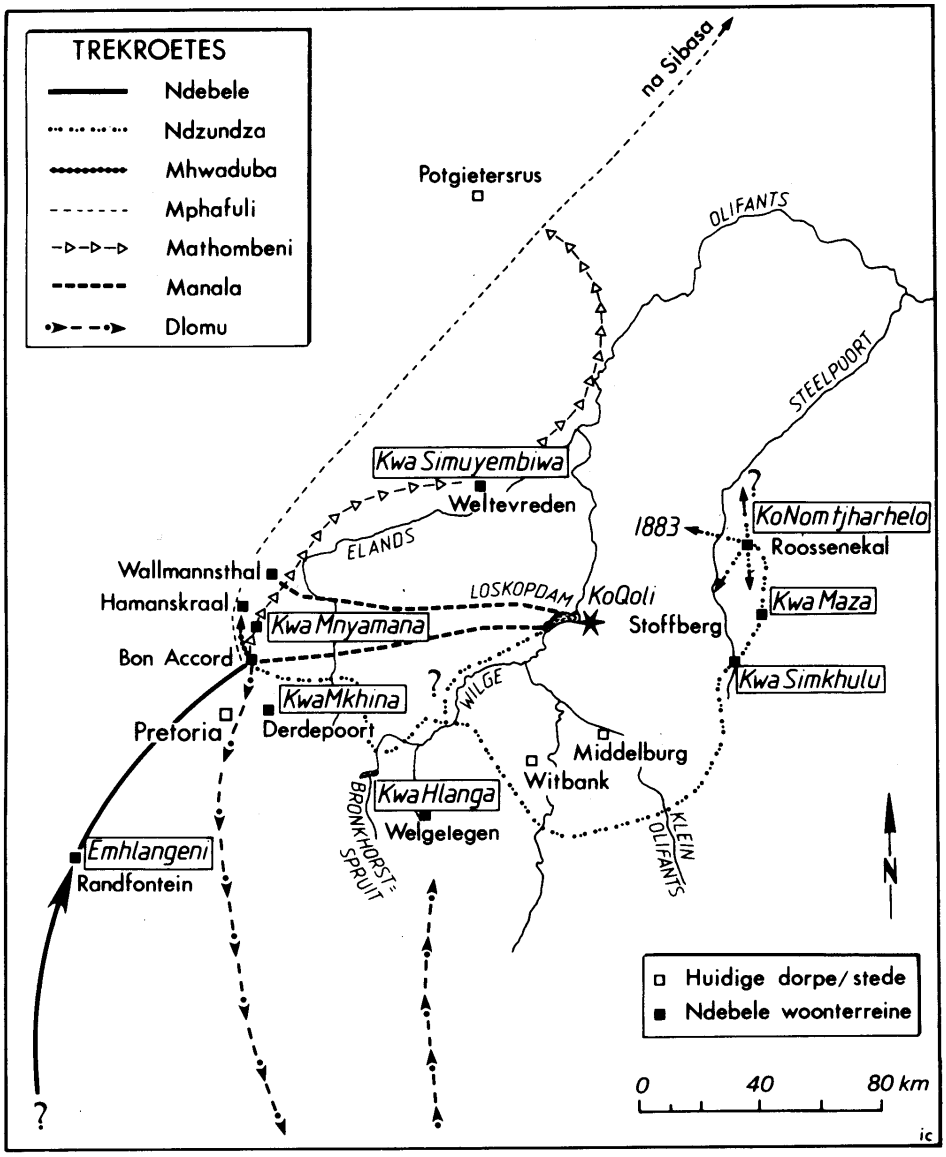

Figure 25: Migration routes of the Ndebele to the west of the survey area (van Vuuren 1995)

Also, according to Van Warmelo's 1935 study the area was traditionally mostly occupied by early Ndebele-speaking groups (Ndzundza-Ndebele).

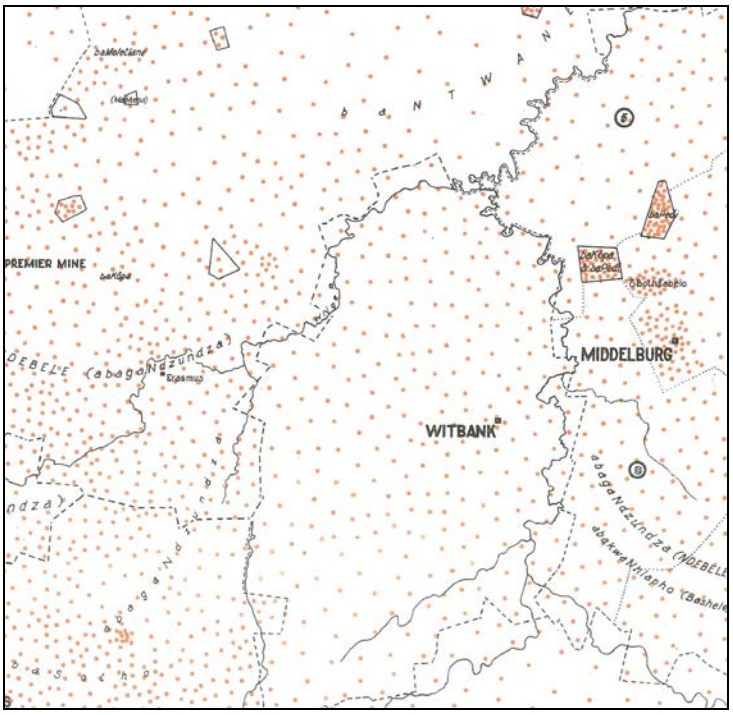

Figure 26: Position of historical groups living in the area south of Witbank (after van Warmelo 1935)

Coal Mining

The history of coal mining in South Africa is closely linked with the economic development of the country. Commercial coal mining commenced in the eastern Cape near Molteno in 1864. The discovery of diamonds in the late 1870s led to expansion of the mines in order to meet the growing demand for coal. Commercial coal mining in KwaZulu-Natal and on the Witwatersrand commenced in the late 1880s following the discovery of gold on the Witwatersrand in 1886. In 1879 coal mining commenced in the Vereeniging area and in 1895 in the Witbank area to supply both the Kimberly mines and those on the Witwatersrand. South Africa began a period of major economic development after World War II. New goldfields were discovered and developed in the Welkom, Klerksdorp and Evander areas; a local steel industry was established with mills being built at Pretoria, Newcastle and Vanderbijlpark.

The first exploitation for coal was probably in KwaZulu-Natal as documentary evidence refers to a wagon load of coal brought to Pietermaritzburg to be sold in 1842. In 1860 the coal trade started in Dundee when a certain Pieter Smith charged ten shillings for a load of coal dug by the buyer from a coal outcrop in a stream. In 1864 a coal mine was opened in Molteno. The explorer, Thomas Baines mentioned that farmers worked coal deposits in the neighbourhood of Bethal (Transvaal) in 1868. Until the discovery of diamonds in 1867 and gold on the Witwatersrand in 1886, coal mining only satisfied a very small domestic demand. With the discovery of gold in the Southern Transvaal and the development of the gold mining industry around Johannesburg came the exploitation of the Boksburg-Spring coal fields, which is now largely worked out. By 1899, at least four colliers were operating in the Middelburg-Witbank district, also supplying the gold mining industry. At this time coal mining also has started in Vereeniging. The Natal Collieries importance was boosted by the need to find an alternative for imported Welsh anthracite used by the Natal Government Railways.

By 1920 the output of all operating colliers in South Africa attained an annual figure of 9,5million tonnes. Total in-situ reserves were estimated to be 23 billion tonnes in Witbank-Springs, Natal and Vereeniging. The total in situ reserves today are calculated to be 121 billion tonnes. The largest consumers of coal are Sasol, Iscor and Eskom. Douglas Colliery emerged from the Witbank Colliery which was founded in the former Transvaal Republic in 1896. Coal mining operations began in the Witbank Main Seam (also known as the No. 2 Seam) two years later. The first dividends were paid to shareholders in 1903. Douglas Colliery was launched in 1973 when Witbank Colliery bought out the former Douglas Colliery from the Transvaal and Delagoa Bay Investment Company (Rand Mines). The export of Low Ash Coal also commenced during this year.

As indicated the Deed of Grant for the farm Van Dyksdrift 19 IS was granted in 1869 and it seems that the original mining activities in the area started in 1898 making it one of the oldest coal mines in the old Trans-Vaal area. The adjacent farm to Van Dyksdrift 19 IS is Steenkoolspruit 18 IS confirming that coal deposits were known to exist in the area from very early on (located west of the survey footprint).

Many farmers from Scottish, Irish, Dutch, German and Scandinavian descend farmed in the Eastern Highveld. These colonials brought knowledge of stone masonry from Europe that compensated for the lack of firewood to bake clay bricks. European architectural influence can also be seen in missionary stations such as Botŝabelo near Middelburg which was constructed in the second half of the 19th century. Here the missionary's house, the school buildings and churches all have stone foundations while some of the buildings in the complex have been built in their entirety with stone (Naude 1994).

Addendum 2: Description of the Recorded Sites

A system for grading the significance of heritage sites was established by the NHRA (Act No. 25 of 1999) and further developed by the South African Heritage Resources Agency (SAHRA 2007) and has been approved by ASAPA for use in southern Africa and was utilised during this assessment.

