



PGS HERITAGE

PROPOSED PIPELINE PROJECT FROM HARMONY ONE PLANT TO FREE STATE NORTH 1 TSF, NEAR WELKOM, FREE STATE PROVINCE

Heritage Impact Assessment

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REVISION HISTORY

Version	Issue Date	Description of Changes
001	8 February 2023	First draft
002	6 April 2023	Second draft – alternative pipelines were added
003	13 April 2023	Third draft – client comments were addressed
004	5 May 2023	Fourth draft – updating of maps and general referencing

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Declaration of Independence

- I, Nikki Mann, declare that –
- General declaration:
- I act as the independent heritage practitioner in this application
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting heritage impact assessments, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I will take into account, to the extent possible, the matters listed in section 38 of the NHRA when preparing the application and any report relating to the application;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- I will ensure that information containing all relevant facts in respect of the application is distributed or made available to interested and affected parties and the public and that participation by interested and affected parties is facilitated in such a manner that all interested and affected parties will be provided with a reasonable opportunity to participate and to provide comments on documents that are produced to support the application;
- I will provide the competent authority with access to all information at my disposal regarding the application, whether such information is favourable to the applicant or not
- All the particulars furnished by me in this form are true and correct;
- I will perform all other obligations as expected from a heritage practitioner in terms of the Act and the constitutions of my affiliated professional bodies; and
- I realise that a false declaration is an offence in terms of regulation 71 of the Regulations and is punishable in terms of section 24F of the NEMA.

Disclosure of Vested Interest

- I do not have and will not have any vested interest (either business, financial, personal or other) in the proposed activity proceeding other than remuneration for work performed in terms of the Regulations;

HERITAGE CONSULTANT:

PGS Heritage (Pty) Ltd

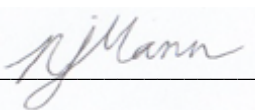
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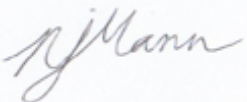
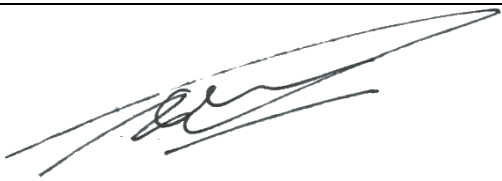
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ACKNOWLEDGEMENT OF RECEIPT

Report Title	<i>PROPOSED PIPELINE PROJECT FROM HARMONY ONE PLANT TO FREE STATE NORTH 1 TSF, NEAR WELKOM, FREE STATE PROVINCE</i>		
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Reviewed	Wouter Fourie		Archaeologist/Heritage Specialist/ Project Manager – PGS Heritage
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SIGNATURE: _____

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The Heritage Impact Assessment Report has been compiled considering the National Environmental Management Act (Act No. 107 of 1998) (NEMA): Appendix 6 of the Environmental Impact Assessment (EIA) Regulations of 2014 (as amended, 2017) requirements for specialist reports as indicated in the table below.

Requirements of Appendix 6 – GN R326 EIA Regulations of 7 April 2017	Relevant section in report
1.(1) (a) (i) Details of the specialist who prepared the report	Page iii of Report – Contact details and company
(ii) The expertise of that person to compile a specialist report including a curriculum vita	Section 1.2 – refer to Appendix A
(b) A declaration that the person is independent in a form as may be specified by the competent authority	Page iii of the report
(c) An indication of the scope of, and the purpose for which, the report was prepared	Section 1.1
(cA) An indication of the quality and age of base data used for the specialist report	Section 3
(cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Section 4, 5
(d) The duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment	Section 3, 4
(e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used	Section 3
(f) details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives;	N/A
(g) An identification of any areas to be avoided, including buffers	N/A
(h) A map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	N/A
(i) A description of any assumptions made and any uncertainties or gaps in knowledge;	Section 1.3
(j) A description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives, on the environment	Section 5, 6
(k) Any mitigation measures for inclusion in the EMPr	Section 8
(l) Any conditions for inclusion in the environmental authorization	Section 8
(m) Any monitoring requirements for inclusion in the EMPr or environmental authorization	Section 8
(n)(i) A reasoned opinion as to whether the proposed activity, activities or portions thereof should be authorised and	Section 9
(n)(iA) A reasoned opinion regarding the acceptability of the proposed activity or activities; and	
(n)(ii) If the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan	Section 9
(o) A description of any consultation process that was undertaken during the course of carrying out the study	
(p) A summary and copies if any comments that were received during any consultation process	Not applicable.
(q) Any other information requested by the competent authority.	Not applicable.
(2) Where a government notice by the Minister provides for any protocol or minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply.	No protocols or minimum standards for HIAs or PIAs

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EXECUTIVE SUMMARY

PGS Heritage (Pty) Ltd (PGS) was appointed by Environmental Impact Management Services Consulting (Pty) Ltd (EIMS), on behalf of Harmony Gold Mining Company Limited (Harmony), to undertake a Heritage Impact Assessment (HIA), which forms part of the environmental process for the proposed pipeline from Harmony One Plant to Free State North (FSN) 1 Tailings Storage Facility (TSF), located within the Matjhabeng Local Municipality, Lejweleputswa District Municipality, near Welkom, Free State Province.

This HIA aims to evaluate the possible impacts on heritage resources present within the proposed development footprint of the Pipeline Project for Harmony. Immediate and direct impacts on archaeological and palaeontological resources were addressed through the HIA.

Site Name and Location

The proposed development is located within the Matjhabeng Local Municipality, Lejweleputswa District Municipality, near Welkom, Free State Province.

Harmony plan to construct new return water lines from FSN 1 TSF Return Water Dam to D-Dam Complex and 2 x new 600mm return pipelines to Dam 13 to pump back return water from the TSF. Harmony also plans to construct new tailings pipelines from Harmony One Plant to FSN 1 TSF for deposition of tailings. Sections of the proposed development will run alongside the existing pipeline. Harmony will install all pipelines next to each other, as far as possible.

Several alternative pipeline route options are being considered.

Fieldwork

The fieldwork component of the study was aimed at identifying tangible remains of archaeological, historical and heritage significance. The fieldwork was undertaken by way of intensive walkthroughs of the proposed pipeline footprint areas. The fieldwork was conducted by one archaeologist (Nikki Mann) and one field assistant (Xander Fourie) from PGS on 26 January 2023. An additional survey was conducted by one archaeologist (Wouter Fourie) and one field assistant (Xander Fourie) from PGS on 5 April 2023.

Throughout the fieldwork, hand-held GPS devices were used to record tracklogs showing the routes followed by the fieldwork teams. It is important to note that although as intensive a fieldwork coverage as possible was undertaken, sections of the study area are in areas which are more densely overgrown and/or disturbed, which limited visibility in those areas of the study area.

During the fieldwork, the only heritage resource identified is the Welkom Municipal cemetery which is within 50 meters from the alternative 1b and 1c alignments.

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It should be noted that owing to the location of two of the proposed alternatives (Alternative 1b and Alternative 1c) close to a large cemetery, these pipeline options are less preferred (Figure 51).

Palaeontology

According to the Palaeosensitivity Map available on the South African Heritage Resources Information System database (SAHRIS), the Palaeontological Sensitivity of the proposed development areas are mostly rated as high (orange) and moderate (green) (**Figure 48**). The proposed project is not going to disturb more than the topsoil and loose subsoil. Therefore, it is unlikely that the small footprint of the proposed project will impact on palaeontological resources.

Impact Assessment

An intensive walkthrough of the proposed alignments has not shown heritage resources within their direct footprint areas. However, the Welkom municipal cemetery is close to alignments 1c and 1b. There will be no impact if the 50m buffer around the cemetery is implemented. If either alignments 1c and 1b are considered, they must be realigned to be outside of the proposed 50-meter buffer.

Mitigation measures

Refer to **Section 8** of this report.

General

If heritage resources are discovered during site clearance, construction activities that may impact the find must stop, and a qualified archaeologist must be appointed to evaluate and make recommendations on mitigation measures.

It is the considered opinion of the author of this report that the overall impact of the proposed development on heritage resources will be Low.

Owing to the location of two of the proposed alternatives (Alternative 1b and Alternative 1c) close to a large cemetery, these pipeline options are less preferred. However, all alternatives are acceptable subject to the recommended mitigation.

Therefore, the proposed development can be placed anywhere within the assessed alignments, provided that the cemetery is avoided, and the recommended mitigations are applied. The management and mitigation measures as described in **Section 8** of this report have been developed to minimise the project impact on heritage resources.

Considering the overall assessment, the impact of the proposed development would be acceptably Low or could be totally mitigated. As such, the project could be approved from a heritage perspective.

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TERMINOLOGY AND ABBREVIATIONS

Archaeological resources

This includes:

- material remains resulting from human activity which are in a state of disuse and are in or on land and which are older than 100 years including artefacts, human and hominid remains and artificial features and structures;
- rock art, being any form of painting, engraving or other graphic representation on a fixed rock surface or loose rock or stone, which was executed by human agency and which is older than 100 years, including any area within 10m of such representation;
- wrecks, being any vessel or aircraft, or any part thereof, which was wrecked in South Africa, whether on land, in the internal waters, the territorial waters or in the maritime culture zone of the republic as defined in the Maritimes Zones Act, and any cargo, debris or artefacts found or associated therewith, which is older than 60 years or which SAHRA considers to be worthy of conservation;
- features, structures and artefacts associated with military history which are older than 75 years and the site on which they are found.

Cultural significance

This means aesthetic, architectural, historical, scientific, social, spiritual, linguistic or technological value or significance

Development

This means any physical intervention, excavation, or action, other than those caused by natural forces, which may in the opinion of the heritage authority in any way result in a change to the nature, appearance or physical nature of a place or influence its stability and future well-being, including:

- construction, alteration, demolition, removal or change in use of a place or a structure at a place;
- carrying out any works on or over or under a place;
- subdivision or consolidation of land comprising a place, including the structures or airspace of a place;
- constructing or putting up for display signs or boards;
- any change to the natural or existing condition or topography of land; and
- any removal or destruction of trees, or removal of vegetation or topsoil

Early Stone Age

The archaeology of the Stone Age between 700 000 and 2 500 000 years ago.

Fossil

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Mineralised bones of animals, shellfish, plants and marine animals. A trace fossil is the track or footprint of a fossil animal that is preserved in stone or consolidated sediment.

Heritage

That which is inherited and forms part of the National Estate (historical places, objects, fossils as defined by the National Heritage Resources Act 25 of 1999).

Heritage resources

This means any place or object of cultural significance and can include (but not limited to) as stated under Section 3 of the NHRA,

- places, buildings, structures and equipment of cultural significance;
- places to which oral traditions are attached or which are associated with living heritage;
- historical settlements and townscapes;
- landscapes and natural features of cultural significance;
- geological sites of scientific or cultural importance;
- archaeological and palaeontological sites;
- graves and burial grounds, and
- sites of significance relating to the history of slavery in South Africa;

Holocene

The most recent geological time period which commenced 10 000 years ago.

Late Stone Age

The archaeology of the last 30 000 years associated with fully modern people.

Late Iron Age (Early Farming Communities)

The archaeology of the last 1000 years up to the 1800's, associated with iron-working and farming activities such as herding and agriculture.

Middle Stone Age

The archaeology of the Stone Age between 30 000-300 000 years ago, associated with early modern humans.

Palaeontology

Any fossilised remains or fossil trace of animals or plants which lived in the geological past, other than fossil fuels or fossiliferous rock intended for industrial use, and any site which contains such fossilised remains or trace.

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Abbreviations	Description
AIA	Archaeological Impact Assessment
ASAPA	Association of South African Professional Archaeologists
CRM	Cultural Resource Management
DEA	Department of Environmental Affairs
EAP	Environmental Assessment Practitioner
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EIMS	Environmental Impact Management Services (Pty) Ltd
EMPr	Environmental Management Programme
ESA	Earlier Stone Age
FSN	Free State North
GPS	Global Positioning System
Harmony	Harmony Gold Mining Company Limited
HIA	Heritage Impact Assessment
I&AP	Interested & Affected Party
LCTs	Large Cutting Tools
LSA	Late Stone Age
LIA	Late Iron Age
LOM	Life of Mine
MPRDA	Mineral and Petroleum Resources Development Act 28 of 2002
MSA	Middle Stone Age
MIA	Middle Iron Age
MWS	Mine Waste Solutions
NEMA	National Environmental Management Act, 1998 (Act No 107 of 1998)
NHRA	National Heritage Resources Act, 1999 (Act No 25 of 1999)
PGS	PGS Heritage (Pty) Ltd
PHRA	Provincial Heritage Resources Authority
PIA	Palaeontological Impact Assessment
PSSA	Palaeontological Society of South Africa
SAHRA	South African Heritage Resources Agency
SAHRIS	South African Heritage Resources Information System
TSF	Tailings Storage Facility

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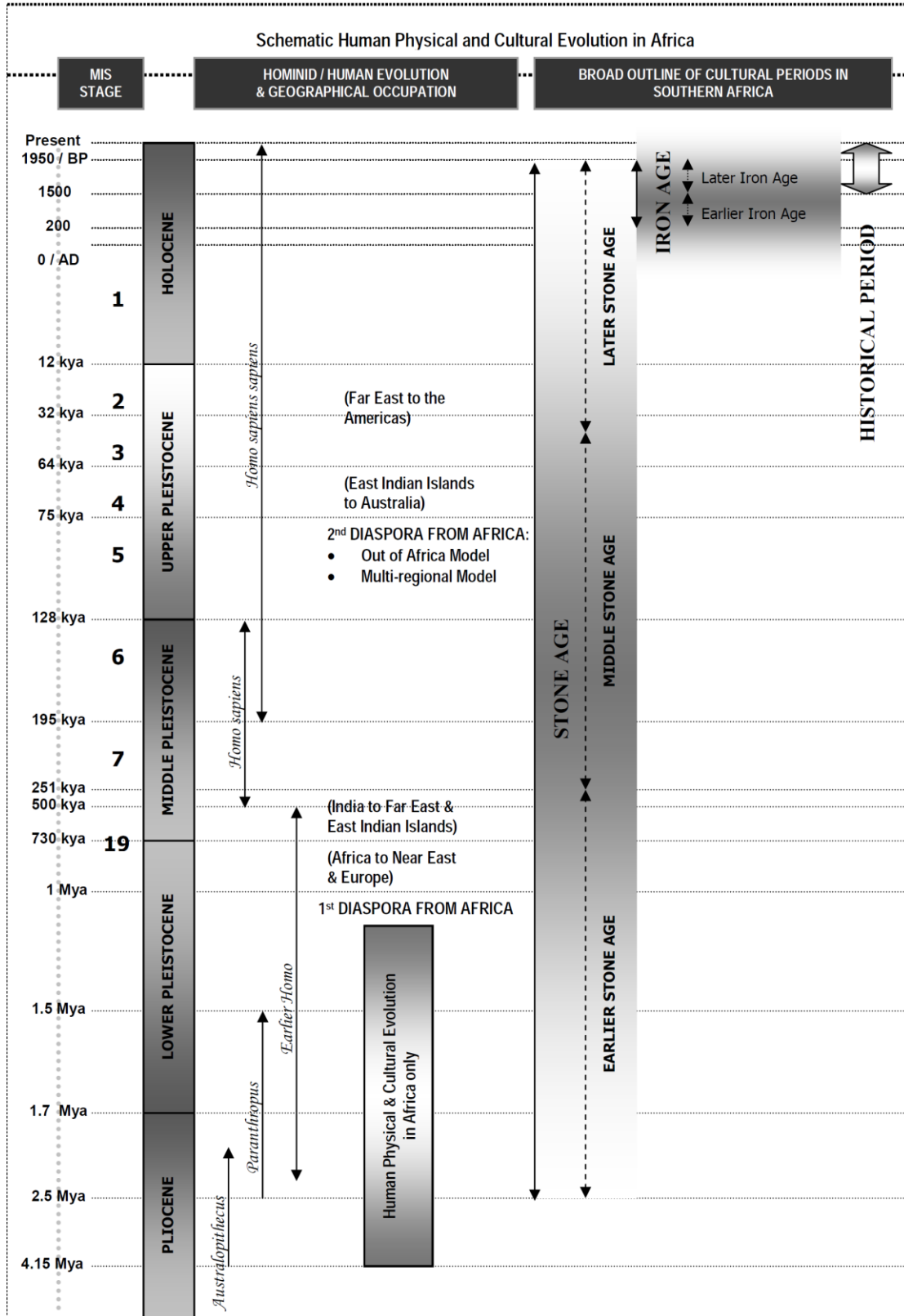


Figure 1 – Human and Cultural Timeline in Africa

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1 INTRODUCTION

PGS Heritage (Pty) Ltd (PGS) was appointed by Environmental Impact Management Services Consulting (Pty) Ltd (EIMS), on behalf of Harmony Gold Mining Company Limited (Harmony), to undertake a Heritage Impact Assessment (HIA), which forms part of the environmental process for the proposed pipeline from Harmony One Plant to Free State North (FSN) 1 Tailings Storage Facility (TSF), located within the Matjhabeng Local Municipality, Lejweleputswa District Municipality, near Welkom, Free State Province.

1.1 SCOPE OF THE STUDY

The aim of the study is to identify heritage sites and finds that may occur in the proposed project area. The HIA aims to inform the BA to assist the developer in managing the discovered heritage resources in a responsible manner, in order to protect, preserve, and develop them within the framework provided by the National Heritage Resources Act of 1999 (Act 25 of 1999) (NHRA).

1.2 SPECIALIST QUALIFICATIONS

This HIA Report was compiled by PGS Heritage (PGS).

The staff at PGS has a combined experience of nearly 90 years in the heritage consulting industry. PGS and its staff have extensive experience in managing HIA processes. PGS will only undertake heritage assessment work where they have the relevant expertise and experience to undertake that work competently.

Wouter Fourie, the Project Coordinator, is registered with the Association of Southern African Professional Archaeologists (ASAPA) as a Professional Archaeologist and is accredited as a Principal Investigator; he is further an Accredited Professional Heritage Practitioner with the Association of Professional Heritage Practitioners (APHP).