Site 1

A. GENERAL SITE DESCRIPTION	
Site type	Historical farmhouse complex
Site Period	Late 19th to early-mid 20th century
Physical description	The site comprises a historic farmhouse complex consisting of the following aspects: ▪ A historical multi-room brick house (and outbuilding) with corrugated iron roof (with recent additions and alterations) probably dating to the early 1900s (Site 1A) ▪ A modern multi-room brick farmhouse that was probably constructed in the 1980s (Site 1B) ▪ Rectangular dressed stone and cement shed with corrugated iron roof and door (Site 1C) ▪ Rectangular sandstone shed (with alterations and extensions) with corrugated iron roof (Site 1D) ▪ Sandstone-walled livestock enclosures (Site1E) Structures associated with the farmhouse complex range from modern (1980s) to late 19th century and probably resulted from family occupation of at least two or three generations. The modern house (Site 1B) will not be discussed in more detail. The historical farmhouse (Site 1A) (situated 150 metres west of Site 1B) was originally square in layout but extensive additions have been added on both the northern and eastern faces. It seems the adjacent shed has also been cladded with modern bricks and cement. As such the structures have lost most of their heritage value (significance). The square shed (Site 1C) probably dates to the early 1900s and is also associated with Site 1A. Large dressed ferricrete blocks and cement were used to construct the structure. The door is facing north. Of special interest is the dressed sandstone shed (Site 1D). A corner stone has the word 'Moray' carved into it. Moray is a well-known quarry in Scotland famous for its Permian and Triassic sandstones of the 'New Red Sandstone' and are typically highly siliceous and well cemented. Colours vary considerably but typically yellow, buff and fawn sandstones predominate unlike the bright red stones of southern Scotland and Cumbria. On the Moray coast, the Sandstones of Hopeman have long been used as a source of good building stone since the early 19th century. Clashach Quarry has been operated by Moray Stone Cutters (McMillan et al 1999). A hand-forged metal door hinge was also recorded near the shed. Although it is unclear whether the sandstone was imported it is clear that a skilled stonemason was contracted to construct the structure. Recently the shed was restored to store construction vehicles and has been extensively expanded with cement blocks. An additional wooden veranda was also added on the western face. As such the shed has therefore lost most of its heritage value (significance). A double set of livestock enclosures (Site 1E) occur to the east of the farmhouse complex. Although partly collapsed the extent of the sandstone constructed enclosures can be clearly seen. It is possible that the same sandstone was used as with the shed (Site 1D). Most of the enclosures are overgrown.
Integrity of deposits or structures.	Most of the older structures are unstable. No substantial midden deposits were recorded in association.
Site extent	Site 1A: Originally 9 m x 9 m (with additions: 12 m x 12 m); wall eight 2.8 m Site 1B: 17 m x 10 m; wall height 3 m Site 1C: 5 m x 7 m; wall height 2 m Site 1D: 13 m x 7 m (currently); wall height 2.3 m Site 1E: 30 m x 40 m & 23 m x 20 m: wall height 0.8 m
B. SITE EVALUATION	

B1. HERITAGE VALUE	Yes	No
Historic Value		
It has importance to the community or pattern of South Africa's history or precolonial history.		X
It has strong or special association with the life or work of a person, group or organisation of importance in the history of South Africa.		X
It has significance relating to the history of slavery in South Africa.		X
Aesthetic Value		
It has importance in exhibiting particular aesthetic characteristics valued by a particular community or cultural group.	X	
Scientific Value		
It has potential to yield information that will contribute to an understanding of South Africa's natural and cultural heritage.		X
It has importance in demonstrating a high degree of creative or technical achievement at a particular period.		X
It has importance to the wider understanding of the temporal change of cultural landscapes, settlement patterns and human occupation.	X	
Social Value		
It has strong or special association with a particular community or cultural group for social, cultural or spiritual reasons (sense of place).		X
Tourism Value		
It has significance through its contribution towards the promotion of a local sociocultural identity and can be developed as tourist destination.		X
Rarity Value		
It possesses unique, uncommon, rare or endangered aspects of South Africa's natural or cultural heritage.		X
Representative Value		
It is importance in demonstrating the principle characteristics of a particular class of South Africa's natural or cultural places or objects.		X
B2. REGIONAL CONTEXT		
Other similar sites in the regional landscape.	X	

C. SPHERE OF SIGNIFICANCE	High	Medium	Low
International			X
National			X
Provincial			X
Local		X	
Specific community		X	

D. FIELD REGISTER RATING	
National/Grade 1 [should be registered, retained]	
Provincial/Grade 2 [should be registered, retained]	
Local/Grade 3A [should be registered, mitigation not advised]	
Local/Grade 3B [High significance; mitigation, partly retained]	
Generally Protected A [High/Medium significance, mitigation]	
Generally protected B [Medium significance, to be recorded]	X
Generally Protected C [Low significance, no further action]	

E. GENERAL STATEMENT OF SITE SIGNIFICANCE	
Low	
Medium	X
High	

F. RATING OF POTENTIAL IMPACT OF DEVELOPMENT	
None	
Peripheral	X
Destruction	
Uncertain	

G. RECOMMENDED MITIGATION

- No direct impact on the site
- Peripheral to Pipeline Alternative 3
- Maintain a 100 m buffer zone during the construction and mining phase

H. APPLICABLE LEGISLATION AND LEGAL REQUIREMENTS

- National Heritage Resources Act (Act No. 25 of 1999, Section 34)

I. PHOTOGRAPHS

Figure 27: Site 1A: historical farmhouse dating to the 1900s with shed on eastern side

Figure 28: Site 1B: Modern multi-room brick farmhouse

Figure 29: Site 1C: The small square shed with dressed stone and corrugated iron roof

Figure 30: Site 1D: The dressed sandstone shed with corrugated iron roof (additions visible)

Figure 31: Site 1D: The corner stone with word 'Moray' and a hand-made steel door hinge

Figure 32: Site 1D: Restoration with cement bricks and additional veranda

Figure 33: Dressed stone wall demarcating the livestock enclosure

Figure 34: The location of all the relevant structures of the farmhouse complex

Site 2

A. GENERAL SITE DESCRIPTION			
Site type	Farmhouse complex		
Site Period	Modern (probably 1980s)		
Physical description	The site comprises a farmhouse complex consisting of the following aspects: ▪ The main multi-room double level brick house ▪ A multi-room brick secondary structure (motor garage) ▪ Swimming pool Structures associated with the farmhouse complex probably date to the 1980s and are therefore not protected by the NHRA (Act No. 25 of 1999). The main house is constructed with bricks and cement. The walls are plastered with a half-moon design. A secondary structure probably functioned as motor garage. A swimming pool is situated adjacent to the main house. Please note that all the structure have been stripped of their roofs, windows, doors and all other fittings.		
Integrity of deposits or structures	None		
Site extent	Main house: 30 m x 15 m; wall eight 4.5 m Motor garage: 9 m x 7 m; wall height 2.6 m		
B. SITE EVALUATION			
B1. HERITAGE VALUE		**Yes**	**No**
Historic Value			
It has importance to the community or pattern of South Africa's history or precolonial history.			X
It has strong or special association with the life or work of a person, group or organisation of importance in the history of South Africa.			X
It has significance relating to the history of slavery in South Africa.			X
Aesthetic Value			
It has importance in exhibiting particular aesthetic characteristics valued by a particular community or cultural group.			X
Scientific Value			
It has potential to yield information that will contribute to an understanding of South Africa's natural and cultural heritage.			X
It has importance in demonstrating a high degree of creative or technical achievement at a particular period.			X
It has importance to the wider understanding of the temporal change of cultural landscapes, settlement patterns and human occupation.			X
Social Value			

It has strong or special association with a particular community or cultural group for social, cultural or spiritual reasons (sense of place).		X
Tourism Value		
It has significance through its contribution towards the promotion of a local sociocultural identity and can be developed as tourist destination.		X
Rarity Value		
It possesses unique, uncommon, rare or endangered aspects of South Africa's natural or cultural heritage.		X
Representative Value		
It is importance in demonstrating the principle characteristics of a particular class of South Africa's natural or cultural places or objects.		X
B2. REGIONAL CONTEXT		
Other similar sites in the regional landscape.	X	

C. SPHERE OF SIGNIFICANCE	**High**	**Medium**	**Low**
International			
National			
Provincial			
Local			
Specific community			

D. FIELD REGISTER RATING	
National/Grade 1 [should be registered, retained]	
Provincial/Grade 2 [should be registered, retained]	
Local/Grade 3A [should be registered, mitigation not advised]	
Local/Grade 3B [High significance; mitigation, partly retained]	
Generally Protected A [High/Medium significance, mitigation]	
Generally protected B [Medium significance, to be recorded]	
Generally Protected C [Low significance, no further action]	
E. GENERAL STATEMENT OF SITE SIGNIFICANCE	
Low	
Medium	
High	
F. RATING OF POTENTIAL IMPACT OF DEVELOPMENT	
None	
Peripheral	X
Destruction	
Uncertain	

G. RECOMMENDED MITIGATION

- No direct impact on the site
- Peripheral to Pit 1 expanding area

H. APPLICABLE LEGISLATION AND LEGAL REQUIREMENTS

- None

I. PHOTOGRAPHS

Figure 35: The main farmhouse with double level construction

Figure 36: Secondary structure which probably functioned as motor garage

Figure 37: Swimming pool adjacent to the main house

Site 3

A. GENERAL SITE DESCRIPTION	
Site type	Graveyard
Site Period	Mid-20th Century
Physical description	The site comprises a graveyard which consists of at least 2 graves with an east-west orientation with the headstones on the western side. Both graves are demarcated with packed stone/sand bases and cement headstones. The following inscriptions were recorded:

	• Kelina (Maria) Masango (Died: 1946) • Sollomon Masango (Died: 04/01/1951) Unmarked graves are by default regarded as older than 60 years and are therefore protected by the NHRA (Act No 25 of 1999, Section 36).
Integrity of deposits or structures	Stable
Site extent	Approximately 10 m x 10 m

B. SITE EVALUATION		
B1. HERITAGE VALUE	**Yes**	**No**
Historic Value		
It has importance to the community or pattern of South Africa's history or precolonial history.		X
It has strong or special association with the life or work of a person, group or organisation of importance in the history of South Africa.		X
It has significance relating to the history of slavery in South Africa.		X
Aesthetic Value		
It has importance in exhibiting particular aesthetic characteristics valued by a particular community or cultural group.		X
Scientific Value		
It has potential to yield information that will contribute to an understanding of South Africa's natural and cultural heritage.		X
It has importance in demonstrating a high degree of creative or technical achievement at a particular period.		X
It has importance to the wider understanding of the temporal change of cultural landscapes, settlement patterns and human occupation.	X	
Social Value		
It has strong or special association with a particular community or cultural group for social, cultural or spiritual reasons (sense of place).	X	
Tourism Value		
It has significance through its contribution towards the promotion of a local sociocultural identity and can be developed as tourist destination.		X
Rarity Value		
It possesses unique, uncommon, rare or endangered aspects of South Africa's natural or cultural heritage.		X
Representative Value		
It is importance in demonstrating the principle characteristics of a particular class of South Africa's natural or cultural places or objects.		X
B2. REGIONAL CONTEXT		
Other similar sites in the regional landscape.	X	

C. SPHERE OF SIGNIFICANCE	**High**	**Medium**	**Low**
International			X
National			X
Provincial		X	
Local	X		
Specific community	X		

D. FIELD REGISTER RATING	
National/Grade 1 [should be registered, retained]	
Provincial/Grade 2 [should be registered, retained]	
Local/Grade 3A [should be registered, mitigation not advised]	
Local/Grade 3B [High significance; mitigation, partly retained]	
Generally Protected A [High/Medium significance, mitigation]	X
Generally protected B [Medium significance, to be recorded]	
Generally Protected C [Low significance, no further action]	
E. GENERAL STATEMENT OF SITE SIGNIFICANCE	
Low	
Medium	
High	X
F. RATING OF POTENTIAL IMPACT OF DEVELOPMENT	
None	

Peripheral	
Destruction	X
Uncertain	

G. RECOMMENDED MITIGATION

- Direct impact: Pipeline Alternative Route 1
- Change the trajectory of the proposed Alternative Route 1
- The graveyard must be fenced off with an access gate installed
- Maintain a buffer zone of 10 metres during construction and mining activities
- If impact cannot be avoided the graves can be exhumed and relocated following a social consultation and legal process (permit application to SAHRA)

H. APPLICABLE LEGISLATION AND LEGAL REQUIREMENTS

- National Heritage Resources Act (Act No. 25 of 1999, Section 36)
- Regulations Relating to the Management of Human Remains, in terms of the National Health Act No. 61 of 2003
- Removal of Graves and Dead Bodies Ordinance (Ordinance No. 7 of 1925)
- Ordinance on Exhumations (Ordinance No. 12 of 1980)
- Local and regional provisions, laws and by-laws

I. PHOTOGRAPHS

Figure 38: Graves indicated with packed stone bases and cement headstones

Site 4

A. GENERAL SITE DESCRIPTION	
Site type	Graveyard
Site Period	Early to Mid-20th Century
Physical description	The site comprises a graveyard which consists of at least 12 graves with an east-west orientation with the headstones on the western side. The graves are demarcated with granite bases and headstones. The following inscription was recorded: • Maria Johanna Fourie (Born: 31/12/1906; Died: 1/07/1921) • Gertruida Ester Bosman (nee de Villiers) (Born: 12/05/1879; Died: 23/12/1936) • Gertruida Johanna Fourie (nee van Aardt) (Born: 24/08/1859; Died: 03/06/1945) • Maria Elizabeth Bosman (Born: 21/06/1884; Died: 01/06/1923) • Wilhelmina Fick Heyns (nee de Villiers) (Born: 07/04/1887; Died: 07/08/1919) • Maria E. de Villiers (nee de Vos) (Born: 25/04/1843; Died: 06/10/1915) • Elizabeth De Villiers (Born: 17/08/1933; Died: 02/03/1934) • Maria de Villiers (Born: 19/05/1929; Died: 22/08/1931) • Carolus Trichard de Villiers (Born: 30/11/1923; Died: 09/04/1949) • Matthys Johannes Albertus de Villiers (Died: 16/07/1941)(20 years 11 months old) Unmarked graves are by default regarded as older than 60 years and are therefore

	protected by the NHRA (Act No 25 of 1999, Section 36).			
Integrity of deposits or structures	Unstable, most of the headstones have been damaged. Some of the graves have been excavated.			
Site extent	Approximately 15 m x 15 m			
B. SITE EVALUATION				
B1. HERITAGE VALUE			**Yes**	**No**
Historic Value				
It has importance to the community or pattern of South Africa's history or precolonial history.				X
It has strong or special association with the life or work of a person, group or organisation of importance in the history of South Africa.				X
It has significance relating to the history of slavery in South Africa.				X
Aesthetic Value				
It has importance in exhibiting particular aesthetic characteristics valued by a particular community or cultural group.				X
Scientific Value				
It has potential to yield information that will contribute to an understanding of South Africa's natural and cultural heritage.				X
It has importance in demonstrating a high degree of creative or technical achievement at a particular period.				X
It has importance to the wider understanding of the temporal change of cultural landscapes, settlement patterns and human occupation.			X	
Social Value				
It has strong or special association with a particular community or cultural group for social, cultural or spiritual reasons (sense of place).			X	
Tourism Value				
It has significance through its contribution towards the promotion of a local sociocultural identity and can be developed as tourist destination.				X
Rarity Value				
It possesses unique, uncommon, rare or endangered aspects of South Africa's natural or cultural heritage.				X
Representative Value				
It is importance in demonstrating the principle characteristics of a particular class of South Africa's natural or cultural places or objects.				X
B2. REGIONAL CONTEXT				
Other similar sites in the regional landscape.			X	
C. SPHERE OF SIGNIFICANCE	**High**	**Medium**	**Low**	
International			X	
National			X	
Provincial		X		
Local	X			
Specific community	X			
D. FIELD REGISTER RATING				
National/Grade 1 [should be registered, retained]				
Provincial/Grade 2 [should be registered, retained]				
Local/Grade 3A [should be registered, mitigation not advised]				
Local/Grade 3B [High significance; mitigation, partly retained]				
Generally Protected A [High/Medium significance, mitigation]			X	
Generally protected B [Medium significance, to be recorded]				
Generally Protected C [Low significance, no further action]				
E. GENERAL STATEMENT OF SITE SIGNIFICANCE				
Low				
Medium				
High			X	
F. RATING OF POTENTIAL IMPACT OF DEVELOPMENT				
None				
Peripheral				
Destruction			X	
Uncertain				
G. RECOMMENDED MITIGATION				

- Direct impact: Pipeline Alternative Route 1
- Change the trajectory of the proposed Alternative Route 1
- The graveyard must be fenced off with an access gate installed
- Maintain a buffer zone of 10 metres during construction and mining activities
- If impact cannot be avoided the graves can be exhumed and relocated following a social consultation and legal process (permit application to SAHRA)

H. APPLICABLE LEGISLATION AND LEGAL REQUIREMENTS

- National Heritage Resources Act (Act No. 25 of 1999, Section 36)
- Regulations Relating to the Management of Human Remains, in terms of the National Health Act No. 61 of 2003
- Removal of Graves and Dead Bodies Ordinance (Ordinance No. 7 of 1925)
- Ordinance on Exhumations (Ordinance No. 12 of 1980)
- Local and regional provisions, laws and by-laws

I. PHOTOGRAPHS

Figure 39: Graves demarcated with granite bases and headstones

Site 5

A. GENERAL SITE DESCRIPTION	
Site type	Graveyard
Site Period	Early to Mid-20th Century
Physical description	The site comprises a graveyard which consists of at least 50 graves with an east-west orientation with the headstones on the western side. The graves are demarcated with granite and cement (some with packed stones) bases and headstones. The following inscription was recorded: • Violet Mkwanazi (Born: 19/03/1918; Died: 12/09/1973) • Mphikeleli Ellijah Mashiloane (Born: 1944; Died: 07/03/1949) • Ngwato Moses Mashiloane (Born: 1942; Died: 07/03/1949) • Lapalibi Samson Mashiloane (Born: 25/02/1951; Died: 21/07/1952) • Elizabeth Mahlangu (Born: 10/06/1927; Died: 07/03/1955)