Nikki Mann, the author of this report, is registered as a Professional Archaeologist with the Association of Southern African Professional Archaeologists (ASAPA). She has 4 years of experience in the heritage assessment field and holds a Master's degree (MSc) in Archaeology from the University of Cape Town.

1.3 ASSUMPTIONS AND LIMITATIONS

Not detracting in any way from the comprehensiveness of the fieldwork undertaken, it is necessary to realise that the heritage resources located during the fieldwork do not necessarily represent all the possible heritage resources present within the area. Various factors account for this, including the

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subterranean nature of some archaeological sites and existing vegetation cover. It should be noted that for the most part, the study area was accessible for the fieldwork survey. Fieldwork was also focussed on area that was not previously ploughed or disturbed by farming activity, thus focussing on areas with the highest potential to yield heritage resources. It should be noted that there were a few sections of study area that could not be surveyed due to limited access (related to property owners or informal occupation of land).

Therefore, should any heritage features and/or objects be located or observed outside the identified heritage sensitive areas during the construction activities, a heritage specialist must be contacted immediately. Such observed or located heritage features and/or objects may not be disturbed or removed in any way until such time that the heritage specialist has been able to make an assessment as to the significance of the site (or material) in question. This applies to graves and cemeteries as well. If any graves or burial places are located during the development, the procedures and requirements pertaining to graves and burials will apply as set out below.

The study area boundaries and development footprints depicted in this report were provided by the client. As a result, these were the areas assessed during the fieldwork. Should any additional development footprints located outside of these study area boundaries be required, such additional areas will have to be assessed in the field by an experienced archaeologist/heritage specialist long before construction starts.

1.4 LEGISLATIVE CONTEXT

The identification, evaluation and assessment of any cultural heritage site, artefact or find in the South African context is required and governed by the following legislation:

- Notice 648 of the Government Gazette 45421- general requirements for undertaking an initial site sensitivity verification where no specific assessment protocol has been identified
- National Environmental Management Act (NEMA), Act 107 of 1998 – Appendix 6
- National Heritage Resources Act (NHRA), Act 25 of 1999

1.4.1 NOTICE 648 OF THE GOVERNMENT GAZETTE 45421

Although minimum standards for archaeological (2007) and palaeontological (2012) assessments were published by SAHRA, GN.648 requires sensitivity verification for a site selected on the national web based environmental screening tool for which no specific assessment protocol related to any theme has been identified. The requirements for this Government Notice (GN) are listed in **Table 1** and the applicable section in this report noted.

Table 1 - Reporting requirements for GN648

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GN 648	Relevant section in report	Where not applicable in this report
2.2 (a) a desktop analysis, using satellite imagery;	Section 5	
2.2 (b) a preliminary on-site inspection to identify if there are any discrepancies with the current use of land and environmental status quo versus the environmental sensitivity as identified on the national web-based environmental screening tool, such as new developments, infrastructure, indigenous/pristine vegetation, etc.	Section 3	-
2.3(a) confirms or disputes the current use of the land and environmental sensitivity as identified by the national web-based environmental screening tool;	Section 3	-
2.3(b) contains motivation and evidence (e.g., photographs) of either the verified or different use of the land and environmental sensitivity;	Section 3	-

An assessment of the Environmental Screening tool provides the following sensitivity rating for archaeological and heritage resources that fall within the proposed area as Low (**Figure 2**), while palaeontological resources are rated as Medium to High (**Figure 3**).

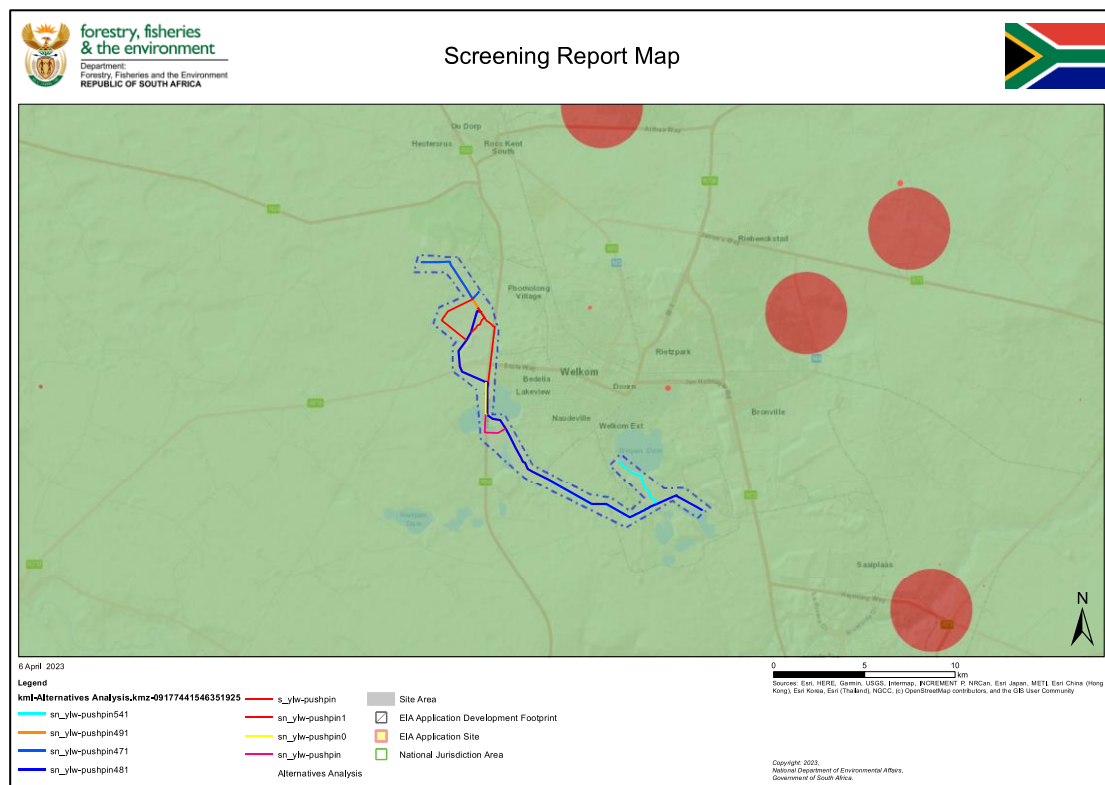


Figure 2 - Environmental screening tool's depiction of the archaeological and heritage sensitivity of the study area and surroundings.

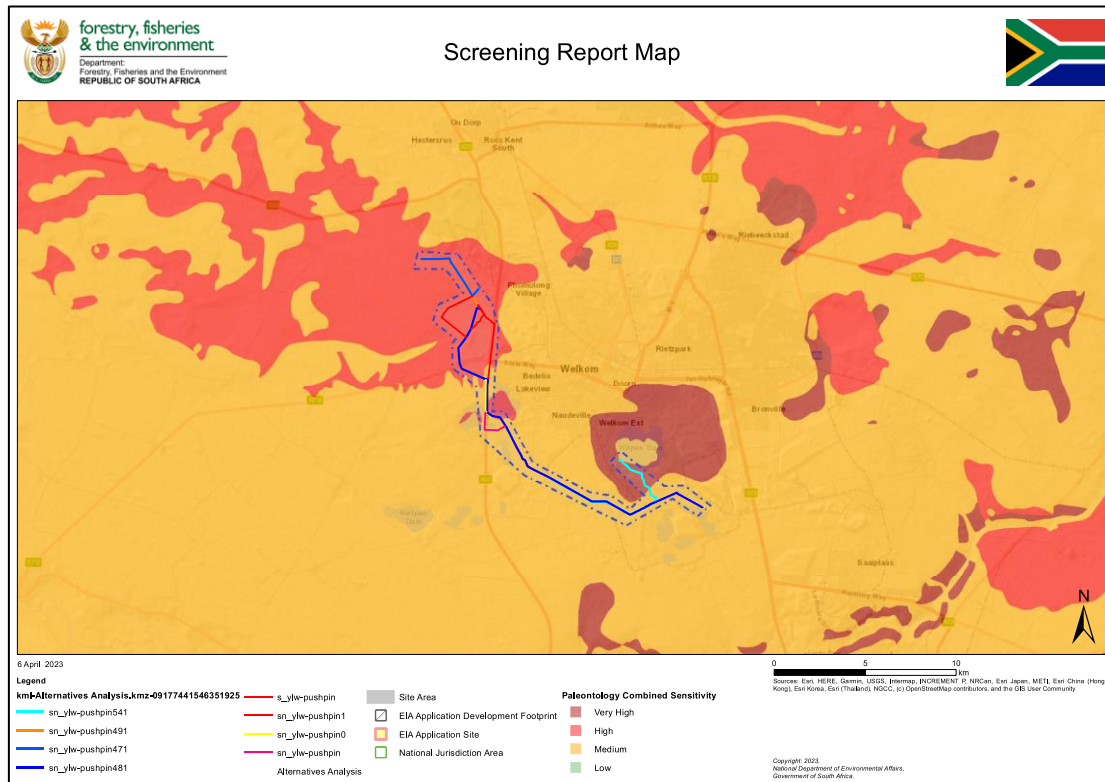


Figure 3 - Environmental screening tool's depiction of the palaeontological sensitivity of the study area and surroundings.

1.4.2 NEMA – APPENDIX 6 REQUIREMENTS

The HIA report has been compiled considering the NEMA Appendix 6 requirements for specialist reports as indicated in the table below. For ease of reference, the table below provides cross-references to the report sections where these requirements have been addressed.

1.4.3 THE NATIONAL HERITAGE RESOURCES ACT

- National Heritage Resources Act (NHRA) Act 25 of 1999
 - Protection of Heritage Resources – Sections 34 to 36; and
 - Heritage Resources Management – Section 38

The NHRA is utilized as the basis for the identification, evaluation, and management of heritage resources and in the case of Cultural Resource Management (CRM) those resources specifically impacted on by development as stipulated in Section 38 of NHRA. This study falls under s38(8) and requires comment from the relevant heritage resources authority.

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2 SITE LOCATION AND DESCRIPTION

2.1 Locality

Coordinates for Study Area	Northernmost point: S -27.928954 E 26.668418	Easternmost point: S -28.037906 E 26.793910
	Southernmost point: S -28.040755 E 26.757635	Westernmost point: S -27.929379 E 26.654368
Location	<p>The proposed development area is located within the Matjhabeng Local Municipality, Lejweleputswa District Municipality, near Welkom, Free State Province (Figure 4).</p> <p>Sections of the proposed pipeline will be installed alongside existing pipeline routes.</p>	
Property	<p>Portions of the farms:</p> <ul style="list-style-type: none"> ▪ Ouders Gift 48 ▪ Rheeders Dam 31 ▪ Goedgedacht 53 ▪ Meribah 16 ▪ Jacobasrust 118 ▪ Therons Rust 69 ▪ Theronia 71 ▪ Vlakplaats 125 ▪ St Helena 42 ▪ Marmageli 20 ▪ Stuirmanspan 92 ▪ Klip Pan 14 	
Topographical Map	2726DC Odendaalsrus, 2826BA Blaauwdrift, 2826BB Virginia	
Extent	The estimated length of the proposed return water pipelines is ~ 23.5 km and the slurry pipelines is estimated ~ 23 km.	

The following infrastructure is encountered in the region of the areas surveyed:

- Provincial roads (R34, R30, R73, R710, R730)
- Mining infrastructure (incl. existing pipelines)
- Power lines
- Local roads (tar and informal)

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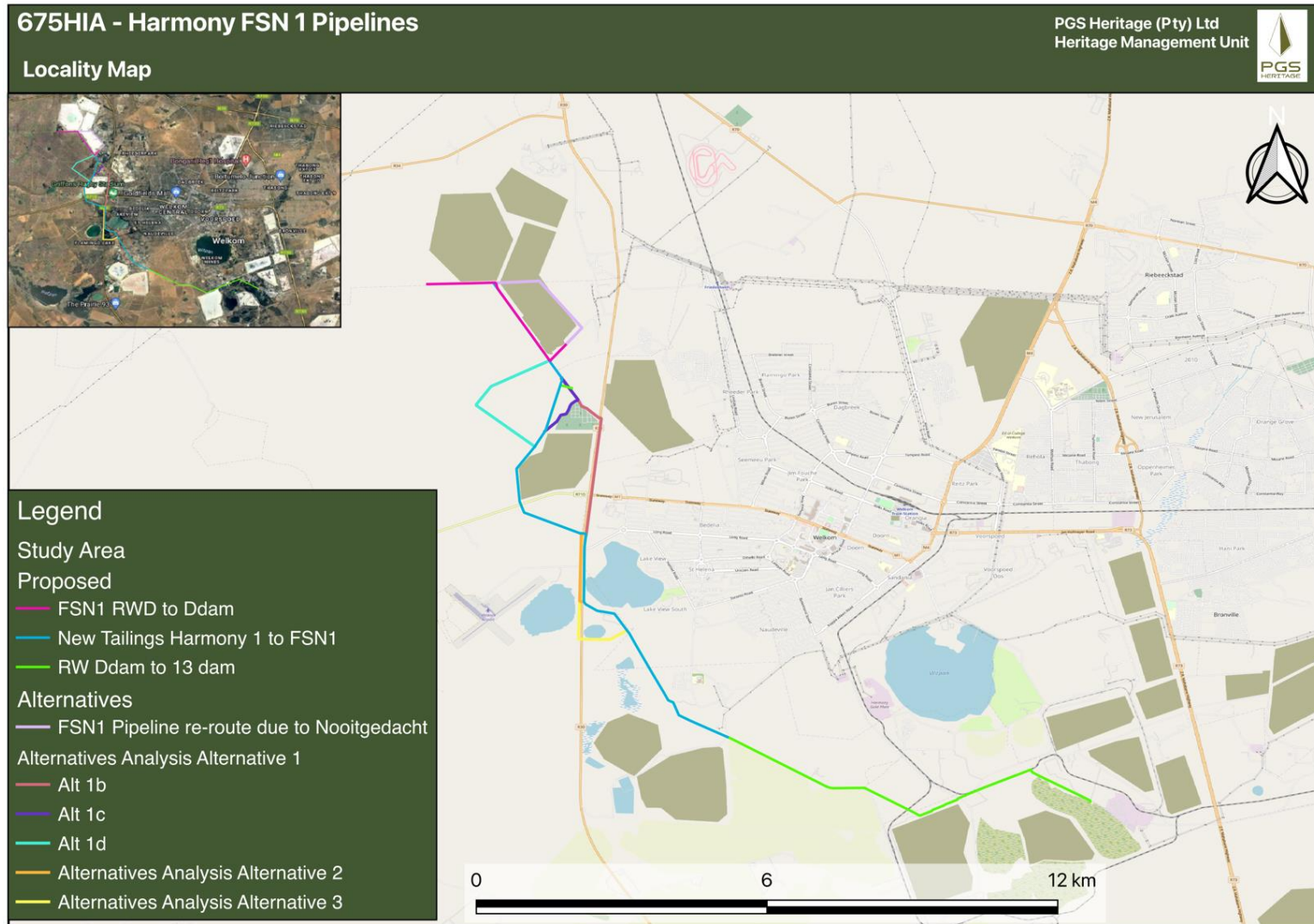


Figure 4 - Locality map depicting the regional context of the study area.

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2.2 Project Background

Harmony Gold Mining Company Limited (Harmony) own and operate a number of Gold Mines and Plants in the Welkom region in the Free State. Harmony's One Plant is located south of the town Welkom. Harmony One Plant is currently depositing half of its residue onto the Free State South (FSS) 2 Tailings Storage Facility (TSF) and the other half onto the recommissioned St. Helena 4 TSF.

These two facilities have deposition capacity until the end of June 2024 at which time another deposition site will be required to accept the residue from One Plant. The Free State North (FSN) 1 TSF has been selected as the next deposition site.

2.3 Project Description

Harmony plan to construct new return water lines from FSN1 TSF Return Water Dam to D-Dam Complex and 2 x new 600mm return pipelines to Dam 13 to pump back return water from the TSF (Figure 5).



Figure 5 – Harmony One Plant Return Water Pipelines.

Construct new tailings pipelines from Harmony One Plant to FSN 1 TSF for deposition of tailings. The existing pipeline is shown as light blue and the proposed extension in orange in Figure 6. Harmony will install all pipelines next to each other, as far as possible.

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Figure 6 – Proposed tailings line extension.

The estimated length of the proposed return water pipelines is ~ 23.5 km and the slurry pipelines is estimated ~ 23 km. The 2 return water pipelines from D-Dam to Dam13 diameter will be 600mm diameter and average flow rate of 500 litres per second (l/s). The residue pipelines from Harmony One Plant to the FSN1 TSF will be 3 x 450mm diameter. One 550mm diameter residue pipeline from Saaiplaas Plant, currently depositing onto St. Helena 123 TSF will be extended in future to the FSN1 TSF complex. The average flow rate of the 450mm pipelines will be 250 l/s and the average flow rate on the 550mm diameter will be 390 l/s (Figure 7).

The pipelines will be flanged steel pipeline and installed above-ground on pre-cast concrete plinths and a 3.5m wide access road, adjacent to the pipelines, will be cleared/graded to provide access for construction, maintenance and inspections.

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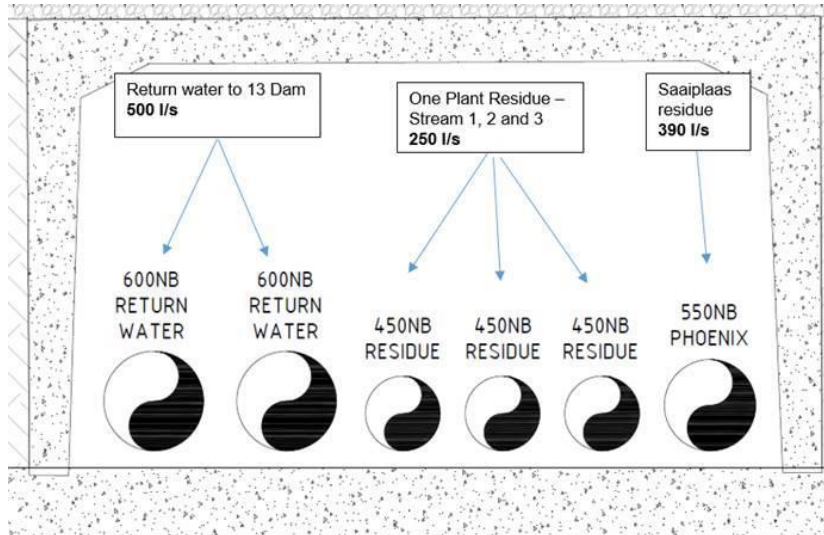


Figure 7 - Proposed pipelines and flow rates.