	• Nompumelelo Irene Mahlangu (Born: 23/06/1983; Died: 16/12/1983) • Piet Mphoswa Mahlangu (Died: 26/12/1966) • Sarah Nomaroko Motha (Born: 23/12/1907; Died: 17/05/1957) Unmarked graves are by default regarded as older than 60 years and are therefore protected by the NHRA (Act No 25 of 1999, Section 36).
Integrity of deposits or structures	Stable
Site extent	Approximately 20 m x 20 m

B. SITE EVALUATION		
B1. HERITAGE VALUE	**Yes**	**No**
Historic Value		
It has importance to the community or pattern of South Africa's history or precolonial history.		X
It has strong or special association with the life or work of a person, group or organisation of importance in the history of South Africa.		X
It has significance relating to the history of slavery in South Africa.		X
Aesthetic Value		
It has importance in exhibiting particular aesthetic characteristics valued by a particular community or cultural group.		X
Scientific Value		
It has potential to yield information that will contribute to an understanding of South Africa's natural and cultural heritage.		X
It has importance in demonstrating a high degree of creative or technical achievement at a particular period.		X
It has importance to the wider understanding of the temporal change of cultural landscapes, settlement patterns and human occupation.	X	
Social Value		
It has strong or special association with a particular community or cultural group for social, cultural or spiritual reasons (sense of place).	X	
Tourism Value		
It has significance through its contribution towards the promotion of a local sociocultural identity and can be developed as tourist destination.		X
Rarity Value		
It possesses unique, uncommon, rare or endangered aspects of South Africa's natural or cultural heritage.		X
Representative Value		
It is importance in demonstrating the principle characteristics of a particular class of South Africa's natural or cultural places or objects.		X
B2. REGIONAL CONTEXT		
Other similar sites in the regional landscape.	X	

C. SPHERE OF SIGNIFICANCE	**High**	**Medium**	**Low**
International			X
National			X
Provincial		X	
Local	X		
Specific community	X		

D. FIELD REGISTER RATING	
National/Grade 1 [should be registered, retained]	
Provincial/Grade 2 [should be registered, retained]	
Local/Grade 3A [should be registered, mitigation not advised]	
Local/Grade 3B [High significance; mitigation, partly retained]	
Generally Protected A [High/Medium significance, mitigation]	X
Generally protected B [Medium significance, to be recorded]	
Generally Protected C [Low significance, no further action]	
E. GENERAL STATEMENT OF SITE SIGNIFICANCE	
Low	
Medium	
High	X
F. RATING OF POTENTIAL IMPACT OF DEVELOPMENT	

None	
Peripheral	X
Destruction	
Uncertain	

G. RECOMMENDED MITIGATION

- Near both Pipeline Alternative 1 & 2
- The graveyard must be fenced off with an access gate installed
- Maintain a buffer zone of 10 metres during the construction and mining activities

H. APPLICABLE LEGISLATION AND LEGAL REQUIREMENTS

- National Heritage Resources Act (Act No. 25 of 1999, Section 36)
- Regulations Relating to the Management of Human Remains, in terms of the National Health Act No. 61 of 2003
- Removal of Graves and Dead Bodies Ordinance (Ordinance No. 7 of 1925)
- Ordinance on Exhumations (Ordinance No. 12 of 1980)
- Local and regional provisions, laws and by-laws

I. PHOTOGRAPHS

Figure 40: Graves indicated with granite and cement bases and headstones

Site 6

A. GENERAL SITE DESCRIPTION	
Site type	Historical farmhouse complex
Site Period	Late 19th century
Physical description	The site comprises a historic farmhouse complex consisting of the following aspects: ▪ A historical multi-room dressed stone house ▪ Associated outbuildings (possibly horse stables) The main farmhouse is constructed with dressed sandstone and probably dated to the late 19th century. Note that the roof, windows, doors and all the fittings have been removed. Additional structures were also noted on the yard, one of which probably functioned as a horse stable.
Integrity of deposits or structures.	Although not specifically located there seems to be several areas of midden deposit around the farm yard.
Site extent	Farmhouse: 20 m x 20 m with walls approximately 2 metres in height Whole farm yard: roughly 50 m x 50 m

B. SITE EVALUATION		
B1. HERITAGE VALUE	**Yes**	**No**
Historic Value		
It has importance to the community or pattern of South Africa's history or precolonial history.		X
It has strong or special association with the life or work of a person, group or organisation of importance in the history of South Africa.		X
It has significance relating to the history of slavery in South Africa.		X

Aesthetic Value		
It has importance in exhibiting particular aesthetic characteristics valued by a particular community or cultural group.		X
Scientific Value		
It has potential to yield information that will contribute to an understanding of South Africa's natural and cultural heritage.		X
It has importance in demonstrating a high degree of creative or technical achievement at a particular period.		X
It has importance to the wider understanding of the temporal change of cultural landscapes, settlement patterns and human occupation.	X	
Social Value		
It has strong or special association with a particular community or cultural group for social, cultural or spiritual reasons (sense of place).		X
Tourism Value		
It has significance through its contribution towards the promotion of a local sociocultural identity and can be developed as tourist destination.		X
Rarity Value		
It possesses unique, uncommon, rare or endangered aspects of South Africa's natural or cultural heritage.		X
Representative Value		
It is importance in demonstrating the principle characteristics of a particular class of South Africa's natural or cultural places or objects.		X
B2. REGIONAL CONTEXT		
Other similar sites in the regional landscape.	X	

C. SPHERE OF SIGNIFICANCE	**High**	**Medium**	**Low**
International			X
National			X
Provincial			X
Local			X
Specific community			X

D. FIELD REGISTER RATING	
National/Grade 1 [should be registered, retained]	
Provincial/Grade 2 [should be registered, retained]	
Local/Grade 3A [should be registered, mitigation not advised]	
Local/Grade 3B [High significance; mitigation, partly retained]	
Generally Protected A [High/Medium significance, mitigation]	
Generally protected B [Medium significance, to be recorded]	
Generally Protected C [Low significance, no further action]	X

E. GENERAL STATEMENT OF SITE SIGNIFICANCE	
Low	X
Medium	
High	

F. RATING OF POTENTIAL IMPACT OF DEVELOPMENT	
None	
Peripheral	X
Destruction	
Uncertain	

G. RECOMMENDED MITIGATION

- No direct impact on the site
- Maintain a 100 m buffer zone during the construction and mining phase

H. APPLICABLE LEGISLATION AND LEGAL REQUIREMENTS

- National Heritage Resources Act (Act No. 25 of 1999, Section 34)

I. PHOTOGRAPHS

Figure 41: The main structure was built with dressed sandstone and cement

Figure 42: All the fittings of the main structure have been removed

Figure 43: Possible horse stables in the background

Site 7

A. GENERAL SITE DESCRIPTION	
Site type	Farm worker complex
Site Period	Modern (probably 1980s)
Physical description	The site comprises a farm worker house and livestock enclosures. All the structures were constructed with bricks and cement and the walls are plastered. The main house is a two-room structure with a chimney on the southern wall. Note that

	the roof, windows, doors and all the fittings have been removed. Additional structures were also noted on the yard, which probably functioned as outbuildings for animals and storage. Feeding troughs were also recorded on the yard.
Integrity of deposits or structures.	No middens were recorded in association
Site extent	Farmhouse: 8 m x 2.5 m with walls approximately 2 metres in height Whole farm yard: roughly 50 m x 50 m

B. SITE EVALUATION		
B1. HERITAGE VALUE	**Yes**	**No**
Historic Value		
It has importance to the community or pattern of South Africa's history or precolonial history.		X
It has strong or special association with the life or work of a person, group or organisation of importance in the history of South Africa.		X
It has significance relating to the history of slavery in South Africa.		X
Aesthetic Value		
It has importance in exhibiting particular aesthetic characteristics valued by a particular community or cultural group.		X
Scientific Value		
It has potential to yield information that will contribute to an understanding of South Africa's natural and cultural heritage.		X
It has importance in demonstrating a high degree of creative or technical achievement at a particular period.		X
It has importance to the wider understanding of the temporal change of cultural landscapes, settlement patterns and human occupation.	X	
Social Value		
It has strong or special association with a particular community or cultural group for social, cultural or spiritual reasons (sense of place).		X
Tourism Value		
It has significance through its contribution towards the promotion of a local sociocultural identity and can be developed as tourist destination.		X
Rarity Value		
It possesses unique, uncommon, rare or endangered aspects of South Africa's natural or cultural heritage.		X
Representative Value		
It is importance in demonstrating the principle characteristics of a particular class of South Africa's natural or cultural places or objects.		X
B2. REGIONAL CONTEXT		
Other similar sites in the regional landscape.	X	

C. SPHERE OF SIGNIFICANCE	**High**	**Medium**	**Low**
International			X
National			X
Provincial			X
Local			X
Specific community			X