A booster pump station will be constructed at St Helena TSF Complex. The booster pump station will consist of pumps and some electrical infrastructure to supply the pumps with power. Although it will not be bigger than 1 Ha, the applicant wishes to apply for 1Ha of vegetation clearance. Location of the booster pump station shown in **Figure 8** below.

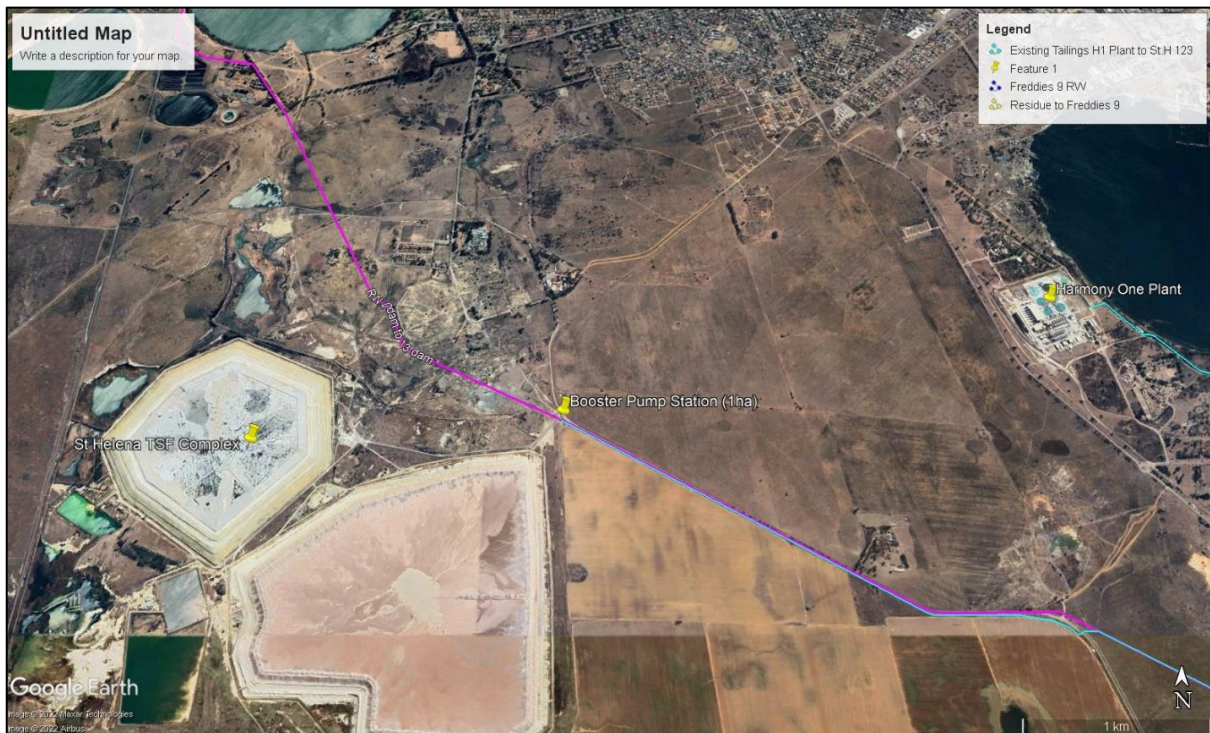


Figure 8 – St Helena Booster Pump Station.

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2.4 Layout Alternatives

Alternative layout routes will be considered and assessed following the sensitivities that were identified along the first proposed pipeline route. These include three alternative pipeline layout options. The pipeline alternatives to be considered are shown in **Figure 9**.

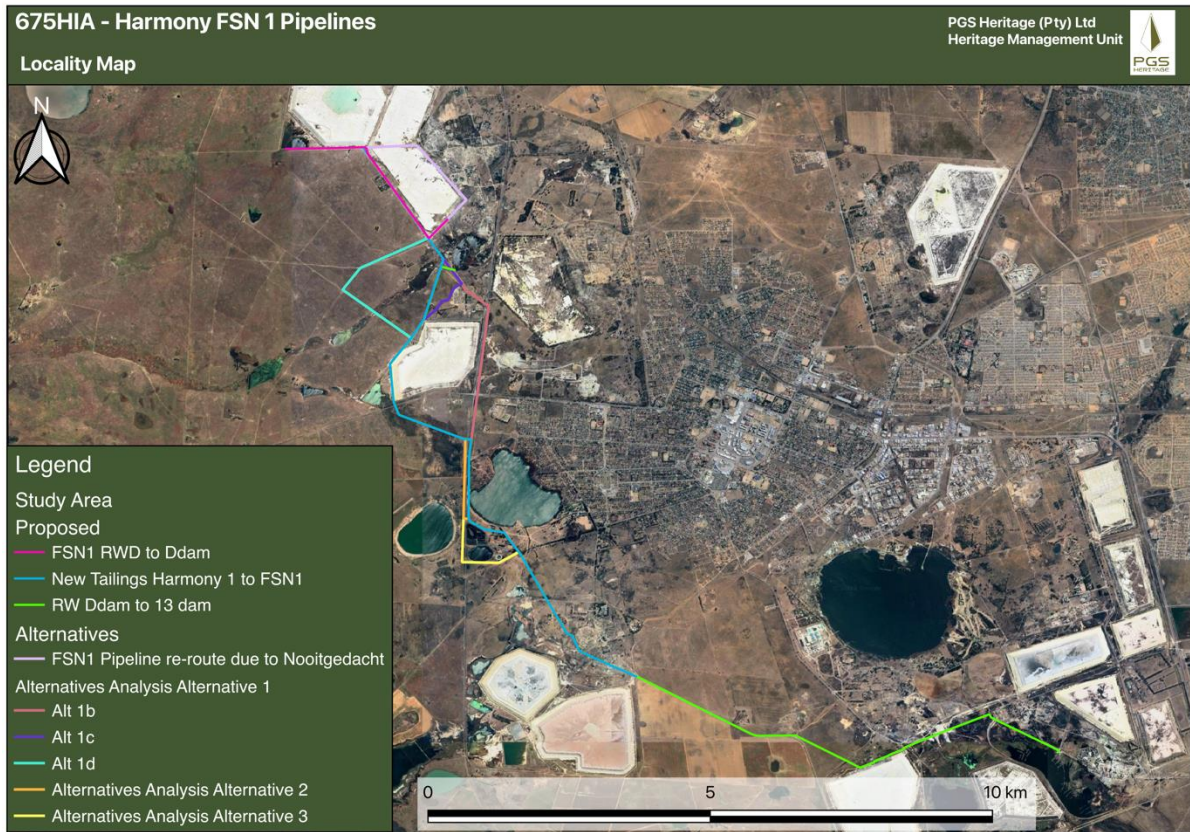


Figure 9 - Map illustrates the proposed alternative routes for the project.

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3 CURRENT STATUS QUO

3.1 Site Description

A site visit was conducted by one archaeologist (Nikki Mann) and one field assistant (Xander Fourie) from PGS on 26 January 2023. The proposed development area is located within the Matjhabeng Local Municipality, Lejweleputswa District Municipality, near Welkom, Free State Province.

As mentioned previously, the study area falls within a landscape that contains pipelines, thus the area can be described as largely disturbed. Parts of the surrounding landscape is used for informal cattle grazing. Other elements of disturbance identified within the study area include farm and provincial roads and other infrastructure associated with the existing pipelines and other mining activities. The likelihood of finding in-situ heritage resources is lessened due to this fact.

In terms of the topography, the study area comprises relatively level portions of land. Ephemeral streams cut across some of the components within the application area. In terms of the geology, the study area comprises: Volksrust Formation (Shale, siltstone, minor sandstone) and alluvium, colluvium, eluvium, gravel, scree, sand, soil, debris.

The study area is serviced by the R34, R30, R73, R710, and R730 roads, provincial gravel roads and farm roads. Existing infrastructure includes mine infrastructure, electricity transmission lines, telephone lines, fences and other recent structures. Photographs of the general study area are provided below.

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Figure 10 – View of existing pipeline infrastructure.



Figure 11 – View of existing pipelines.



Figure 12 – View of demolished structures.



Figure 13 – View of building rubble.



Figure 14 – View of disturbed areas.



Figure 15 – View of disused residential compound.

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Figure 16 – View of grazing land.



Figure 17 – View of dense grass cover.



Figure 18 – View of the railway line in the southern portion of the study area.



Figure 19 – View of the area near Dam 13.



Figure 20 - View towards the existing TSF in the northern part of the study area.

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Figure 21 – General views of the area proposed for Alternative 1c.



Figure 22 - General views of the area proposed for Alternative 2b.



Figure 23 - General view of the area proposed for Alternative 3b.

3.2 Site Vegetation

Significant sections of the undisturbed components of the study area comprise open grassland, interposed by scattered pockets of trees. Planted vegetation, which includes exotic trees (*Eucalyptus*) and plants, are found in proximity to farmsteads and human occupation areas. Lanes of such planted

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exotic trees were also strategically planted as windbreaks and are found all over the study area. There is also secondary grassland which is associated with areas of cultivation/grazing.

In terms of region's vegetation, the study area is characterised by one vegetation type: The Vaal-Vet Sandy Grassland (Mucina and Rutherford, 2006).

“The Vaal-Vet Sandy Grassland is characterised by Aeolian and colluvial sand overlying sandstone, mudstone and shale of the Karoo Supergroup (mostly the Ecca Group). An important feature of the vegetation type is the dominance of *Themeda triandra*. In areas where heavy grazing and/or erratic rainfall occurs low cover of *T. triandra* associated with an increase in *Elionurus muticus*, *Cymbopogon pospischii* and *Aristida congesta* is evident.”

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4 ASSESSMENT METHODOLOGY

The section below outlines the assessment methodologies utilised in the study.

4.1 Methodology for Assessing Heritage Site Significance

This HIA report was compiled by PGS for the proposed pipeline project. The applicable maps, tables and figures are included, as stipulated in the NHRA (no 25 of 1999) and the National Environmental Management Act (NEMA) (No. 107 of 1998). The HIA process consists of three steps:

Step I – Literature Review and initial site analysis: The background information to the field survey relies greatly on the Heritage Background Research which was undertaken through archival research and evaluation of satellite imagery and topographical maps of the study area.

Step II – Physical Survey: A physical survey was conducted by a combination of vehicle and pedestrian access through the proposed project area by one qualified heritage specialist and one field assistant (26 January 2023 and 5 April 2023), aimed at locating and documenting sites falling within and adjacent to the proposed development footprint.

Step III – The final step involved the recording and documentation of relevant heritage resources identified in the physical survey, the assessment of these resources in terms of the HIA criteria and report writing, as well as mapping and constructive recommendations.

The significance of heritage sites is based on four main criteria:

- Site integrity (i.e., primary vs. secondary context),
- Amount of deposit, range of features (e.g., stonewalling, stone tools and enclosures),
- Density of scatter (dispersed scatter)
 - Low - <10/50m²
 - Medium - 10-50/50m²
 - High - >50/50m²
- Uniqueness; and
- Potential to answer present research questions.

Management actions and recommended mitigation, which will result in a reduction in the impact on the sites, will be expressed as follows:

A - No further action necessary;

B - Mapping of the site and controlled sampling required;

C - No-go or relocate development activity position;

D - Preserve site, or extensive data collection and mapping of the site; and

E - Preserve site.

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

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4.1.1 Site Significance

Site significance classification standards use is based on the heritage classification of s3 in the NHRA and developed for implementation keeping in mind the grading system approved by SAHRA for archaeological impact assessments. The update classification and rating system as developed by Heritage Western Cape (2021) is implemented in this report.

Site significance classification standards prescribed by the Heritage Western Cape Guideline (2016), were used for the purpose of this report (**Table 2** and **Table 3**).

Table 2 - Rating system for archaeological resources

Grading	Description of Resource	Examples of Possible Management Strategies	Heritage Significance
I	Heritage resources with qualities so exceptional that they are of special national significance. Current examples: Langebaanweg (West Coast Fossil Park), Cradle of Humankind	May be declared as a National Heritage Site managed by SAHRA. Specific mitigation and scientific investigation can be permitted in certain circumstances with sufficient motivation.	Highest Significance
II	Heritage resources with special qualities which make them significant, but do not fulfil the criteria for Grade I status. Current examples: Blombos, Paternoster Midden.	May be declared as a Provincial Heritage Site managed by Provincial Heritage Authority. Specific mitigation and scientific investigation can be permitted in certain circumstances with sufficient motivation.	Exceptionally High Significance
III	Heritage resources that contribute to the environmental quality or cultural significance of a larger area and fulfils one of the criteria set out in section 3(3) of the Act but that does not fulfil the criteria for Grade II status. Grade III sites may be formally protected by placement on the Heritage Register.		
IIIA	Such a resource must be an excellent example of its kind or must be sufficiently rare. Current examples: Varschedrift; Peers Cave; Brobartia Road Midden at Bettys Bay	Resource must be retained. Specific mitigation and scientific investigation can be permitted in certain circumstances with sufficient motivation.	High Significance
IIIB	Such a resource might have similar significances to those of a Grade III A resource, but to a lesser degree.	Resource must be retained where possible where not possible it must be fully investigated and/or mitigated.	Medium Significance
IIIC	Such a resource is of contributing significance.	Resource must be satisfactorily studied before impact. If the recording already done (such as in an HIA or permit application) is not sufficient, further recording or even mitigation may be required.	Low Significance
NCW	A resource that, after appropriate investigation, has been determined to not have enough heritage significance to be retained as part of the National Estate.	No further actions under the NHRA are required. This must be motivated by the applicant or the consultant and approved by the authority.	No research potential or other cultural significance

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Table 3 - Rating system for built environment resources

Grading	Description of Resource	Examples of Possible Management Strategies	Heritage Significance
I	Heritage resources with qualities so exceptional that they are of special national significance. Current examples: Robben Island	May be declared as a National Heritage Site managed by SAHRA.	Highest Significance
II	Heritage resources with special qualities which make them significant in the context of a province or region, but do not fulfil the criteria for Grade I status. Current examples: St George's Cathedral, Community House	May be declared as a Provincial Heritage Site managed by Provincial Heritage Authority.	Exceptionally High Significance
II	Such a resource contributes to the environmental quality or cultural significance of a larger area and fulfils one of the criteria set out in section 3(3) of the Act but that does not fulfil the criteria for Grade II status. Grade III sites may be formally protected by placement on the Heritage Register.		
IIIA	Such a resource must be an excellent example of its kind or must be sufficiently rare. These are heritage resources which are significant in the context of an area.	This grading is applied to buildings and sites that have sufficient intrinsic significance to be regarded as local heritage resources; and are significant enough to warrant that any alteration, both internal and external, is regulated. Such buildings and sites may be representative, being excellent examples of their kind, or may be rare. In either case, they should receive maximum protection at local level.	High Significance
IIIB	Such a resource might have similar significances to those of a Grade III A resource, but to a lesser degree. These are heritage resources which are significant in the context of a townscape, neighbourhood, settlement or community.	Like Grade IIIA buildings and sites, such buildings and sites may be representative, being excellent examples of their kind, or may be rare, but less so than Grade IIIA examples. They would receive less stringent protection than Grade IIIA buildings and sites at local level.	Medium Significance
IIIC	Such a resource is of contributing significance to the environs These are heritage resources which are significant in the context of a streetscape or direct neighbourhood.	This grading is applied to buildings and/or sites whose significance is contextual, i.e., in large part due to its contribution to the character or significance of the environs. These buildings and sites should, as a consequence, only be regulated if the significance of the environs is sufficient to warrant protective measures, regardless of whether the site falls within a Conservation or Heritage Area. Internal alterations should not necessarily be regulated.	Low Significance

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Grading	Description of Resource	Examples of Possible Management Strategies	Heritage Significance
NCW	A resource that, after appropriate investigation, has been determined to not have enough heritage significance to be retained as part of the National Estate.	No further actions under the NHRA are required. This must be motivated by the applicant and approved by the authority. Section 34 can even be lifted by HWC for structures in this category if they are older than 60 years.	No research potential or other cultural significance

5 HISTORICAL AND ARCHAEOLOGICAL OVERVIEW OF THE STUDY AREA

5.1 Overview of the Study Area and Surrounding Landscape

The high-level archival research focused on available information sources that were used to compile a general background history of the study area and surrounds.

The Free State has a rich archaeological and historical history going back millions of years and includes significant aspects such as Later Stone Age rock art, Battlefields and Iron Age stonewalled enclosures. The general surroundings of the study area became a melting pot of contact and conflict as it represents one of many frontiers where San hunter-gatherers, Nguni and Sotho-Tswana agro-pastoralists, Dutch Voortrekkers and British Colonists all came together. The ravages of war also swept across these plains, and in particular the South African War (1899-1902) as well as the Boer Rebellion (1914-1915).

It must be noted that such an overview, which is based on available literature and archival research, would necessarily reflect a bias toward a traditional white history of the region as this would have been the focus of publications and archival documents during the last 150 years.

Table 4 – Archaeological and Historical Overview of the Study Area and Surrounding Landscape

DATE	DESCRIPTION
The Study Area during the Stone Age	
	Very little is known about the Stone Age archaeology of the study area and its immediate surroundings. In the wider surroundings, probably the most significant Stone Age is at Florisbad, located roughly 78 km south-west of the present study area. Closer to the study area, a number of Middle and Later Stone Age material in associated with mammal fossil remains have been identified in erosion gullies along the Sand, Doring and Vet Rivers between Virginia and Theunissen (De Ruiter <i>et. al.</i> 2011). See also Rossouw (n.d.).
2.5 million to 250 000 years ago	The Earlier Stone Age (ESA) is the first and oldest phase identified in South Africa's archaeological history and comprises two technological phases. The earliest of these is known as Oldowan and is associated with crude flakes and hammer stones. It dates to approximately 2 million years ago. The second technological phase is the Acheulian and comprises more refined and better made stone artefacts such as the cleaver and bifacial hand axe. The Acheulian dates back to approximately 1.5 million years ago. No information regarding ESA sites from the study area and surroundings was found.