D. FIELD REGISTER RATING	
National/Grade 1 [should be registered, retained]	
Provincial/Grade 2 [should be registered, retained]	
Local/Grade 3A [should be registered, mitigation not advised]	
Local/Grade 3B [High significance; mitigation, partly retained]	
Generally Protected A [High/Medium significance, mitigation]	
Generally protected B [Medium significance, to be recorded]	
Generally Protected C [Low significance, no further action]	X
E. GENERAL STATEMENT OF SITE SIGNIFICANCE	
Low	X
Medium	
High	
F. RATING OF POTENTIAL IMPACT OF DEVELOPMENT	
None	
Peripheral	X

Destruction	
Uncertain	

G. RECOMMENDED MITIGATION

- No direct impact on the site
- Maintain a 100 m buffer zone during the construction and mining phase

H. APPLICABLE LEGISLATION AND LEGAL REQUIREMENTS

- National Heritage Resources Act (Act No. 25 of 1999, Section 34)

I. PHOTOGRAPHS

Figure 44: The main structure was built with brick and cement (note chimney)

Figure 45: Outbuildings at the site

Figure 46: Water and feeding trough

Site 8

A. GENERAL SITE DESCRIPTION	
Site type	Graveyard
Site Period	Early to Mid-20th Century
Physical description	The site comprises a graveyard which consists of at least 3 graves with an east-west orientation with the headstones on the western side. The graves are demarcated with granite and cement bases and headstones. The following inscription was recorded: • Lettie Heyns (Died: 19/10/1918) • Mathijs H. Heyns (Died: 01/08/1910; 58 years old) • Sarah J. Heyns (Died: 07/01/1917; 58 years old) Unmarked graves are by default regarded as older than 60 years and are therefore protected by the NHRA (Act No 25 of 1999, Section 36).
Integrity of deposits or structures	Stable
Site extent	Approximately 10 m x 10 m

B. SITE EVALUATION		
B1. HERITAGE VALUE	**Yes**	**No**
Historic Value		
It has importance to the community or pattern of South Africa's history or precolonial history.		X
It has strong or special association with the life or work of a person, group or organisation of importance in the history of South Africa.		X
It has significance relating to the history of slavery in South Africa.		X
Aesthetic Value		
It has importance in exhibiting particular aesthetic characteristics valued by a particular community or cultural group.		X
Scientific Value		
It has potential to yield information that will contribute to an understanding of South Africa's natural and cultural heritage.		X
It has importance in demonstrating a high degree of creative or technical achievement at a particular period.		X
It has importance to the wider understanding of the temporal change of cultural landscapes, settlement patterns and human occupation.	X	
Social Value		
It has strong or special association with a particular community or cultural group for social, cultural or spiritual reasons (sense of place).	X	
Tourism Value		
It has significance through its contribution towards the promotion of a local sociocultural identity and can be developed as tourist destination.		X
Rarity Value		
It possesses unique, uncommon, rare or endangered aspects of South Africa's natural or cultural heritage.		X
Representative Value		
It is importance in demonstrating the principle characteristics of a particular class of South Africa's natural or cultural places or objects.		X
B2. REGIONAL CONTEXT		
Other similar sites in the regional landscape.	X	

C. SPHERE OF SIGNIFICANCE	**High**	**Medium**	**Low**
International			X
National			X
Provincial		X	
Local	X		
Specific community	X		

D. FIELD REGISTER RATING	
National/Grade 1 [should be registered, retained]	
Provincial/Grade 2 [should be registered, retained]	
Local/Grade 3A [should be registered, mitigation not advised]	
Local/Grade 3B [High significance; mitigation, partly retained]	

Generally Protected A [High/Medium significance, mitigation]	X
Generally protected B [Medium significance, to be recorded]	
Generally Protected C [Low significance, no further action]	
E. GENERAL STATEMENT OF SITE SIGNIFICANCE	
Low	
Medium	
High	X
F. RATING OF POTENTIAL IMPACT OF DEVELOPMENT	
None	X
Peripheral	
Destruction	
Uncertain	

G. RECOMMENDED MITIGATION

- The graveyard must be fenced off with an access gate installed
- Maintain a buffer zone of 10 metres during the construction and mining activities

H. APPLICABLE LEGISLATION AND LEGAL REQUIREMENTS

- National Heritage Resources Act (Act No. 25 of 1999, Section 36)
- Regulations Relating to the Management of Human Remains, in terms of the National Health Act No. 61 of 2003
- Removal of Graves and Dead Bodies Ordinance (Ordinance No. 7 of 1925)
- Ordinance on Exhumations (Ordinance No. 12 of 1980)
- Local and regional provisions, laws and by-laws

I. PHOTOGRAPHS

Figure 47: Graves demarcated with cement bases and headstones

Site 9

A. GENERAL SITE DESCRIPTION	
Site type	Historical power line pylons
Site Period	Early 20th century
Physical description	The linear site comprises a series of historic power line pylons that were probably constructed during the early 20th century as part of the early power grid network in South Africa. The pylons seem to have been constructed with a cement compound and metal core. The unique design (almost art-deco) is good example of this time period and should be preserved.
Integrity of deposits or structures.	Stable
Site extent	The section that was recorded (also spanning the mining pit) is approximately 6 km in length. It does however extend further on both sides of the recorded section.
B. SITE EVALUATION	

B1. HERITAGE VALUE	Yes	No
Historic Value		
It has importance to the community or pattern of South Africa's history or precolonial history.		X
It has strong or special association with the life or work of a person, group or organisation of importance in the history of South Africa.		X
It has significance relating to the history of slavery in South Africa.		X
Aesthetic Value		
It has importance in exhibiting particular aesthetic characteristics valued by a particular community or cultural group.		X
Scientific Value		
It has potential to yield information that will contribute to an understanding of South Africa's natural and cultural heritage.		X
It has importance in demonstrating a high degree of creative or technical achievement at a particular period.	X	
It has importance to the wider understanding of the temporal change of cultural landscapes, settlement patterns and human occupation.	X	
Social Value		
It has strong or special association with a particular community or cultural group for social, cultural or spiritual reasons (sense of place).		X
Tourism Value		
It has significance through its contribution towards the promotion of a local sociocultural identity and can be developed as tourist destination.		X
Rarity Value		
It possesses unique, uncommon, rare or endangered aspects of South Africa's natural or cultural heritage.	X	
Representative Value		
It is importance in demonstrating the principle characteristics of a particular class of South Africa's natural or cultural places or objects.		X
B2. REGIONAL CONTEXT		
Other similar sites in the regional landscape.		X

C. SPHERE OF SIGNIFICANCE	High	Medium	Low
International			X
National			X
Provincial		X	
Local		X	
Specific community		X	

D. FIELD REGISTER RATING	
National/Grade 1 [should be registered, retained]	
Provincial/Grade 2 [should be registered, retained]	
Local/Grade 3A [should be registered, mitigation not advised]	
Local/Grade 3B [High significance; mitigation, partly retained]	
Generally Protected A [High/Medium significance, mitigation]	
Generally protected B [Medium significance, to be recorded]	X
Generally Protected C [Low significance, no further action]	

E. GENERAL STATEMENT OF SITE SIGNIFICANCE	
Low	
Medium	X
High	

F. RATING OF POTENTIAL IMPACT OF DEVELOPMENT	
None	
Peripheral	
Destruction	X
Uncertain	

G. RECOMMENDED MITIGATION

- Change in trajectory of Pipeline Alternative 1 and Pipeline Alternative 3
- Controlled expansion of Pit 1 not to damage more of the pylons
- Maintain a 10 m buffer zone during the construction and mining phase
- Permit application to SAHRA for documentation and removal if mitigation is not feasible

H. APPLICABLE LEGISLATION AND LEGAL REQUIREMENTS

- National Heritage Resources Act (Act No. 25 of 1999, Section 34)

I. PHOTOGRAPHS

Figure 48: Twin pylon near the existing mining operations

Figure 49: Detail of the construction and design of the pylons

Addendum 3: Surveyor General Farm Diagram

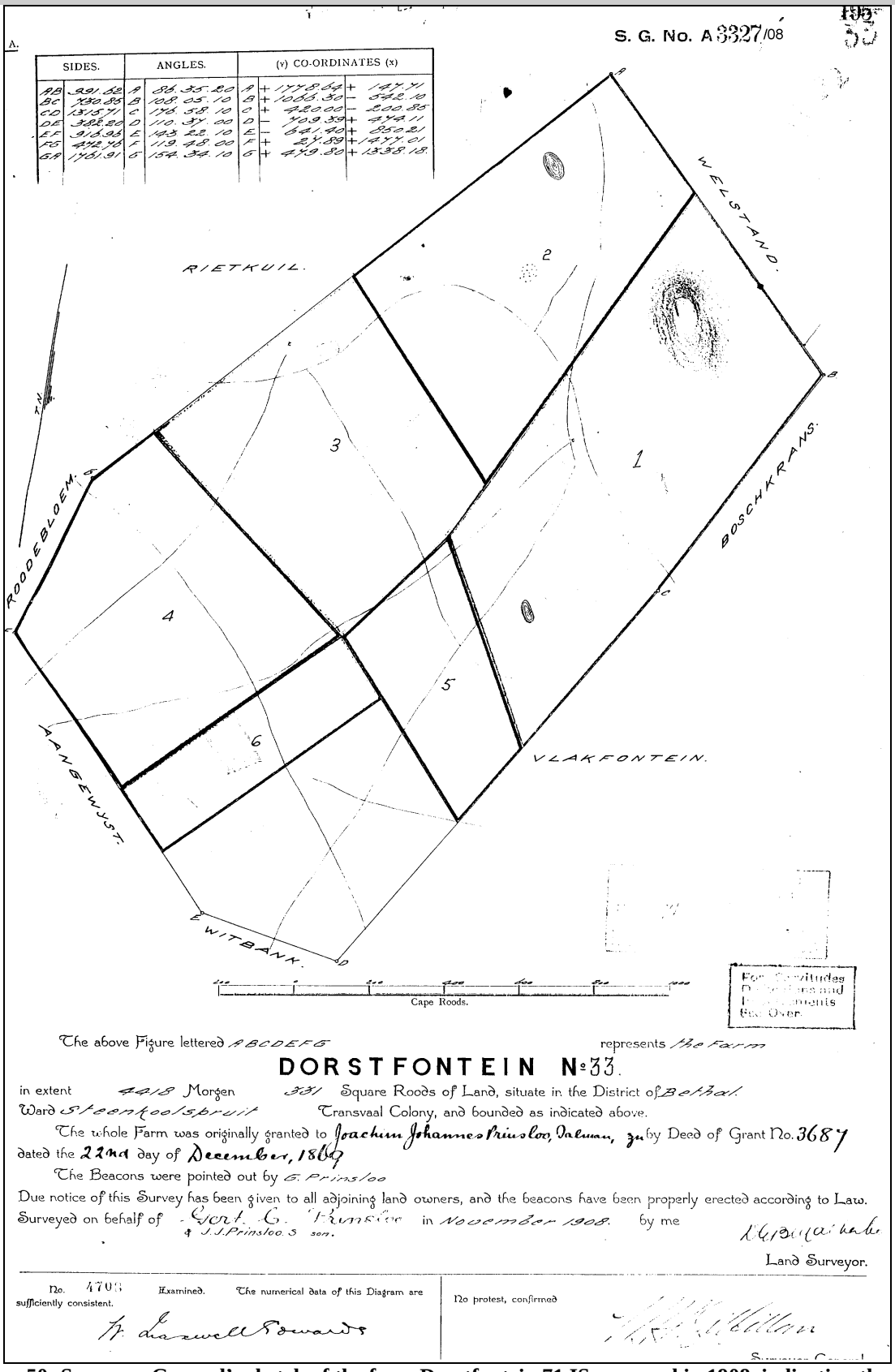

Figure 50: Surveyor General's sketch of the farm Dorstfontein 71 IS surveyed in 1908, indicating the Title Deed granted on 22 December 1869

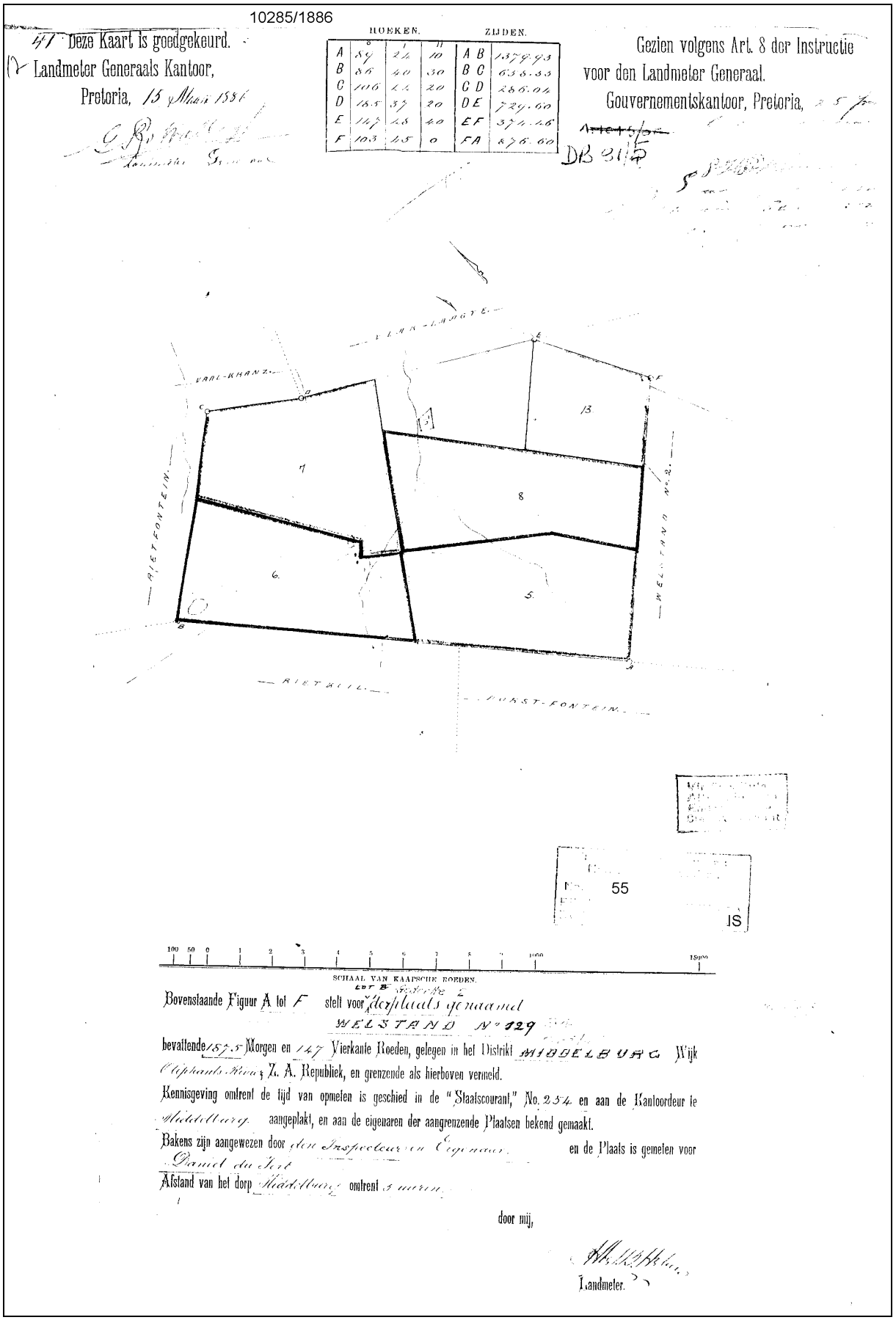

Figure 51: Surveyor General's sketch of the farm Welstand 55 IS surveyed in 1905, indicating the Title Deed granted on 28 November 1879