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DATE	DESCRIPTION
>250 000 to 40 000 years ago	The Middle Stone Age (MSA) is associated with flakes, points and blades manufactured by means of the prepared core technique. This phase is furthermore associated with modern humans and complex cognition (Wadley, 2013). During research fieldwork by the National Museum in Bloemfontein, ten sites were recorded where Middle Stone Age and/or Later Stone Age lithics were identified in association with mammal fossil remains from erosion gullies along the Sand, Vet and Doring Rivers (De Ruiter <i>et. al.</i> 2011).



Figure 24 – Photograph of the archaeological field survey as published in De Ruiter *et. al.* (2011).

40 000 years ago, to c. 1800s	The Later Stone Age (LSA) is the third archaeological phase identified and is characterised by an abundance of very small stone tools known as microliths as well many rock art sites across the country. This period is associated with hunter-gatherers (San) as well as early pastoralists (Khoekhoe) and lasted up until - and in many cases a considerable number of years after – the arrival of Iron Age and European communities. Apart from the occurrence of Later Stone Age lithics along the Sand, Vet and Doring Rivers (see above), no other Later Stone Age sites are known from the surroundings of the study area. Similarly, no known rock art sites are known from the study area or its wider surroundings.
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The Study Area during the Iron Age

The arrival of early farming communities during the first millennium, heralded in the start of the Iron Age for South Africa. The Iron Age is that period in South Africa's archaeological history associated with pre-colonial farming communities associated with agricultural and pastoralist farming activities, metal working, cultural customs such as lobola as well as the tangible representation of the significance of cattle imprinted on their settlement layouts (known as the Central Cattle Pattern) (Huffman, 2007).

According to the distribution map for Iron Age settlements on the Southern Highveld as published in Maggs (1976), the study area is located to the west of the known distribution of such Late Iron Age sites. It is therefore unlikely for any Late Iron Age sites to be located within the study area or its immediate surroundings. This surmise is largely supported by the distribution maps as published by Huffman (2007), albeit these latter distribution maps (which are based on known archaeological information) indicate that the study area is located very close to the periphery of two Iron Age facies. For the sake of completeness, these two Iron Age facies, known as Thabeng and Makgwareng, will be presented here.

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DATE	DESCRIPTION
AD 1700 – AD 1840	<p>The Thabeng facies of the Moloko Branch of the Urewe Tradition is one of the facies identified within the wider region. The decoration on the ceramics associated with this facies is characterised by incised triangles, coloured chevrons and arcades. The Tlhaping at Dithakong, Rolong at Platberg and the Kubung from the Free State form a Southwestern Sotho-Tswana cluster that is associated with this Thabeng facies pottery and Type Z settlement layouts (Huffman, 2007).</p> <p>The Type Z settlements are one of the Late Iron Age stonewalled settlement types identified by Tim Maggs during his extensive archaeological research project on the Iron Age of the southern Highveld, which includes the present study area (Maggs, 1976). These sites are characterised by large primary enclosures enclosed by a 'discontinuous ring' of characteristic bilobial dwellings. Each of these bilobial dwellings comprises a hut at its front with a semi-circular courtyard at the back. With the area in front of the hut enclosed by a low stone wall and the courtyard at the back similarly enclosed by a smaller enclosure, the layout plan of these huts comprises two lobes, one larger than the other. The huts are defined by a ring of upright stones and are usually paved with flat stones. Unlike Type V settlements (see below), corbelled hut are rarely associated with these Type Z settlements, and appear to be the result of contact with the Type V settlements located to the east.</p> <p>One of the more prominent ones is OXF1, located a short distance north-west of the town of Ventersburg. This site was excavated by Tim Maggs during the 1970s as part of his overall research project alluded to above (Maggs, 1976).</p> <p>In his conclusions on the history of his entire study area, Maggs (1976:317) states that "...the conclusion seems inescapable that the Kubung were the builders of Type Z. This conclusion could be put forward on the typological evidence alone, for the Kubung are the only known off-shoot of the Rolong to have settled in our area, and the Type Z industry was clearly the work of a group related to the Rolong."</p>

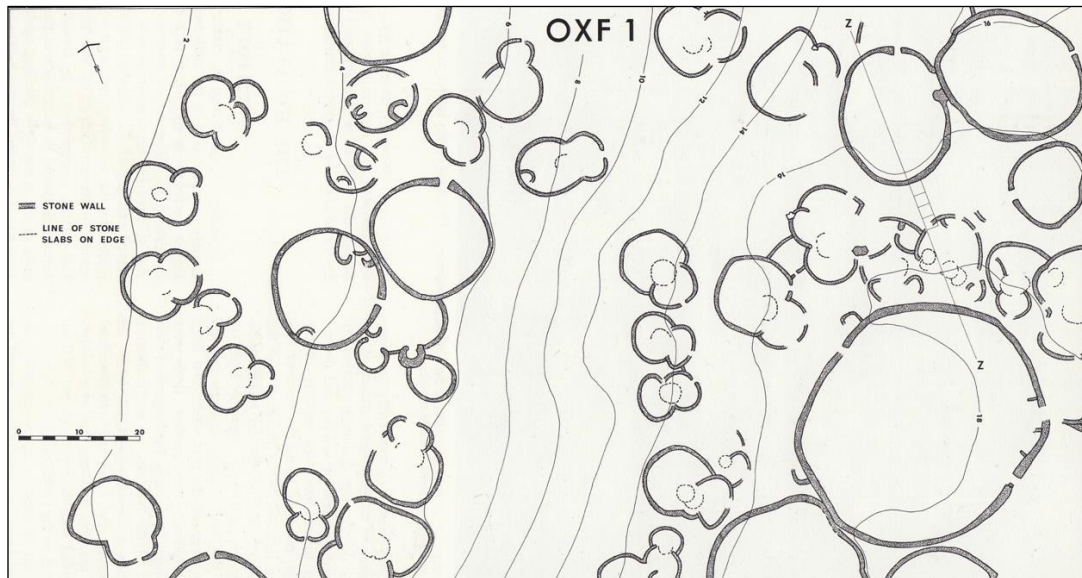


Figure 25 - This plan depicts the settlement layout of a typical Type Z site, and was recorded at site OXF 1 (Maggs, 1976:233).

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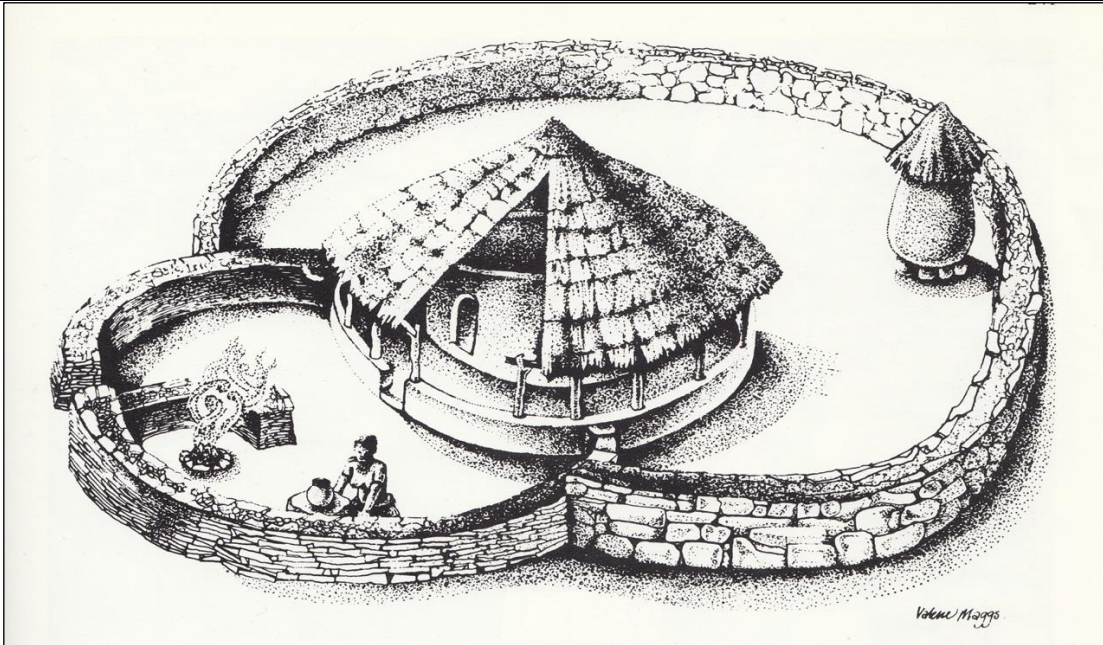


Figure 26 – Artist's impression of a bilobial dwelling at site OXF 1. These bilobial dwellings represent a characteristic element of Type Z settlements (Maggs, 1976:241).

AD 1700 –
AD 1820

The Makgwareng facies of the Blackburn Branch of the Urewe Ceramic Tradition represents the next known Iron Age period within the surroundings of the study area. The decoration on the ceramics from this facies is characterised by finely stamped triangles, rim notching and appliqué (Huffman, 2007).

This facies developed from Ntsuanatsatsi south of the Vaal River and can be associated with the Type V stone walling settlement type (Huffman, 2007), the name of which is derived from Vegkop (Maggs, 1976). Van Riet Lowe (1927) was one of the first to record these structures. Dreyer (1990) also conducted excavations on Type V Late Iron Age stonewalled settlements located a short distance south-west of Winburg. The Type V settlements comprise a core of cattle enclosures surrounded by beehive huts. Corbelled stone huts are associated with this walling type, and can be seen as characteristic. They are low stone huts located at the edge of the cattle enclosures and were where the boys herding the cattle often lived (Huffman 2007). As suggested by Huffman (2007), the corbelled huts were in fact beehive huts made of stone rather than grass and reeds. Furthermore, the presence of beehive huts at these sites necessarily indicates a Nguni association or origin with these settlements.

Based in information presently available, the best known site of this type found within the surroundings of the study area, comprises a so-called “Early Sotho Settlement, Waterval, Sandrivierhoogte” that was originally declared a National Monument and which is now registered as a Provincial Heritage Site. The site is located 37 km south-east of the present study area. The site was proclaimed a national monument by virtue of a notice in the Government Gazette on 17 December 1982. In the declaration, the site is described as a ‘Leghoya Village’ comprising corbelled huts and stonewalls. The site has since been declared a Provincial Heritage Site in terms of the National Heritage Resources Act (www.sahra.org.za).

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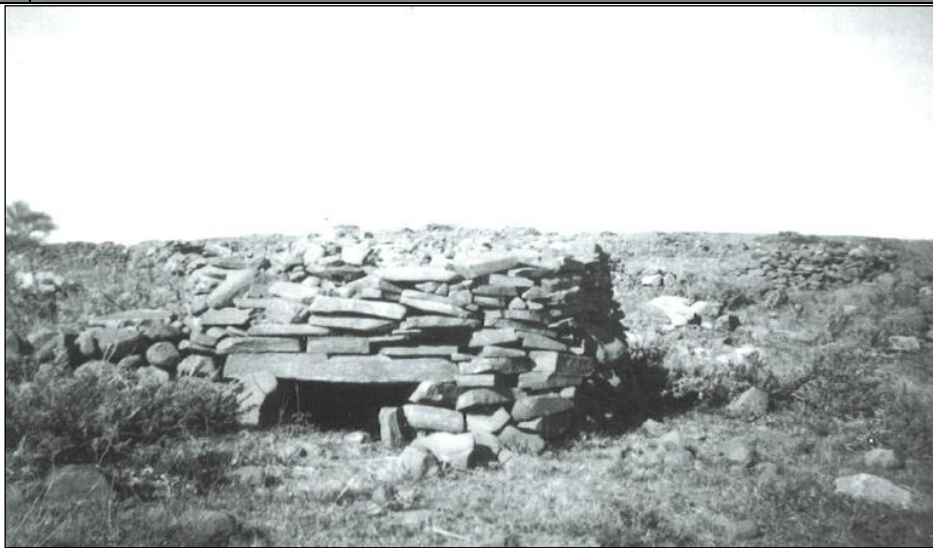


Figure 27 – Corbelled stone huts associated with a Type V settlement (Huffman, 2007:39).

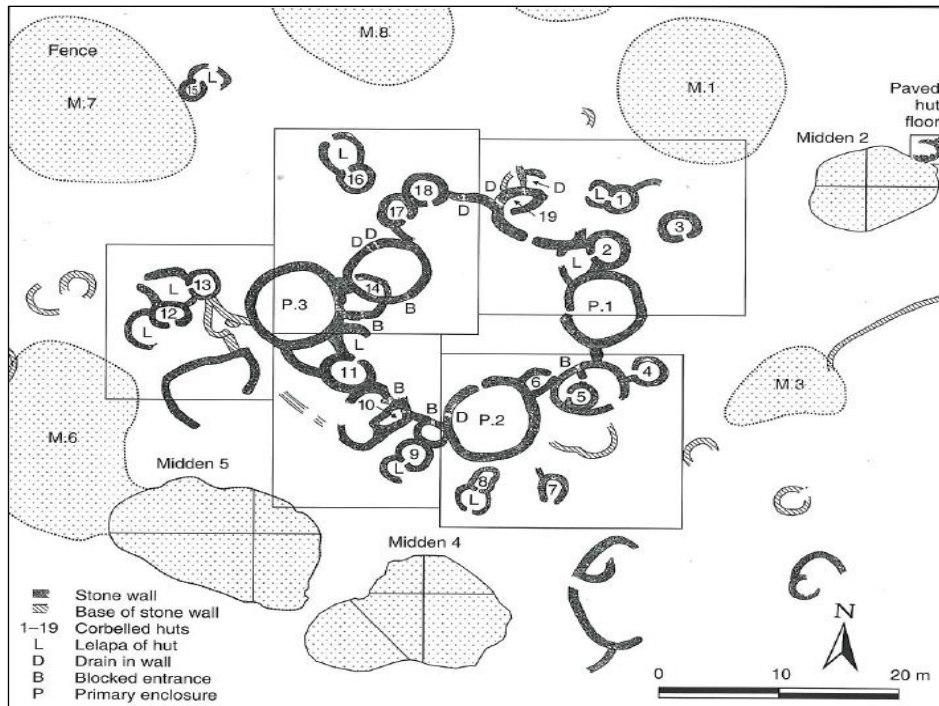


Figure 28 – Layout of a Type V Settlement (Huffman, 2007:38).

1820s

Across the Southern Highveld, this period was characterised by warfare and unrest. Known as the Mfecane, these years of upheaval originated primarily in the migration of three Nguni groups from present day Kwazulu-Natal into the present day Free State as a result of the conquests of the Zulu under King Shaka. The three Nguni groups were the Hlubi of Mpangazitha, the Ngwane of Matiwane and the Khumalo Ndebele (Matabele) of Mzilikazi.

In c. 1821, the Hlubi migrated across the Drakensberg Mountains in a westerly direction (Maggs, 1976) and attacked the Tlokwa of MaNthatisi along the banks of the Wilge River. This river has its source near Harrismith and flows into the Vaal River where the Vaal Dam is located today. While it is not exactly certain where MaNthatisi's settlements would have been located (in all likelihood further south), the Tlokwa fled westward as a result of the Hlubi attack and in turn attacked other groups in its path.

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	<p>This started a period of unrest and warfare, which rippled across the Highveld on both sides of the Vaal River (Legassick, 2010) (Lye and Murray, 1980). The Ngwane followed closely on the Hlubi and further augmented the unrest and warfare along the southern Highveld (Legassick, 2010). Although the effects of the migrations of the Hlubi and Ngwane would certainly have had a profound impact on the northern Free State, this was also the case in terms of the Khumalo Ndebele who would have played a significant role in the surroundings of the study area during this time.</p> <p>The Khumalo Ndebele (also known as the Matabele) were also forced to leave Kwazulu-Natal and between 1823 and 1827 settled along the central Vaal River (Bergh, 1999). Mzilikazi attacked a number of Sotho-Tswana groups and settlements and incorporated them into his kingdom. As a result, his activities would have had a definite impact on the northern Free State at the time.</p>

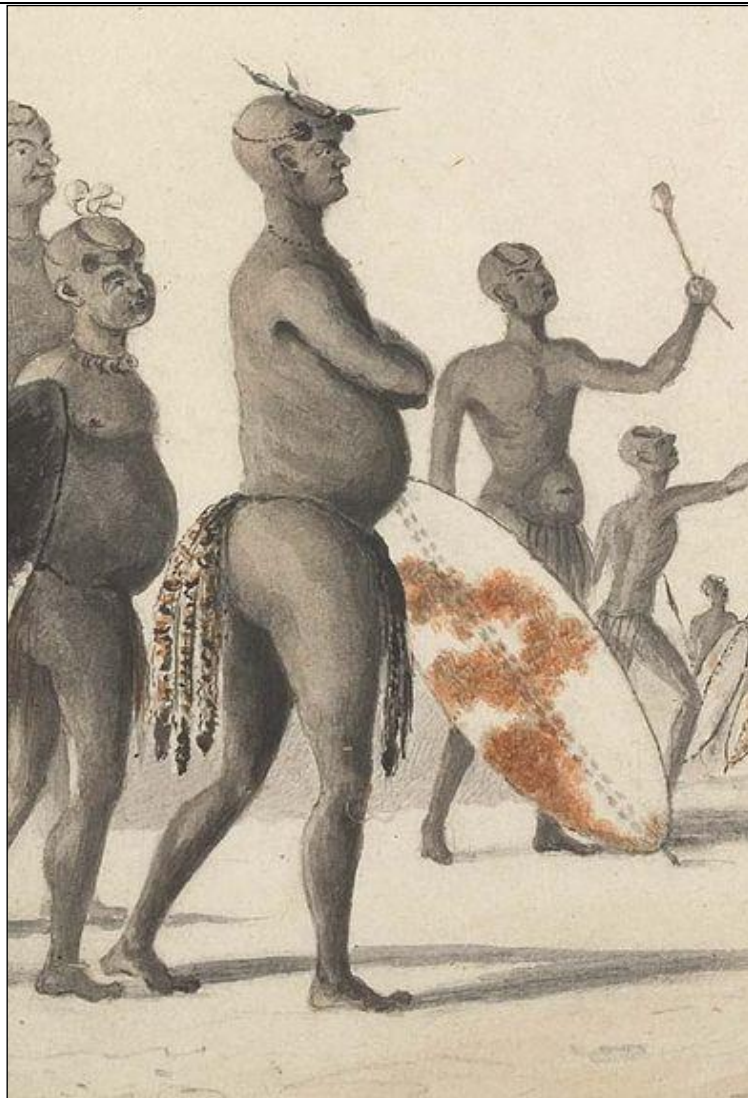



Figure 29 - King Mzilikazi of the Matabele. This illustration was made by Captain Cornwallis Harris in c. 1838 (www.sahistory.org.za).

The Early Colonial Period

The early Colonial Period within the study area and surroundings was characterised by the arrival of newcomers to the Transoraniga. The first arrivals were the Griqua followed by white Trekboers, who for the most part practiced a nomadic pastoralist way of life and were small in number. During

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	the 1830s a mass migration of roughly 2 540 Afrikaner families (comprising approximately 12 000 individuals) from the frontier zone of the Cape Colony to the interior of Southern Africa took place. The people who took part in this Great Trek were later to be known as Voortrekkers (Visagie, 2011).
1804	The Griqua were of European and Khoikhoi descent, and although they had been present on the Orange River for some time, they only established themselves permanently north of the river in 1804 when they settled near present-day Danielskuil (Reader's Digest, 1994).
Early 1800s	During the early 1800s, frequent droughts forced white farmers from the Cape Colony to move with their livestock across the Orange River to look for better grazing. Initially, these Trekboers first obtained permission from the Cape authorities before departing across the frontier, however with time, increasing numbers of Trekboers moved across this river into the Transorangia (as it became known) without any prior permission (Schoeman, 1980).
Early 1836	The first Voortrekker party of some 70 wagons crossed over the Orange River during early 1836. More groups followed and in terms of the surroundings of the study area, established themselves along the Vet River (Schoeman, 1980). Meintjies (1973) mentions that a Voortrekker party under Hendrik Potgieter arrived along the Vet River during this time. The grazing around the Vet River was not enough for all the livestock and animals of the Voortrekkers, so they split into smaller groups with one group establishing itself in May 1836 at Blaauwdrift, on the Zand River.
1837 - 1843	In 1841 the town of Winburg was established on the banks of the Vet river. After the annexation of Natal by the British in 1843 and the subsequent dissolution of the Voortrekker Republic of Natalia, Winburg became the capital of the Voortrekkers in what is today known as the Free State (Erasmus, 2004). Winburg is located 55 km south-south-east of the study area. On 10 October 1968, an extensive Voortrekker Monument was opened near Winburg (www.artefacts.co.za).
	 <p><i>Figure 30 – Depiction of an ox wagon crossing a river during the Great Trek (Reader's Digest, 1994:116).</i></p>
The Mid to Late Nineteenth Century	
3 February 1848	The Orange River Sovereignty was proclaimed over the Transorangia by Great Britain and had its capital at the newly established town of Bloemfontein (www.wikipedia.org). The sovereignty came about after one-sided agreements that favoured the British Government had been reached between Great Britain on the one hand and King Moshesh of the Basotho and Adam Kok III of the Griqua on the other. Those Voortrekkers present in the Transorangia were completely by-passed by these agreements, which led to serious dismay and disappointment amongst them. In terms of the surroundings of the study area, the response of the Voortrekkers was to force

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	the British magistrate at Winburg, one Thomas Biddulph, out of town and proclaim the Republic of Winburg (Reader's Digest, 1994).
16 January 1852	<p>On 16 January 1852 the Sand River Convention was signed between the British Government and the Transvaal Boers. The British Government was represented by British Assistant Commissioners W.S. Hogge and C.M. Owen, whereas the Transvaal Boers were under the leadership of the Voortrekker hero of Blood/Ncome River, General Andries Pretorius.</p> <p>This convention formally recognised the existence and independence of the Boer Republic north of the Vaal River by the British Government. As a result, this agreement allowed for the creation of a Boer Republic, namely the <i>Zuid-Afrikaansche Republiek</i> (South African Republic) (Oberholster, 1972). The <i>Zuid-Afrikaansche Republiek</i> remained in existence until the end of the South African War in 1902.</p> <p>The site where the signing of the convention took place, was declared a monument and for many years was marked by a stone cairn and plaque (Oberholster, 1972). The present condition of the monument is not known.</p> <p>The site is located near the bridge where the N1 highway passes over the Sand River.</p>
23 February 1854	<p>The Orange River Convention was signed by representatives of Great Britain and the Boers, and resulted in the proclamation of the Boer Republic of the Orange Free State. The convention was signed at Bloemfontein (www.wikipedia.org).</p> <p>As with the proclamation of the Sovereignty, the Orange River Convention was again one-sided and did not obtain the blessing or inputs of all the major role-players in the Free State. While the Voortrekkers were excluded in 1848, the signing of the Orange River Convention in 1854 did the same to the Basotho and Griqua.</p> <p>For the next 48 years, the study area fell within the boundaries of the Boer Republic of the Orange Free State.</p> <p>Incidentally, the Orange River Convention is sometimes referred to as the Bloemfontein Convention.</p>
1872	<p>The town of Ventersburg was laid out on the farm Kromfontein in 1872. Kromfontein had originally belonged to one of the early Voortrekker leaders, namely Field-Cornet P.A. Venter. After his death in 1857, his son B.G. Venter allowed church services to be held in his father's homestead. The second Gereformeerde (Dopper) church north of the Orange River was also established at Kromfontein in 1859.</p> <p>The use of the farm for church services led to the establishment of a town. The new town was named after Field-Cornet P.A. Venter, and formal proclamation for Ventersburg took place in 1876 (Erasmus, 2004).</p>
1890	<p>Erasmus (2004) states that two American engineers were responsible for the original survey of sections of the proposed railway line between Bloemfontein and Johannesburg. On the farm Merriespruit they chiselled the name 'Virginia' on a boulder, presumably in honour of the American State of Virginia. When the railway line was built a few years later, the nearby railway siding was named Virginia and some years later, in 1954, the town of Virginia was also established.</p> <p>The exact position of the chiselled boulder, if it still exists today, is not presently known.</p>
Early 1890s	<p>The railway line between Bloemfontein and Johannesburg was built during the early 1890s, and eventually reached Johannesburg during September 1891 and Pretoria in January 1892 (Schoeman, 1980). In terms of the study area, this railway line passed to its east and in this area was built from Smaldeel (present day Theunissen) to Theron, Welgelegen and Virginia.</p>
9 November 1892 – 1899	<p>The Driekopjes Diamond Mining Company was registered. One of the founding directors of the company was the man who would become synonymous with South African diamond mining and diamonds, Sir Thomas Major Cullinan.</p> <p>The "Driekopjes" in the name of the company referred to a farm of that name north-west of Kroonstad, where diamond mining was taking place. In June 1894 the</p>

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	<p>Driekopjes Diamond Mining Company also acquired an interest in the farm Welgegund from the Van Rensburg Diamond Mining Syndicate. The farm Welgegund is presently known as the farm Driekoppies 422. No information could be found on this syndicate. However, the fact that the Driekopjes Company acquired an interest from the Van Rensburg syndicate, suggests that diamond prospecting and possibly mining activities had taken place within the study area before this transfer took place.</p> <p>A large number of diamonds were subsequently recovered from Welgegund. However all mining activities came to a halt with the South African War (1899 – 1902) (Helme, 1974).</p>
Mid 1890s	<p>During the mid 1890s two men arrived on the farm Aandenk to undertake prospecting work. Alexander Edward King Donaldson was a prospector and his associate Herbert Hinds an engineer. They excavated an 18-meter-deep shaft and took samples from their excavations for further testing and analysis. On their return journey to England, both men died when their ship, the Drummond Castle, wrecked at Ushant off France, and with it the samples they had brought from the Free State (www.sahra.org.za) (Felstar Publishers, 1968).</p> <p>The activities of these two men laid the foundation for the discovery and development of the Free State Goldfields. The farm Aandenk is located immediately south of Allanridge today.</p>
1899	<p>The town of Odendaalsrust was officially established in 1899 when the Dutch Reformed Church chose the farm Kalkkuil for its new parish. The town was proclaimed a municipality in 1912. At the time, it only had about 40 houses, three shops and a hotel (Mayhew, 1982).</p>
The South African War (1899 – 1902)	
<p>The South African War was fought between the Boer Republics of the Transvaal and Free State on the one side and Great Britain on the other, but is referred to as the South African War as the victims and participants of the war were not excluded to Britain or Boer alone.</p> <p>As will be discussed in more detail below, the march of Lord Roberts from Bloemfontein to Pretoria in May and June 1900 was especially significant in terms of the study area. In particular, the so-called Battle of Zand River (7 – 10 May 1900) was fought very close to the study area, with at least the movement of troops during the battle taking place across the study area.</p>	
13 March 1900 – 6 May 1900	<p>Bloemfontein, the capital of the Boer Republic of the Orange Free, was occupied by the British Army under Lord Roberts on 13 March 1900. The Boer Republic of the Orange Free State was renamed the Orange River Colony.</p> <p>With the Republican forces of the Transvaal and Free State retreating northwards from Bloemfontein, Lord Roberts's eyes drifted further north, where the greatest prize of the war lay waiting, Pretoria. Lord Roberts and his staff strongly believed that once the capital of the <i>Zuid-Afrikaansche Republiek</i> fell, the war would be over.</p> <p>However, the success of the British Army required all focus on the immediate front, as the land between Bloemfontein and Pretoria was bisected by a myriad of rivers, dongas and hills, all strategically significant obstacles from where the Boer forces could implement a solid defence. The Boer forces standing between Lord Roberts and Transvaal capital were estimated by British Intelligence to comprise two main groups namely a force of between 5 000 to 6 000 burghers with 18 guns under General Louis Botha and a similarly large force in the surroundings of Kroonstad (Maurice & Grant, 1906).</p> <p>After departing from Bloemfontein, Lord Roberts's force was involved in a couple of successful actions on their way to Pretoria, including Brandfort (3 May 1900) and Vet River (4 - 6 May 1900). With the successful conclusion of the battle of Vet River, Lord Roberts and almost his entire army crossed over the river successfully, and by the evening of 6 May 1900 bivouacked at the small railway siding known as Smaldeel. The</p>

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	<p>town of Theunissen is located here today and is roughly 39 km south of the present study area (Maurice & Grant, 1906).</p> <p>A short distance to the north lay the next, and far more daunting, obstacle on Lord Roberts's march to Pretoria, the Zand (or Sand) River. It was here, at this river, that General Louis Botha, the commanders-in chief of the Transvaal republican forces, was determined to halt Lord Roberts's march on Pretoria.</p>



Figure 31 – Lord Frederick Sleigh Roberts (left) and General Louis Botha (right). These two officers commanded the opposing forces at the Battle of Zand River (Changuion, 2001:77 & 117)

7 – 10 May 1900	<p>On 7 May 1900 a reconnaissance of the Zand River by General Edward Hutton indicated that the northern bank of the river was held by a force of roughly 6 000 Boers supported by two heavy and eight light pieces of artillery. These estimates provided by General Hutton allowed Lord Roberts to draw up a battle plan (Maurice & Grant, 1906).</p> <p>On the 9th of May 1900, Lord Roberts moved his army forward and established his headquarters at the Welgelegen Station. The movement of the British Army under Lord Roberts at Smaldeel to a position a short distance east, suggests that the main component of Lord Roberts's force followed the railway line.</p> <p>Lord Roberts's battle plan focussed on securing significant drifts that provides safe crossing of his infantry over the Zand River, and especially so Junction Drift, Merriespruit, Du Preez Leger Drift (where the bridge on the road between Theunissen and Welkom crosses the river) and De Klerks Kraal Drift. For the purposes of this discussion, the events associated with the latter two of these drifts will be discussed in more detail below.</p> <p>On the morning of 9 May 1900, Lieutenant-Colonel Thomas William Porter with the 1s Cavalry Brigade departed from Smaldeel to reconnoitre the two drifts at Du Preez Leger and De Klerks Kraal. They were assisted in this task by Major-General J.B.B. Dickson with the 4th</p>
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	<p>Cavalry Brigade. Meanwhile, at 11 am, Major-General John French with his advance guard reached Kalkoenkrans, a section of which farm is located within the present study area. At Kalkoenkrans, French received word from the reconnaissance units on the river that the Du Preez Leger Drift was not held by the enemy. Seizing the opportunity to outflank the Boer positions, French immediately ordered a squadron of the Scots Greys forward to take possession of the drift and ordered the remainder of the 1st Cavalry Brigade to follow and assist in this task. The 4th Cavalry Brigade was left at Kalkoenkrans in support. By 15h30 that afternoon the area was occupied by the British force, and the De Klerks Kraal Drift was taken shortly thereafter. Incidentally, the other significant drifts on the river had also been taken with similar ease.</p> <p>On the morning of 10 May 1900, Lord Roberts's army advanced on the river. On its left flank (and the side closest to the study area) General French with the 1st Cavalry Brigade, the 4th Cavalry Brigade as well as Hutton's Mounted Infantry, crossed over the Du Preez Leger Drift from where they moved in a north-eastern direction.</p> <p>On the left centre of the front, the 3rd Cavalry Brigade and Henry's Mounted Infantry crossed over the drift at the railway line in proximity to present-day Virginia. The northern bank was occupied by 8 am that same morning.</p> <p>The crossing of the drifts further to the east was achieved with more difficulty, but the northern banks were also occupied a mere half an hour after the crossing over the Merriespruit Drift near the railway line.</p> <p>This meant that Lord Roberts's front comprising cavalry and mounted infantry units had successfully crossed over the Zand River early on the morning of 10 May 1900, without meeting any significant resistance. However, the fortunes of war were about to change for Lord Roberts.</p> <p>A patrol sent out by General French ran into a large Boer force of between 2 000 and 3 000 burghers moving down onto the centre of Lord Roberts's front at the Virginia Station. French ordered an attack by one squadron each from the 6th Inniskilling Dragoons, Scots Greys and Australian Horse and two troops from the 6th Dragoon Guards (Carabiniers). Their attack was focussed on the centre of the advancing Boer force on a ridge located on the farm Vredes Verdrag. Suffice to say that the battle raged for some time and the outcome was not at all clear until 14h00 that afternoon when the Boers abandoned the field of battle, allowing the British to occupy the ridge and proceed forward (Maurice & Grant, 1906).</p> <p>Further battles and actions took place to the east, near Junction Drift. However, by the afternoon of 10 May 1900, all the drifts had been successfully cleared and occupied to allow for the crossing of the Zand River by Lord Roberts's infantry (Maurice & Grant, 1906).</p>

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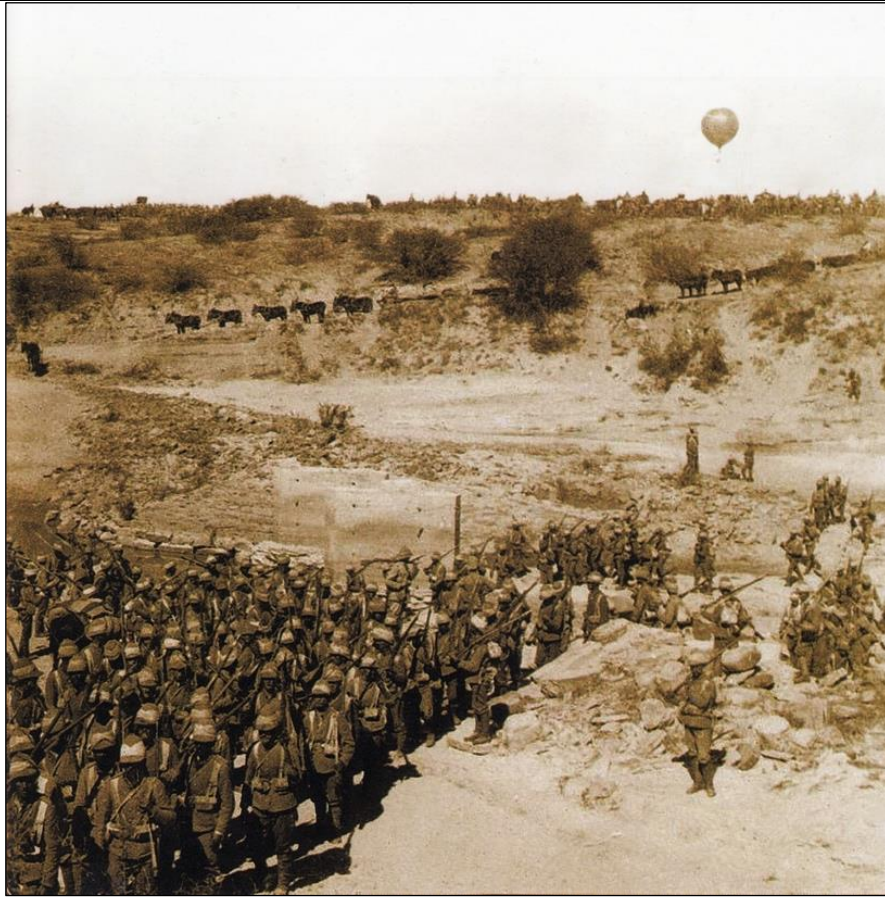


Figure 32 – Lord Roberts’s infantry crossing the Zand River at the conclusion of the Battle of Zand River. This photograph was in all likelihood taken during the afternoon of 10 May 1900, after all the significant drifts across the river had been cleared by the cavalry and other units. The crossing and surrounding landscape are monitored by an observation balloon (see top right). It is not possible to identify the exact drift where this crossing took place, although the remnants of a bridge foundation structure can be seen in the river bed (Raath, 2007:351).