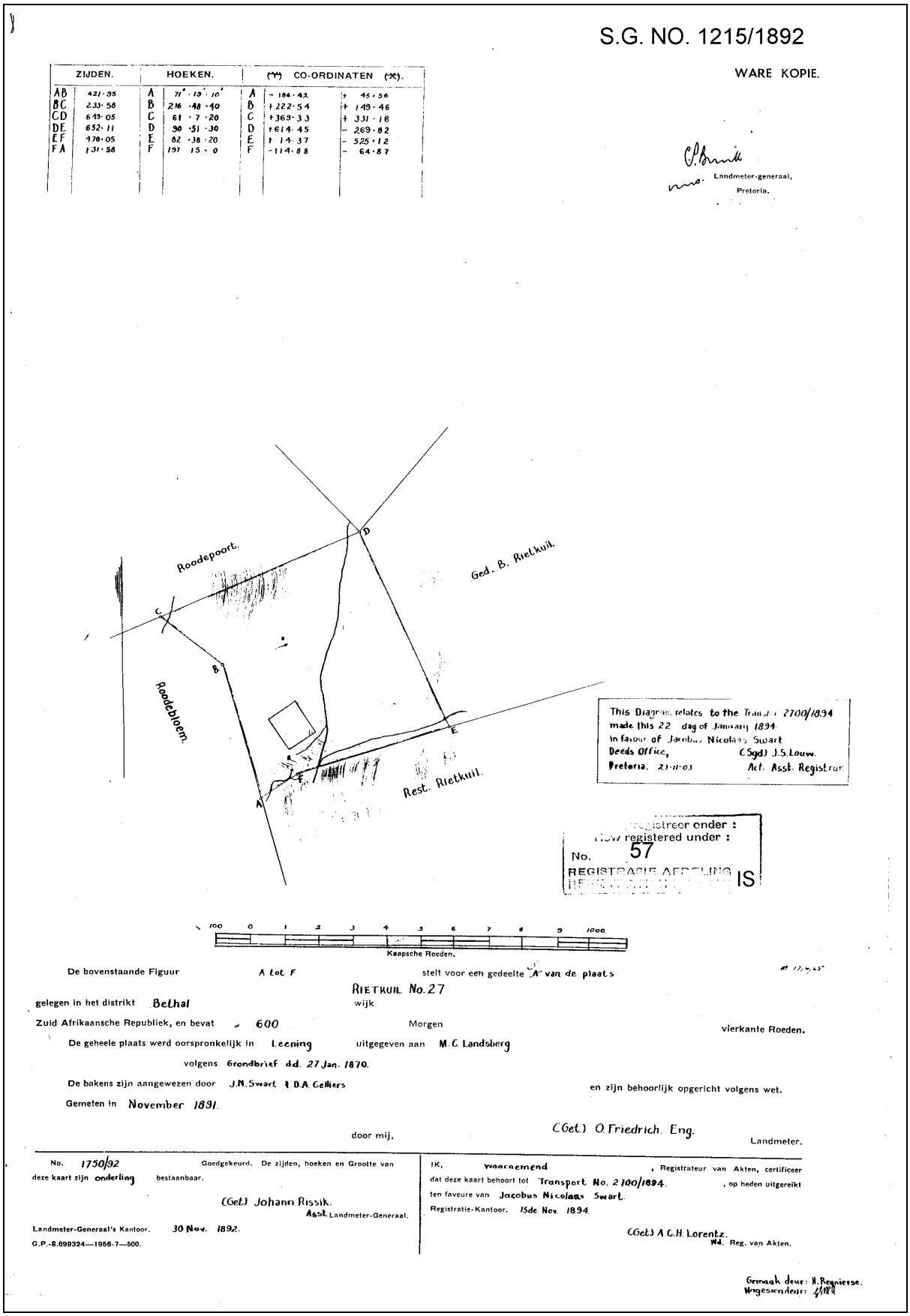

Figure 52: Surveyor General's sketch of the farm Rietkuil 57 IS surveyed in 1891, indicating the Title Deed granted on 27 January 1870

Addendum 4: Relocation of Graves

Marked graves younger than 60 years do not fall under the protection of the NHRA (Act No. 25 of 1999) with the result that exhumation, relocation and reburial can be conducted by an undertaker. This will include logistical aspects such as social consultation, purchasing of plots in cemeteries, procurement of coffins, etc. Other legislative measures which may be pertinent include the Removal of Graves and Dead Bodies Ordinance (Ordinance No. 7 of 1925), Regulations Relating to the Management of Human Remains (GNR 363 of 22 May 2013) made in terms of the National Health Act No. 61 of 2003, Ordinance on Exhumations (Ordinance No. 12 of 1980) as well as any local and regional provisions, laws and by-laws that may be in place.

Marked graves older than 60 years are protected by the NHRA (Act No. 25 of 1999) an as a result an archaeologist must be in attendance to assist with the exhumation and documentation of the graves. Note that unmarked graves are by default regarded as older than 60 years and therefore also falls under the NHRA (Act No. 25 of 1999, Section 36).

The relocation of graves entails the following procedure:

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

Information needed for the SAHRA permit application

- The permit application must be done by an archaeologist.
- A map of the area where the graves have been located.
- A survey report of the area prepared by an archaeologist.
- All the information on the families that have identified graves.
- A letter of permission from the landowner granting permission to the developer to exhume and relocate the graves.
- A letter (or proof of purchase of the plots) from the new cemetery confirming that the graves will be reburied there.
- Details of the farm name and number, magisterial district and GPS coordinates of the gravesite.

Graves are generally be classified into four categories. These are:

- Graves younger than 60 years;
- Graves older than 60 years, but younger than 100 years;
- Graves older than 100 years; and
- Graves of victims of conflict or of individuals of royal descent.

Addendum 5: SRK Criteria: Significance of Impact

SEVERITY OF IMPACT	RATING
Insignificant / non-harmful	1
Small / potentially harmful	2
Significant / slightly harmful	3
Great / harmful	4
Disastrous / extremely harmful	5

SPATIAL SCOPE OF IMPACT	RATING
Activity specific	1
Mine specific (within the mine boundary)	2
Local area (within 5 km of the mine boundary)	3
Regional (Greater Rustenburg area)	4
National	5

DURATION OF IMPACT	RATING
One day to one month	1
One month to one year	2
One year to ten years	3
Life of operation	4
Post closure / permanent	5

CONSEQUENCE

FREQUENCY OF ACTIVITY / DURATION OF ASPECT	RATING
Annually or less / low	1
6 monthly / temporary	2
Monthly / infrequent	3
Weekly / life of operation / regularly / likely	4
Daily / permanent / high	5

FREQUENCY OF IMPACT	RATING
Almost never / almost impossible	1
Very seldom / highly unlikely	2
Infrequent / unlikely / seldom	3
Often / regularly / likely / possible	4
Daily / highly likely / definitely	5

LIKELIHOOD

Table 13-2: Interpretation of Impact Rating

Likelihood \ Consequence	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
2	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30
3	3	6	9	12	15	18	21	24	27	30	33	36	39	42	45
4	4	8	12	16	20	24	28	32	36	40	44	48	52	56	60
5	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75
6	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90
7	7	14	21	28	35	42	49	56	63	70	77	84	91	98	105
8	8	16	24	32	40	48	56	64	72	80	88	96	104	112	120
9	9	18	27	36	45	54	63	72	81	90	99	108	117	126	135
10	10	20	30	40	50	60	70	80	90	100	110	120	1	140	150

	High	76 to 150	Improve current management
	Medium High	40 to 75	Maintain current management
	Medium Low	26 to 39	
	Low	1 to 25	No management required

SIGNIFICANCE = CONSEQUENCE x LIKELIHOOD

Addendum 6: SRK: Significance of Impact (Pre-Construction)

TYPE OF IMPACT	POTENTIAL IMPACT DESCRIPTION IN TERMS OF ENVIRONMENTAL ASPECTS	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION							Impact Management Objective	IMPACT MANAGEMENT ACTIONS (PROPOSED MITIGATION MEASURES)		IMPACT MANAGEMENT OUTCOME (ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION)						
		Consequence			Likelyhood (Probability)		Significance (Degree to which impact may cause irreplaceable loss of resources)	Significance Rating		Management and Mitigation Measures	Timeframe	Consequence			Likelyhood (Probability)		Significance (Degree to which impact may cause irreplaceable loss of resources)	Significance Rating
		Severity	Spatial	Duration	Frequency: Activity	Frequency: Impact						Severity	Spatial	Duration	Frequency: Activity	Frequency: Impact		
Direct	Initial clearing and stripping of surface for preconstruction	5	2	1	5	5	80	H Improve Current Management	Prevent and minimize impact	The location of all heritage sites and graveyards should be known to the construction subcontractor.	Pre-phase	2	2	1	5	3	40	MH Maintain Current Management
	Erection of construction camps	5	2	1	5	5	80	H Improve Current Management	Prevent and minimize impact	All heritage sites and graveyards should be fenced off and clearly demarcated.	Pre-phase	2	2	1	5	3	40	MH Maintain Current Management
	Construction of access roads	5	2	1	5	5	80	H Improve Current Management	Prevent and minimize impact	All heritage sites and graveyards should be fenced off and clearly demarcated.	Pre-phase	2	2	1	5	3	40	MH Maintain Current Management
Indirect	Vibrations caused by heavy construction vehicles	5	2	1	5	5	80	H Improve Current Management	Prevent and minimize impact	A buffer zone around heritage sites of least 100 metres should be maintained	Pre-phase	2	2	1	5	3	40	MH Maintain Current Management
	Compression of underground archaeological deposits	5	2	1	5	5	80	H Improve Current Management	Prevent and minimize impact	All heritage sites should be fenced off and clearly demarcated.	Pre-phase	2	2	1	5	3	40	MH Maintain Current Management
	Leaching of archaeological deposits and features by excess surface water	5	2	1	5	5	80	H Improve Current Management	Prevent and minimize impact	A buffer zone around heritage sites of least 100 metres should be maintained	Pre-phase	2	2	1	5	3	40	MH Maintain Current Management
Residual	Subsurface trenching and any semipermanent structures and beacons	5	2	1	5	5	80	H Improve Current Management	Prevent and minimize impact	All heritage sites should be fenced off and clearly demarcated.	Pre-phase	2	2	1	5	3	40	MH Maintain Current Management
	Construction of any foundation or semi-permanent cement/concrete surface	5	2	1	5	5	80	H Improve Current Management	Prevent and minimize impact	All heritage sites should be fenced off and clearly demarcated.	Pre-phase	2	2	1	5	3	40	MH Maintain Current Management
Cumulative	Constant movement of heavy construction vehicles	5	2	1	5	5	80	H Improve Current Management	Prevent and minimize impact	A buffer zone around heritage sites of least 100 metres should be maintained	Pre-phase	2	2	1	5	3	40	MH Maintain Current Management
	Constant use of constructions camps (people and vehicle movement)	5	2	1	5	5	80	H Improve Current Management	Prevent and minimize impact	A buffer zone around heritage sites of least 100 metres should be maintained	Pre-phase	2	2	1	5	3	40	MH Maintain Current Management
	Preliminary preparation of area for construction	5	2	1	5	5	80	H Improve Current Management	Prevent and minimize impact	A buffer zone around heritage sites of least 100 metres should be maintained	Pre-phase	2	2	1	5	3	40	MH Maintain Current Management

Addendum 7: SRK: Significance of Impact (Construction)