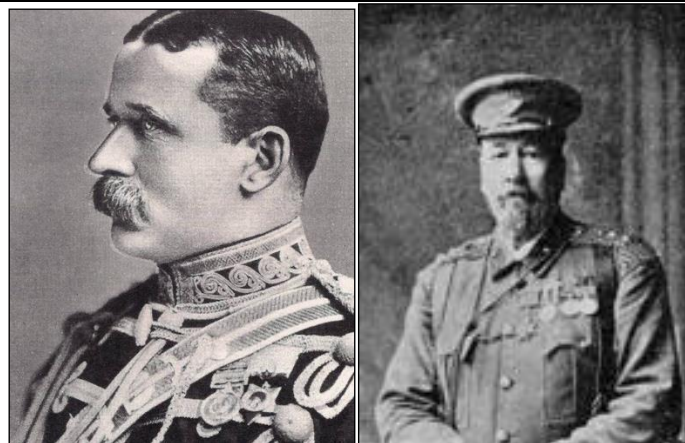


Figure 33 - Two of the British officers at the Battle of the Zand River who were closely associated with the events within the study area, namely the occupation of the Du Preez Leger Drift on 9 May 1900 as well as the crossing of the drift on the morning of 10 May 1900. General John French (left) (Changuion, 2001:77) and Colonel Thomas William Porter (www.nzetc.victoria.ac.nz).

After the fall of Pretoria on 5 June 1900 and the subsequent battles of Diamond Hill (11-12 June 1900) and Bergendal (21-27 August 1900), the Boer generals decided that the only way to proceed with the war would

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	<p>be the implementation of a completely different strategy, a strategy based on mobility by using smaller commandos to attack and harass the British on all fronts in what was to become known as guerrilla warfare. This style of warfare had significant successes, and extended the war for nearly another two years. However, these successes also came with significant losses as the war increasingly dragged the civilian population of the Boer Republics into the carnage of war.</p> <p>No skirmishes or battles associated with the guerrilla war are known from within the study area or its immediate surroundings. This said, the study area and surroundings, as with almost the entire South Africa, experienced the effects of guerrilla warfare.</p> <p>In retaliation to the new form of warfare, the British High Command devised a strategy of building extensive blockhouse lines across the country as a way of hindering the mobility of the Boer commandoes. By December 1900, points along the railway line north of Bloemfontein had been fortified with hastily constructed trenches shaded by roofs and defended by razor wire. The closest of these defensive works was at Virginia. Shortly thereafter, a number of key positions along the railway line north of Bloemfontein were significantly strengthened with the construction of multi-storey blockhouses. At Virginia, for example, a double storey stone blockhouse as well as one corrugated iron blockhouse were built (Hattingh & Wessels, 1997).</p> <p>Lord Kitchener, in particular, also implemented a strategy that was to become known as scorched earth whereby the Boer farms were burnt to the ground and the civilian population (both white and black) remaining on these farms forced into concentration camps.</p> <p>While no concentration camps existed within the study area, a surprising large number of such camps were located in the surroundings of the study area. Black concentration camps were located at Smaldeel, Virginia, Welgelegen and Winburg (Warwick, 1983) (www.angloboerwar.com).</p> <p>Untold hardship ensued in these concentration camps, and many women and children died as a result of exposure, inadequate nutrition and poor medical facilities. These camps resulted in the deaths of 27 926 white and 14 154 black people (www.sahistory.org.za).</p>
The Early Twentieth Century (1902 – 1913)	
<p>October 1902 – November 1904</p>	<p>In October 1902, some months after the end of the South African War, the name of the Driekopjes Diamond Mining Company was changed to the New Driekopjes Diamond Mining Company, which still had Thomas Major Cullinan as one of its directors.</p> <p>Although work at the Driekopjes Mine north-west of Kroonstad resumed on a small scale during 1903 (in all likelihood work at Welgegund also continued), all work at the mine was permanently halted by November 1904. This was due to disappointing yields and as a result the company was liquidated shortly thereafter (Helme, 1974).</p>

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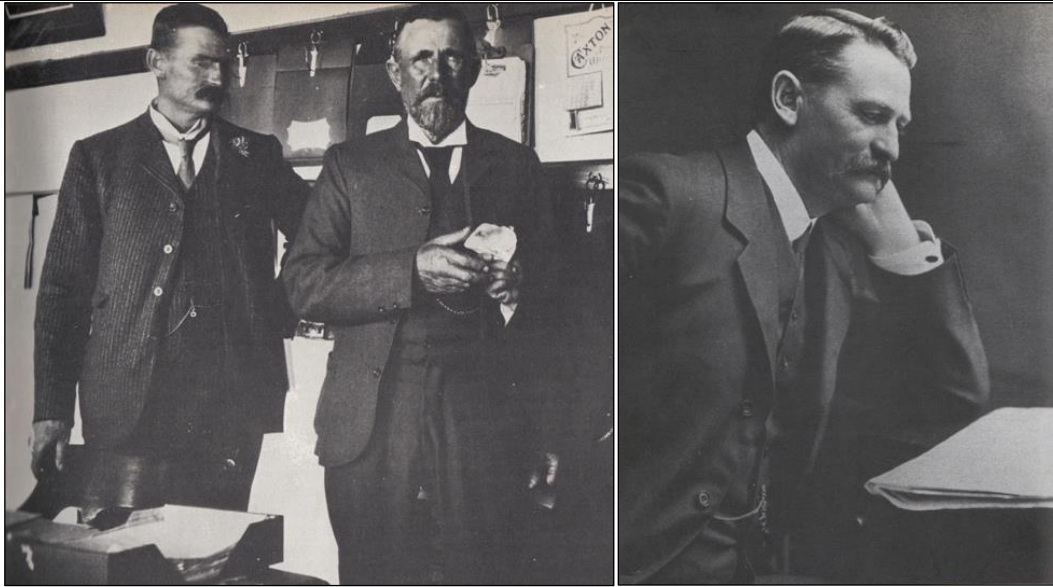


Figure 34 – Sir Thomas Major Cullinan was one of the founding directors of the Driekopjes Diamond Mining Company, which acquired an interest in the farm Welgegund in 1894. In the historic photograph on the left he is shown shortly after the discovery of the Cullinan diamond (which is held by F. Wells) at the Premier Diamond Mining Company, of which he was the chairman. The photograph on the right depicts Cullinan in 1929 (Helme, 1974: 75 & 146).

1904

After the South African War, renewed efforts were made to carry out gold prospecting work in the area.

In 1904, a prospector named Archibald Megson arrived on the farm Aandenk, and the farmer showed him the trench where Alexander Edward King Donaldson and Herbert Hinds had looked for gold. It had been more than a decade since these two pioneers had prospected the same farm.

Megson opened up the old trench and continued with the excavations. At a depth of 30 meters, he found indications of gold and took a number of samples.

Megson returned to Johannesburg with his samples and attempted to gain the interest of various mining houses and investors on the rand. However, with the rapid development and expansion of the Witwatersrand gold mining industry attracting all of the attention, no one seemed interested in possible gold discoveries so far away from Johannesburg (www.sahra.org.za).



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<i>Figure 35 – Archibald Megson standing in the prospecting trench on the farm Aandenk (Felstar Publications, 1968).</i>	
August 1907	In August 1907, the town of Theunissen was proclaimed. This proclamation followed on a petition by farmers living in proximity to Smaldeel Siding. The town was named in honour of Commandant Helgaardt Theunissen, who led the petition and had also been the leader of the local commando during the South African War. The town of Theunissen became a municipality in 1912 (Erasmus, 2004).
1910	At the time, the Driekoppies Diamond Mine at Welgegund comprised 50 claims (Johnson, 1910). Although no detailed information on these syndicates and companies could be obtained, it would appear that by this time the farm was prospected and mined by at least the Magnus Diamond Syndicate Limited as well as the Triumph Diamond Mining Company Limited. Based on this information, it would appear that the Magnus and Triumph entities in all likelihood took over at Welgegund after the liquidation of the New Driekopjes Mining Company in 1904.
25 November 1911	The Drie Koppie Diamond Mine Limited was formed on 25 November 1911 by W.G. Griffiths to acquire from the Magnus Diamond Syndicate Limited and the Triumph Diamond Mining Company Limited the farm Welgegund in the Winburg District (The Mining Manual and Mining Year Book, 1914). The later history of the diamond mine and mining activities at Welgegund could not be revealed by way of the desktop study. However, based on the remains of the mine property observed during the field, it would appear that a diamond mine was operated here into the relatively recent past.
The Boer Rebellion (1914 – 1918)	
At the end of the South African War (1899 – 1902), the Transvaal and Orange Free State republics lost their independence to the British Empire. In 1910, the Union of South Africa was established consisting of the Cape Colony, Natal, the Transvaal Colony and the Orange River Colony. General Louis Botha was appointed the Union's first prime minister and believed that South Africa's future would be best served as part of the British Commonwealth. In 1914, the South African government under General Louis Botha decided to assist Great Britain in its war with Germany. A number of Boer leaders were not happy about this turn of events, and when General Koos de la Rey was killed at a roadblock in Johannesburg, emotions reached a boiling point and rebellion broke out across the former Boer republics. This rebellion saw more than 11 000 Boer men under the leadership of some of the former Boer War generals such as De Wet, Maritz, Kemp and Beyers rebelling against the South African government and its armed forces under the leadership of former Boer War generals Louis Botha and Jan Smuts.	
16 November 1914	In terms of the study area, the most notable event relating to the Boer Rebellion was the battle that occurred between the commando of General De Wet and the Government forces under the command of Colonel Enslin at the Virginia railway station on 16 November 1914. This battle followed on the defeat of De Wet's rebels at Mushroom Valley, south-east of Winburg, at the hands of General Louis Botha. De Wet and 2 000 rebels managed to escape from Mushroom Valley and followed the railway line north-eastwards towards the Virginia Station on the Zand River. De Wet wanted to cross over the railway line, and as a result, a fight ensued with Colonel Enslin's forces stationed at Virginia Station. General De Wet suffered a number of casualties and 50 of his men were also taken prisoner. After the battle, De Wet and his men followed the Zand River in a western direction and crossed over the river into the Transvaal Colony in proximity to Hoopstad (Union of South Africa, 1916).

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Figure 36 –The hardships experienced by General C.R. de Wet during the rebellion can be seen on these photographs. The one on the left shows De Wet shortly after the South African War (Van Schoor, 2007) with the image on the right depicting the general in the Bloemfontein prison after his capture late in 1914 (Raath & Langner, 2014:119).

The Remainder of the Twentieth Century (1915 – Present Day)

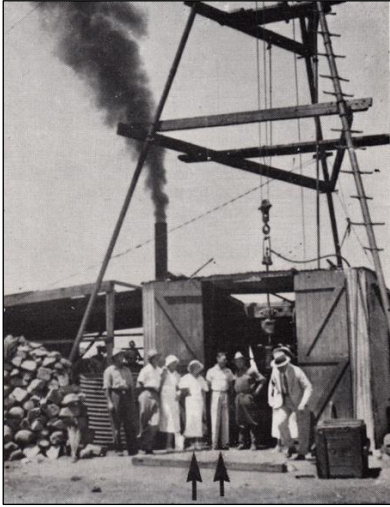

1929 - 1933

Nearly 25 years after finding the first indications of gold on the farm Aandenk, Archibald Megson finally managed to raise the interests of possible investors in Johannesburg. In 1929, during a chance encounter with Joseph Freedman, Megson found a more welcoming response. Freedman introduced the prospector to Johannesburg attorney, Emmanuel Jacobson, and his friend Allan Roberts, a dental technician. Despite being interested in what the prospector had to say, it took almost four years before Jacobson, Roberts and Megson travelled to the Free State (Shorten, 1970).


Allan Roberts, who was an amateur prospector, was able to trace a conglomerate outcrop all along the farm Aandenk, and incorrectly identified it as part of the Upper Witwatersrand series. The two friends returned to Johannesburg and formed a syndicate comprising themselves, F.L. Marx, Dr. E.B. Woolf, Samuel Potter and Joseph Freedman. Freedman represented the interests of the old prospector Archibald Megson in the syndicate (Shorten, 1970).

The syndicate acquired prospecting options on 31 farms in the area and the company Wit. Extensions Limited was established by the syndicate. On 23 October 1933, drilling commenced at a point roughly 80 m from Megson's trench on the same farm Aandenk. However, by February 1935 the drilling work had to be halted due to a lack of funds without any evidence for gold-bearing reefs identified. Many years later, it was estimated that if the two friends had only managed to deepen the hole by another 400 feet, they would have become very rich men and the discoverers of the Free State goldfields. Sadly, this was not to be their fate. Allan Roberts died in such poverty in 1939 and his friends had to pay for his funeral whereas Emmanuel Jacobson had to sell all his assets to survive (Shorten, 1970). Today, the town of Allanridge (named after Allan Roberts) and a monument to the west of the road between Welkom and Bothaville are all that is left of the dreams and expectations of these two mining pioneers.


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	 <p><i>Figure 37 - The first gold prospecting borehole in the Free State was sunk on the farm Aandenk between October 1933 and February 1935. The arrows indicate the positions of Allan Roberts and his wife (Felstar Publications, 1968:11).</i></p>
1935	<p>After the failure of Wit. Extensions Limited, an agreement was reached with the Anglo-French Exploration Company to continue prospecting work at Aandenk. However, instead of continuing deeper on the same borehole, the Anglo-French Exploration Company decided to rather deflect the borehole and no results were achieved. It was later estimated that if either one of these companies had deepened the borehole by only another 400 feet, payable gold would have been discovered (Shorten, 1970).</p> <p>The agreement between Wit. Extensions Limited and Anglo-French Exploration Company came to an end and the famous geologist Dr. Hans Merensky acquired an interest in Wit. Extensions Limited. He subsequently carried out extensive prospecting work including the drilling of further boreholes. However, even these more extensive attempts by Merensky to find the Free State goldfields also failed (Shorten, 1970). Machens (2009) indicates that when news broke that the famous discoverer of inter alia South Africa's platinum reserves owned options in a company working on the Free State goldfields, the interest from investors and mining companies to this part of the Free State was further awakened.</p>
	 <p><i>Figure 38 –The famous geologist Dr. Hans Merensky, who had his role to play in the discovery of the Free State goldfields (Machens, 2009).</i></p>
1 February 1937 – April 1939	<p>After failing to discover any payable gold, Merensky sold his shares in Wit. Extensions to the Anglo American Corporation, who on 1 February 1937 established the West Rand Investment Trust. The trust also carried</p>

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	<p>out an extensive drilling operation. The activities and interest of the Anglo American Corporation in this part of the Free State attracted the interest of other mining houses and investment companies, and prospecting options were taken out on a large number of farms from this area (Shorten, 1970).</p>
	<p>Despite all this interest, the first payable gold in the Free state was only identified in March 1939 during drilling operations by the African and European Investment Company on the farm Uitsig at a depth of 2 701 feet (Felstar Publishers, 1968). One month later, during April 1939, another discovery of payable gold was made on the farm St. Helena at a depth of 1 143 feet (Shorten, 1970).</p> <p>The discoveries of payable gold at Uitsig and St. Helena created significant excitement amongst mining companies and investors, and increasing numbers of prospecting options and eventually mines were acquired and developed. The Free State gold rush had begun.</p>
1941	<p>The first gold mining lease in the Free State was granted by the government of the Union of South Africa for the farm St. Helena in 1941, and the St. Helena Gold Mining Company was established to mine and develop the property (Felstar Publishers, 1968). A number of other gold mining companies were also established in a relatively short spate of time, including the Welkom Gold Mining Company, President Steyn Gold Mining Company and the President Brand Gold Mining Company.</p>
	
<p><i>Figure 39 – The first mine shaft ever sunk along the Free State goldfields, namely the No. 3 Incline Shaft at the St. Helena Gold Mine (Felstar Publishers, 1968:151).</i></p>	
16 April 1946	<p>The borehole of the Blinkpoort Gold Syndicate Limited on the boundary of the farms Geduld and Friedenheim, reached payable gold in 1946. On 16 April 1946 it was announced that the gold-bearing material retrieved at a depth of 3 922 feet from this borehole assayed at an impressive 1 252 dwts per ton which was unique in the history of gold prospecting and mining in South Africa, with averages usually in the region of 250 dwts per ton. This discovery led to further interest in the Free State goldfields (Felstar Publishers, 1968).</p>
11 July 1946 – 15 April 1947	<p>On 11 July 1946 an application was made by the land company of Sir Ernest Oppenheimer's Anglo American Corporation, namely the South African Township and Mining and Finance Corporation, for the establishment of a new town called Welkom. After some legal and procedural processes and debate between the township applicants and its opponents (including the Odendaalsrus Town Council), the application for the establishment of the town of Welkom was approved on 15 April 1947 (Felstar Publishers, 1968).</p>

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	William Backhouse designed the town as a garden city with a commercial centre built around a town square and traffic circles rather than stop streets or traffic lights. More than a million trees were also planted (Erasmus 2014).
	 <p><i>Figure 40 – This photograph of Welkom was taken during the 1960s, roughly ten years after its establishment (Felstar Publications, 1968:171).</i></p>
1953	After gold was discovered in the area, Odendaalsrus became a prominent town in the Free State. A railway line was built from Allanridge to Odendaalsrus in 1953 and served the two Freddie’s mines (Nienaber et al. 1982).
1954	Three of the six mines surrounding Welkom had reached production stage by 1954. These were the Welkom, Western Holdings and St. Helena Mines. During the same year, the town of Virginia was laid out on the banks of the Zand River. As indicated elsewhere, the name of this town was derived from the nearby railway station, which in turn was named this after two American engineers working on the line in 1890 had carved the name “Virginia” on a boulder from a nearby hill (Erasmus 2014).
1981 - 1987	Beisa Shaft (now the Beatrix West Section) was commissioned in 1981 to exploit uranium. The sinking of Beatrix 1 and 2 Shafts (now the Beatrix South Section) were also started at the time (www.sibanyegold.co.za). In 1984, the Beisa Uranium Mine was closed due to the low price of uranium at the time. In 1985 the Beatrix 1 and 2 Shafts were commissioned and exploration work commenced in proximity to the Beisa Mine on the farm Kalkoenkrans (www.sibanyegold.co.za). The sinking of two sub-vertical shafts and a ventilation shaft commenced at the Beisa Mine in 1987. During the same year this mine was renamed the Oryx Mine (www.sibanyegold.co.za).

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5.2 Heritage Sensitivity as Revealed in the Historical and Archaeological Overview

It is clear that the historical and archaeological overview revealed various aspects relating to the surroundings of the study area. While this assists with reconstructing the historical landscape, it does however provide some indication of the relatively limited historical significance of the study area as a whole. The following historical events and sites can be directly associated with the study area:

- During archaeological research undertaken by the National Museum in Bloemfontein, a total of 10 Middle Stone Age and Later Stone Age sites were identified in association with mammal fossil bones in drainage gullies along the Vet, Doring and Sand Rivers. It is important to note that this research was not focussed on identifying Stone Age sites without the associated presence of mammal fossil bones.
- The historical and archaeological review has revealed that the study area is located outside of the known distribution of Late Iron Age stonewalled settlements as published by Maggs (1976). This observation is largely supported by the distribution maps of known Iron Age sites as published by Huffman (2007). This said, it is always still possible for Iron Age sites to be located within the study area, and especially sites associated with the Thabeng and Makgwareng facies.
- In May 1836, a Voortrekker party under the leadership of Hendrik Potgieter arrived in the wider surroundings of the study area. Due to limited grazing the party decided to splinter into smaller groups. One of these groups established themselves at the present-day farm Blaauwdrift (Meintjies, 1976).
- Diamond prospecting and mining activities had been undertaken on the farm Welgegund since at least the early 1890s. These early activities appear to have been undertaken by the Van Rensburg Diamond Mining Syndicate. In June 1894 an interest in the farm Welgegund was acquired by the Driekopjes Diamond Mining Company, a founding director of which was the famous diamond magnate Sir Thomas Major Cullinan. While mining activities were undertaken in earnest during the remainder of the decade, the outbreak of the South African War in 1899 brought all work to a halt. After the war, mining activities continued at Welgegund. With time other mining companies also acquired claims on the farm, including the Magnus Diamond Mining Company, Triumph Diamond Mining Company, Welgegund Diamond Mining Company as well as the Drie Koppies Diamond Mining Company. This latter company appears to have still existed by 1931.
- The South African War (1899-1902) had a significant impact across the country, and also within the study area. During the Battle of Zand River (7 – 10 May 1900), the most significant drifts across the river were earmarked for attention by Lord Robers in his attack, including the Du Preez Leger Drift as well as De Klerks Kraal Drift.
- During the Boer Rebellion (1914 -1915) a battle took place between the commando of General De Wet and government forces under Colonel Enslin at the Virginia railway station on 16 November

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1914. It is important to note that after the battle De Wet and his commando followed the Zand River in a westerly direction towards Hoopstad.

- In March and April 1939 and 16 April 1946 significant discoveries of payable gold were made during prospecting drilling operations on the farms Uitsig, St. Helena and Geduld. These discoveries led to the rapid development of the Free State goldfields which significantly changed the entire landscape, including the present study area.

5.3 Examination of Archival and Historical Maps

The examination of historical data and cartographic resources represents a critical tool for locating and identifying heritage resources and in determining the historical and cultural context of the study area. Relevant topographic maps and satellite imagery were studied to identify structures, possible burial grounds or archaeological sites present in the footprint area.

Historical topographic maps (1:50 000) for various years (1945, 1954, 1975, 1997, 2007) were available for utilisation in the background study. These maps were assessed to observe the development of the area, as well as the location of possible historical structures and burial grounds. The study area was overlain on the map sheets to identify structures or graves situated within or immediately adjacent to the study area that could possibly be older than 60 years and thus protected under Section 34 and 36 of the NHRA.

5.3.1 First Edition of the 2826BA Blaauwdrift and 2826BB Virginia Topographical Map Dated to 1945

The 2826BA Blaauwdrift map sheet was surveyed in 1945 by 45 Survey Company U.D.F and drawn by the Trigonometrical Survey Office, 1945. The 2826BB Virginia map sheet was surveyed in 1945 and drawn by the Trigonometrical Survey Office, 1945.

These map sheets show several structures and homesteads adjacent to the study area. If these heritage sites still exist today, they would be at least 78 years old. Overlays of the study area components over this map sheet are provided in the section below.

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First Edition of the 2826BA Topographical Sheet:

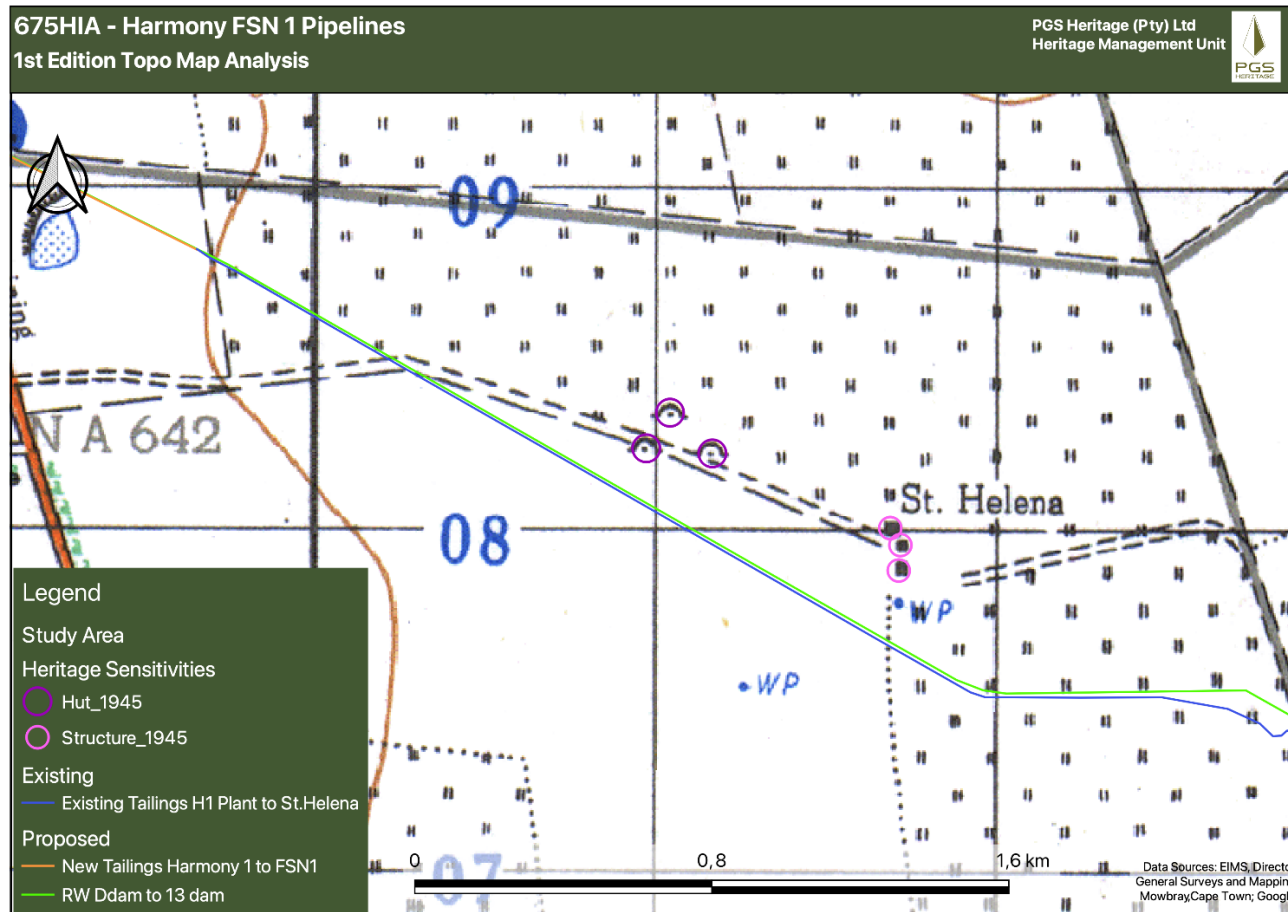


Figure 41 - Section of First Edition of the 2826BA Topographical Map, showing several heritage features. These comprise structures (pink polygon), and historical Black Homesteads (purple polygons) located adjacent to the proposed development.

First Edition of the 2826BB Topographical Sheet:

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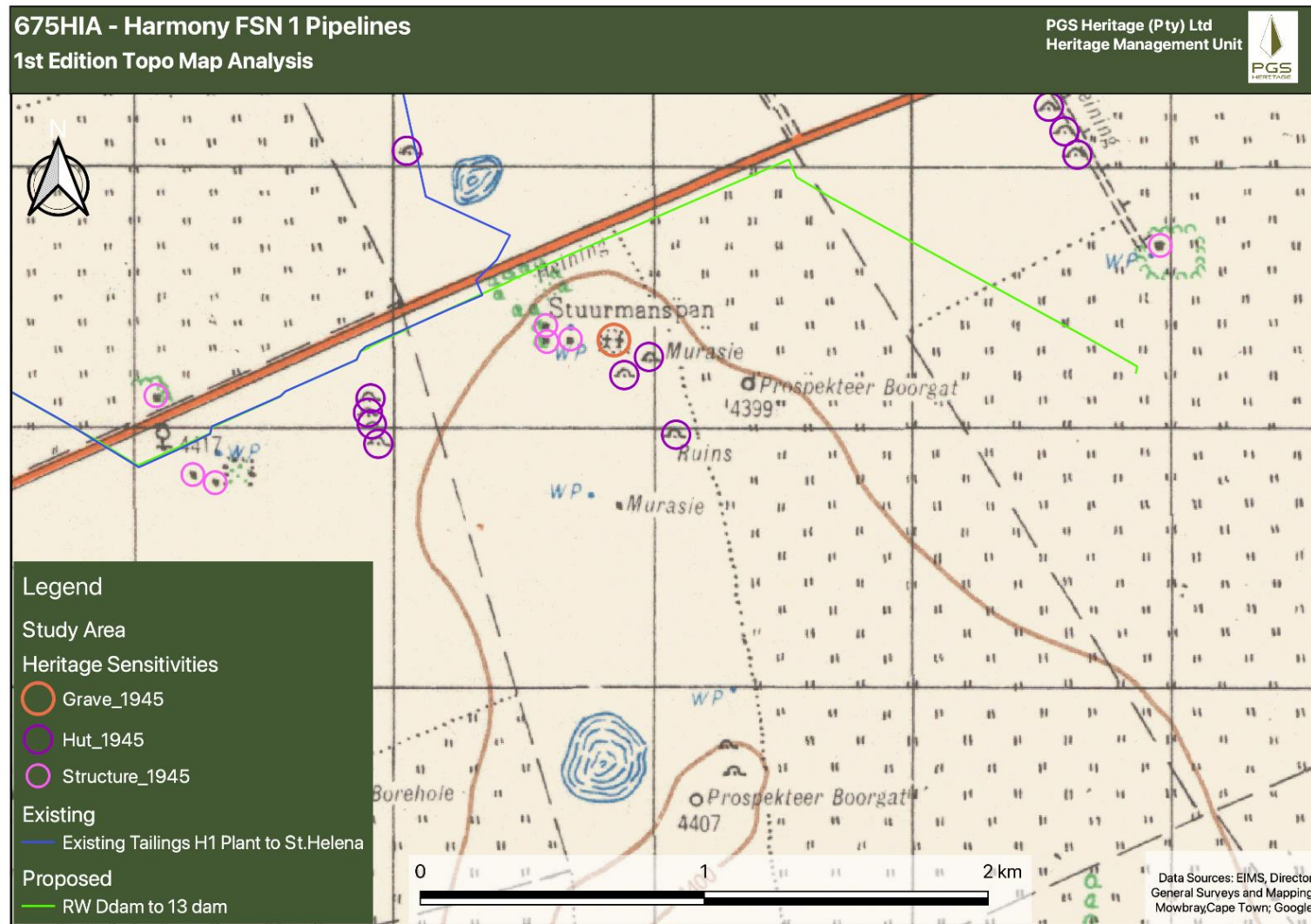


Figure 42 - Section of First Edition of the 2826BB Topographical Map, showing several heritage features. These comprise structures (pink polygon), historical Black Homesteads (purple polygons) and graves (orange polygon) located adjacent to the proposed development.

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5.3.2 First Edition of the 2726DC Odendaalsrus Topographical Map Dated to 1952

The 2726DC Odendaalsrus map sheet was based on aerial photography carried out in 1952, was surveyed in 1954 and drawn in 1955 by the Trigonometrical Survey Office.

This map sheet shows several structures, homesteads and graves within the vicinity of the study area. If these heritage sites still exist today, they would be at least 71 years old. Overlays of the study area components over this map sheet are provided in the section below.

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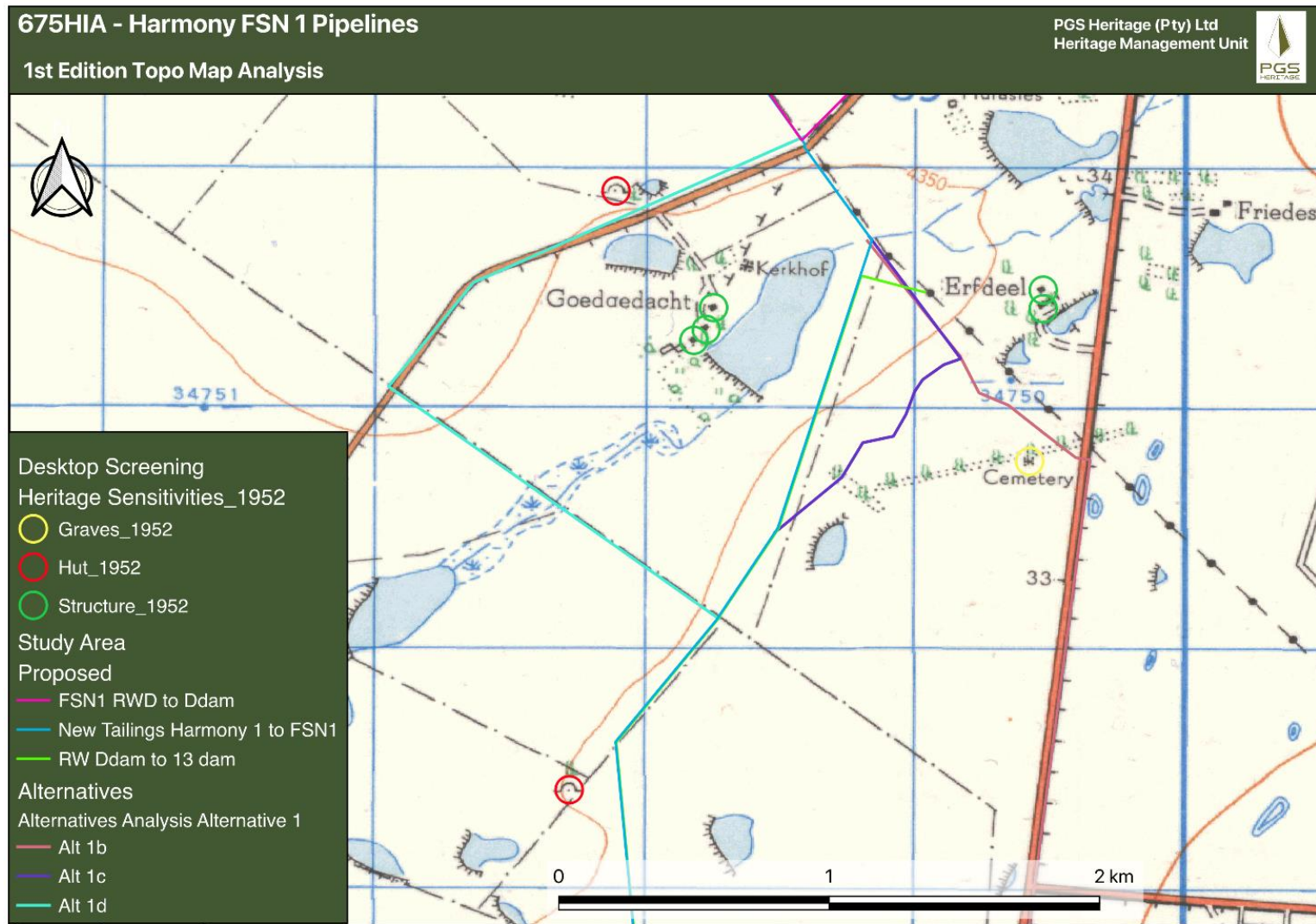


Figure 43 - Section of First Edition of the 2726DC Topographical Map, showing several heritage features. These comprise structures (green polygon), historical Black Homesteads (red polygons) and graves (yellow polygon) located adjacent to the proposed development.