TYPE OF IMPACT	POTENTIAL IMPACT DESCRIPTION IN TERMS OF ENVIRONMENTAL ASPECTS	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION							Impact Management Objective	IMPACT MANAGEMENT ACTIONS (PROPOSED MITIGATION MEASURES)		IMPACT MANAGEMENT OUTCOME (ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION)						
		Consequence			Likelyhood (Probability)		Significance (Degree to which impact may cause irreplaceable loss of resources)	Significance Rating		Management and Mitigation Measures	Timeframe	Consequence			Likelyhood (Probability)		Significance (Degree to which impact may cause irreplaceable loss of resources)	Significance Rating
		Severity	Spatial	Duration	Freqquency: Activity	Frequency: Impact						Severity	Spatial	Duration	Freqquency: Activity	Frequency: Impact		
Direct	Construction of mining infrastructure & pipeleine	5	2	2	5	5	90	H Improve Current Management	Prevent and minimize impact	The location of all heritage sites and graveyards should be known to the construction subcontractor.	Pre-Phase	2	2	2	5	3	48	MH Maintain Current Management
	Subsurface trenching and laying cables (pipelines or cables)	5	2	2	5	5	90	H Improve Current Management	Prevent and minimize impact	All heritage sites and graveyards should be fenced off and clearly demarcated.	Pre-Phase	2	2	2	5	3	48	MH Maintain Current Management
Indirect	Compression of underground archaeological deposits by heavy equipment	5	2	2	5	5	90	H Improve Current Management	Prevent and minimize impact	All heritage sites and graveyards should be fenced off and clearly demarcated.	Pre-Phase	2	2	2	5	3	48	MH Maintain Current Management
	Vibrations caused by heavy construction vehicles	5	2	2	5	5	90	H Improve Current Management	Prevent and minimize impact	A buffer zone around heritage sites of least 100 metres should be maintained	Pre-Phase	2	2	2	5	3	48	MH Maintain Current Management
	Leaching of archaeological deposits and features by excess surface water	5	2	2	5	5	90	H Improve Current Management	Prevent and minimize impact	A buffer zone around heritage sites of least 100 metres should be maintained	Pre-Phase	2	2	2	5	3	48	MH Maintain Current Management
Residual	Semipermanent foundation or cement/concrete surface	5	2	2	5	5	90	H Improve Current Management	Prevent and minimize impact	All heritage sites should be fenced off and clearly demarcated.	Pre-Phase	2	2	2	5	3	48	MH Maintain Current Management
	Footprint caused by headgear, offices, production plant and associated infrastructure	5	2	2	5	5	90	H Improve Current Management	Prevent and minimize impact	All heritage sites should be fenced off and clearly demarcated.	Pre-Phase	2	2	2	5	3	48	MH Maintain Current Management
	Tarred or surfaced access roads, fences and powerlines	5	2	2	5	5	90	H Improve Current Management	Prevent and minimize impact	All heritage sites should be fenced off and clearly demarcated.	Pre-Phase	2	2	2	5	3	48	MH Maintain Current Management
Cumulative	Construction of all aspects of the mining infrastructure simultaneously	5	2	2	5	5	90	H Improve Current Management	Prevent and minimize impact	A buffer zone around heritage sites of least 100 metres should be maintained	Pre-Phase	2	2	2	5	3	48	MH Maintain Current Management

Addendum 8: SRK: Significance of Impact (Operational)

TYPE OF IMPACT	POTENTIAL IMPACT DESCRIPTION IN TERMS OF ENVIRONMENTAL ASPECTS	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION							Impact Management Objective	IMPACT MANAGEMENT ACTIONS (PROPOSED MITIGATION MEASURES)		IMPACT MANAGEMENT OUTCOME (ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION)						
		Consequence			Likelyhood (Probability)		Significance (Degree to which impact may cause irreplaceable loss of resources)	Significance Rating		Management and Mitigation Measures	Timeframe	Consequence			Likelyhood (Probability)		Significance (Degree to which impact may cause irreplaceable loss of resources)	Significance Rating
		Severity	Spatial	Duration	Freqquency: Activity	Frequency: Impact						Severity	Spatial	Duration	Freqquency: Activity	Frequency: Impact		
Direct	Mining of primary area (Pit) (including blasting)	5	2	5	5	5	120	H Improve Current Management	Prevent and minimize impact	All heritage sites and graveyards should be fenced off and clearly demarcated.		1	2	5	5	3	64	MH Maintain Current Management
	Accumulation of waste material (waste dump)	5	2	5	5	5	120	H Improve Current Management	Prevent and minimize impact	All heritage sites and graveyards should be fenced off and clearly demarcated.		1	2	5	5	3	64	MH Maintain Current Management
	Processed and semiprocessed material (dump)	5	2	5	5	5	120	H Improve Current Management	Prevent and minimize impact	All heritage sites and graveyards should be fenced off and clearly demarcated.	Pre-Phase	1	2	5	5	3	64	MH Maintain Current Management
Indirect	Vibrations caused by heavy vehicle movement	5	2	5	5	5	120	H Improve Current Management	Prevent and minimize impact	A buffer zone around heritage sites of least 100 metres should be maintained	Pre-Phase	1	2	5	5	3	64	MH Maintain Current Management
	Shock waves and vibrations cuased by blasting	5	2	5	5	5	120	H Improve Current Management	Prevent and minimize impact	A buffer zone around heritage sites and graveyards of least 500 metres should be maintained	Pre-Phase	1	2	5	5	3	64	MH Maintain Current Management
	Leaching of archaeological deposits and features by excess surface water	5	2	5	5	5	120	H Improve Current Management	Prevent and minimize impact	A buffer zone around heritage sites of least 100 metres should be maintained	Pre-Phase	1	2	5	5	3	64	MH Maintain Current Management
Residual	Footprint of any waste dump and processed material	5	2	5	5	5	120	H Improve Current Management	Prevent and minimize impact	All heritage sites should be fenced off and clearly demarcated.	Pre-Phase	1	2	5	5	3	64	MH Maintain Current Management
	Any expansions or additions that cover the surface semipermanently	5	2	5	5	5	120	H Improve Current Management	Prevent and minimize impact	All heritage sites should be fenced off and clearly demarcated.	Pre-Phase	1	2	5	5	3	64	MH Maintain Current Management
Cumulative	Mining of primary area	5	2	5	5	5	120	H Improve Current Management	Prevent and minimize impact	All heritage sites should be fenced off and clearly demarcated.	Pre-Phase	1	2	5	5	3	64	MH Maintain Current Management
	Vibrations caused by heavy vehicle movement and blasting	5	2	5	5	5	120	H Improve Current Management	Prevent and minimize impact	A buffer zone around heritage sites of least 100 metres should be maintained	Pre-Phase	1	2	5	5	3	64	MH Maintain Current Management
	Continious movement of people and vehicles	5	2	5	5	5	120	H Improve Current Management	Prevent and minimize impact	All heritage sites should be fenced off and clearly demarcated.	Pre-Phase	1	2	5	5	3	64	MH Maintain Current Management

Addendum 9: SRK: Significance of Impact (Rehabilitation)

TYPE OF IMPACT	POTENTIAL IMPACT DESCRIPTION IN TERMS OF ENVIRONMENTAL ASPECTS	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION							Impact Management Objective	IMPACT MANAGEMENT ACTIONS (PROPOSED MITIGATION MEASURES)		IMPACT MANAGEMENT OUTCOME (ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION)						
		Consequence			Likelyhood (Probability)		Significance (Degree to which impact may cause irreplaceable loss of resources)	Significance Rating		Management and Mitigation Measures	Timeframe	Consequence			Likelyhood (Probability)		Significance (Degree to which impact may cause irreplaceable loss of resources)	Significance Rating
		Severity	Spatial	Duration	Freqquency: Activity	Frequency: Impact						Severity	Spatial	Duration	Freqquency: Activity	Frequency: Impact		
Direct	Movement of wast dumps	5	2	2	5	4	81	H Improve Current Management	Prevent and minimize impact	All heritage sites and graveyards should be fenced off and clearly demarcated.	Pre-phase	2	2	2	5	3	48	MH Maintain Current Management
	Removal of mining equipment	5	2	2	5	4	81	H Improve Current Management	Prevent and minimize impact	All heritage sites and graveyards should be fenced off and clearly demarcated.	Pre-phase	2	2	2	5	3	48	MH Maintain Current Management
Indirect	Vibrations caused by heavy construction vehicles	5	2	2	5	4	81	H Improve Current Management	Prevent and minimize impact	A buffer zone around heritage sites and graveyards of least 100 metres should be maintained	Pre-phase	2	2	2	5	3	48	MH Maintain Current Management
Residual	Semipermanent foundation or cement/concrete surface	5	2	2	5	4	81	H Improve Current Management	Prevent and minimize impact	All heritage sites should be fenced off and clearly demarcated.	Pre-phase	2	2	2	5	3	48	MH Maintain Current Management
	Tarred or surfaced access roads, fences and powerlines	5	2	2	5	4	81	H Improve Current Management	Prevent and minimize impact	All heritage sites should be fenced off and clearly demarcated.	Pre-phase	2	2	2	5	3	48	MH Maintain Current Management
Cumulative	Constant movement of heavy construction vehicles	5	2	2	5	4	81	H Improve Current Management	Prevent and minimize impact	A buffer zone around heritage sites of least 100 metres should be maintained	Pre-phase	2	2	2	5	3	48	MH Maintain Current Management