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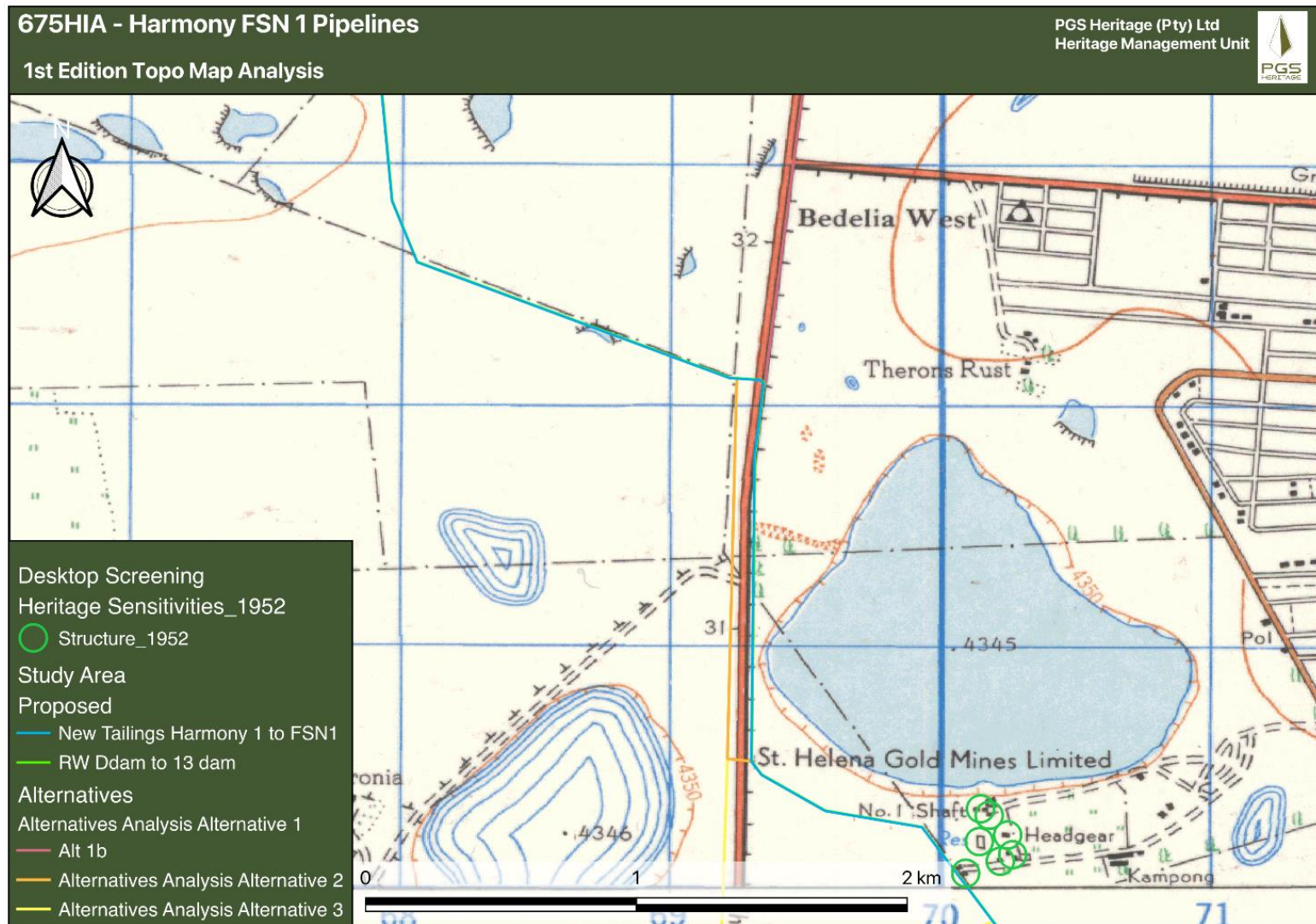


Figure 44 – Second section of First Edition of the 2726DC Topographical Map, showing several heritage features. These comprise structures (green polygon) located adjacent to the proposed development.

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5.3.3 Second Edition of the 2826BB and 2826BA Topographical Maps Dated to 1954

The map sheets were remapped in 1954 by the Trigonometrical Survey Office.

The map sheets show several structures and homesteads adjacent to the study area. If these heritage sites still exist today, they would be at least 69 years old. Overlays of the study area components over this map sheet are provided in the section below.

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Second Edition of the 2826BB Topographical Sheet:

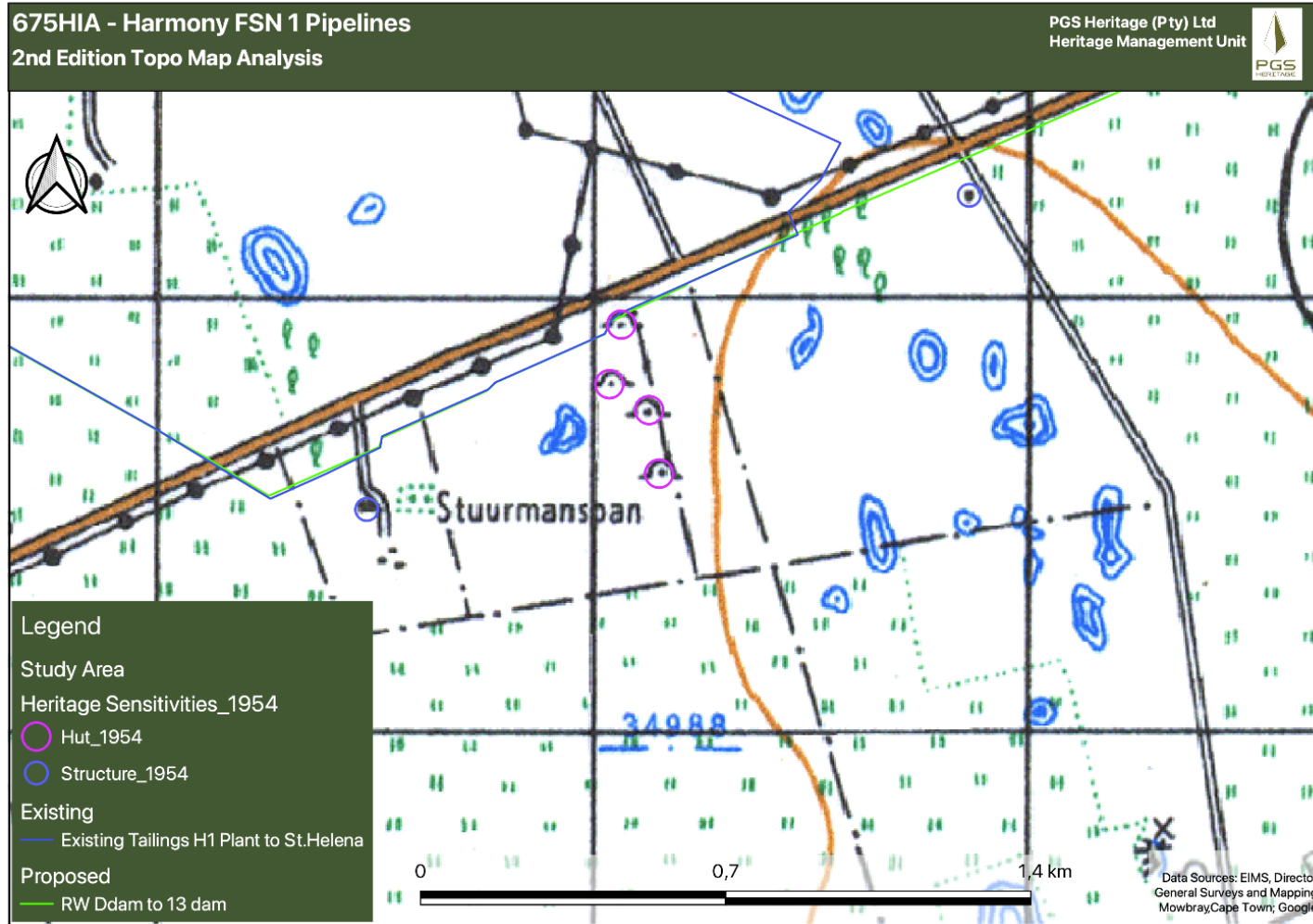


Figure 45 - Section of Second Edition of the 2826BB Topographical Map, showing several heritage features. These comprise structures (purple polygon) and ruins (yellow polygon) located adjacent to the proposed development.

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Second Edition of the 2826BA Topographical Sheet:

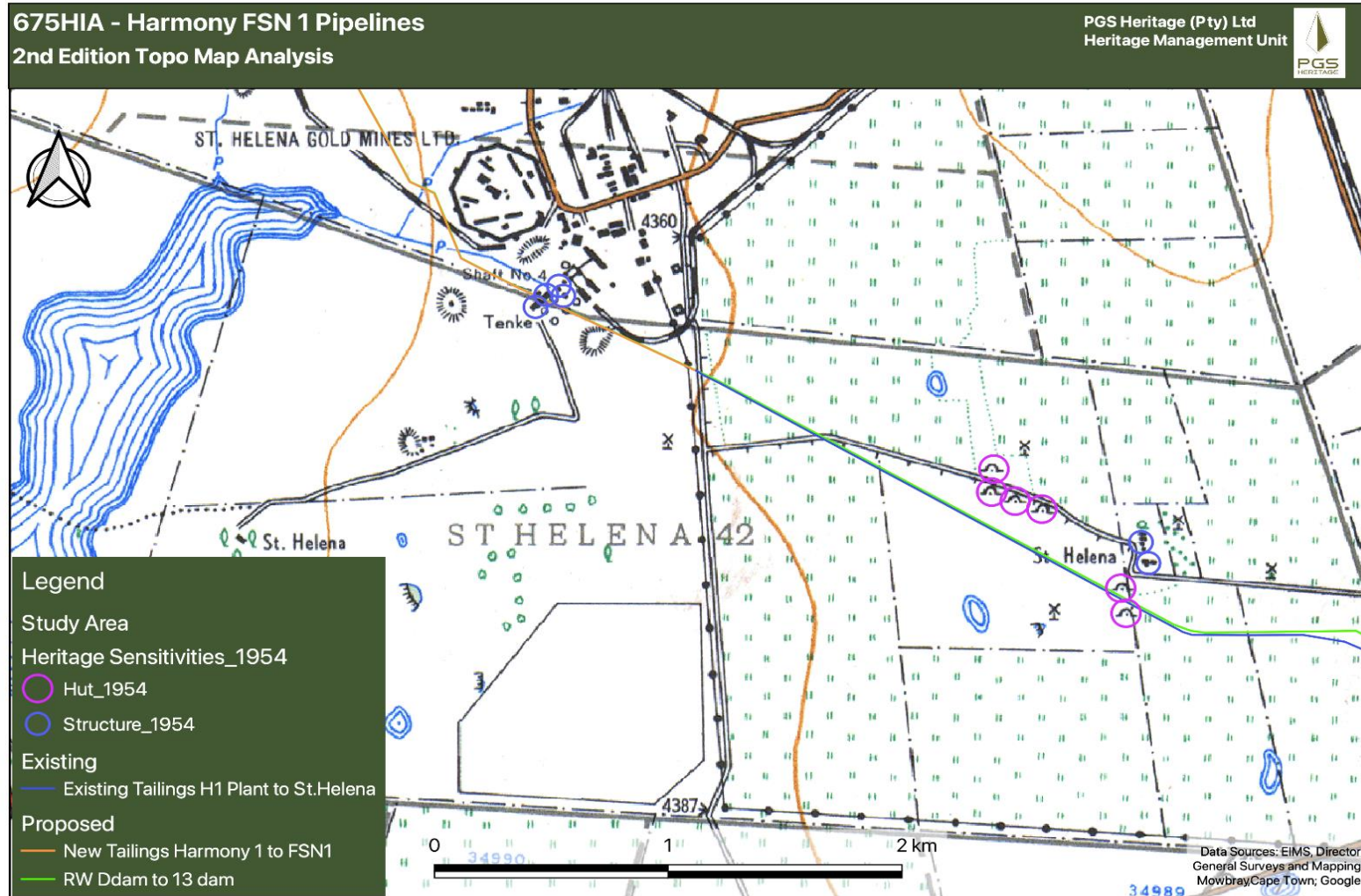


Figure 46 - Section of Second Edition of the 2826BA Topographical Map, showing several heritage features. These comprise structures (purple polygon) and homesteads (pink polygon) located adjacent to the proposed development.

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5.3.4 Third Edition of the 2726DC Topographical Map Dated to 1975

The 2726DC Odendaalsrus map sheet was remapped in 1975 by the Director – General of Surveys.

This map sheet shows several structures and graves adjacent to the study area. If these heritage sites still exist today, they would be at least 48 years old. Overlays of the study area components over this map sheet are provided in the section below.

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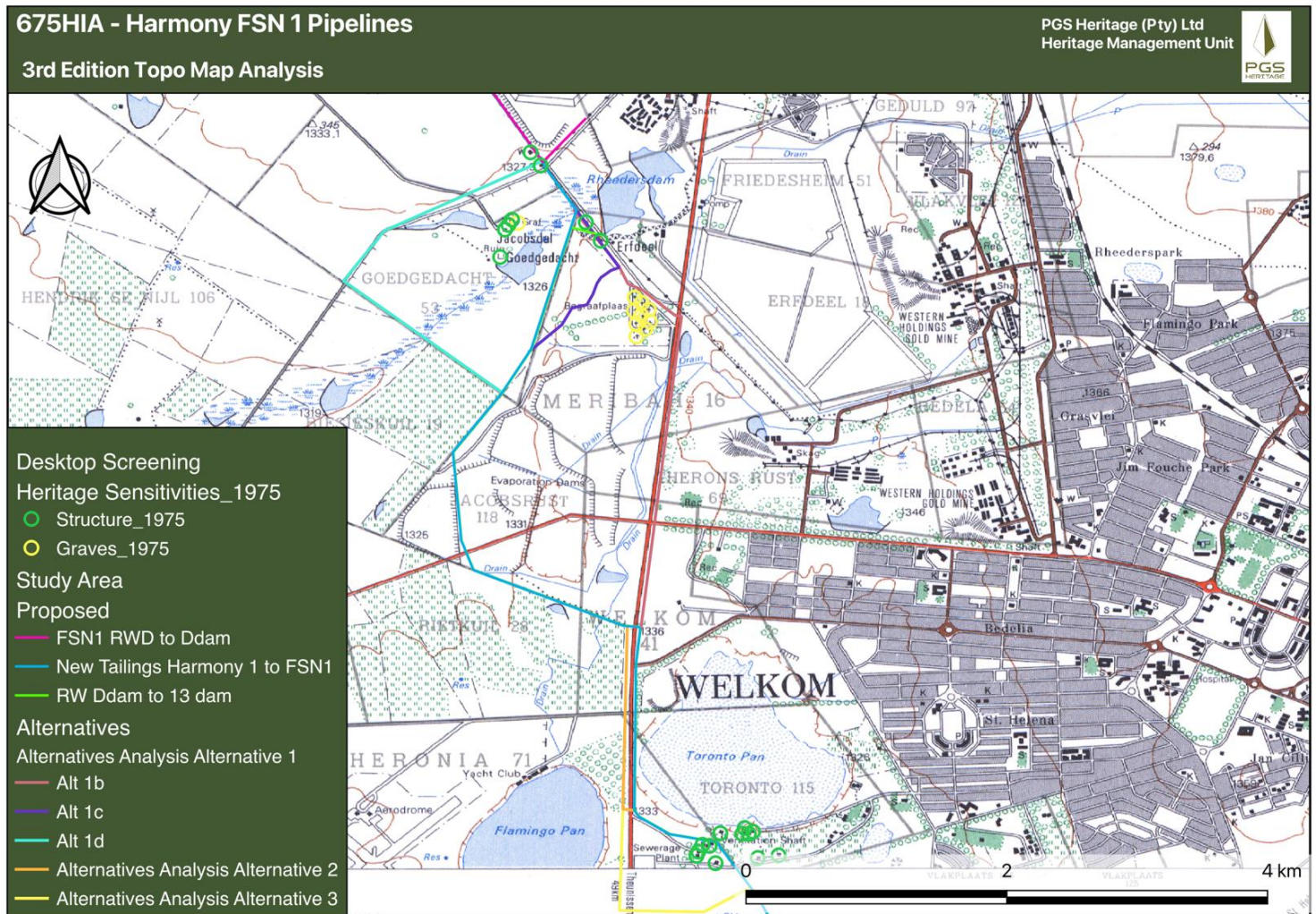


Figure 47 - Section of Third Edition of the 2726DC Topographical Map, showing several heritage features. These comprise structures (green polygon) and graves (yellow polygon) located adjacent to the proposed development.

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5.4 Previous Archaeological and Heritage Research from within the Study Area and Surroundings

A search of the South African Heritage Resources Information System (SAHRIS) database revealed that several previous archaeological and heritage impact assessments had been undertaken within the surroundings of the study area. In each case, the results of each study are shown in bold. These previous studies are listed below in ascending chronological order:

- Dreyer, C. 2004a. First Phase Heritage/Archaeological Assessment of the Proposed Powerline Route at Phakisa Mine, Welkom, Free State. **The survey was conducted approximately 6km north-east of the current study area. No archaeological, cultural, or historical material was identified during the survey.**
- Dreyer, C. 2004b. Archaeological and Historical Investigation of the Graves at the Proposed Housing Developments near Thabong, Welkom, Free State. **The survey was conducted approximately 16km east of the current study area. One grave and several other stones protruding from the ground suggested that it was an old graveyard.**
- Dreyer, C. 2005. Archaeological and Historical Investigation of the Proposed New Filling Station at Virginia, Free State. **The survey was conducted approximately 2.5km south-east of the current study area. No archaeological, cultural, or historical material was identified during the survey.**
- Dreyer, C. 2007. First Phase Archaeological and Cultural Heritage Assessment of the Proposed New MTN Cell Phone Mast at Pumlani Cemetery, Thabong, Welkom, Free State. **The survey was conducted approximately 10.6km north-north-east of the current study area. No archaeological, cultural or historical material was identified during the survey.**
- Coetzee, F. 2008. Cultural Heritage Survey of the Proposed Phakisa Housing Development, Welkom, Free State. **The survey was conducted approximately 4.3km east of the current study area. No Stone Age or Iron Age settlements, structures, features, or artefacts were recorded during the survey. One site that consisted of a mine shaft and various associated buildings and structures that probably older than 60 years were identified. No impact on the site was envisaged.**
- Dreyer, C. 2008. First Phase Archaeological and Heritage Investigation of the proposed Oppenheimer Park Golf Estate, Welkom, Free State. **The survey was conducted**

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approximately 1.2km north of the current study area. **No archaeological, cultural, or historical material was identified during the survey due to the surface disturbance.**

- Dreyer, C. 2011. First Phase Archaeological and Heritage Investigation of the proposed Chicken Egg Production Developments at Mooidoorns 319, Welkom, Free State. **No archaeological, cultural, or historical material was identified during the survey due to the surface disturbance (ploughed fields).**
- Van Ryneveld, K. 2013. Phase 1 Archaeological Impact Assessment for the Lebone Solar Farm, Onvewag RE/728 and Vaalkranz 2/220, Welkom, Free State, South Africa. Prepared for Enviroworks. **The survey was conducted approximately 10km east of the current study area. The report identified five sites: colonial period farming infrastructure, farmstead, cultural landscape, structure remains and railway bridge.**
- van Schalkwyk, J. 2014. Cultural Heritage Impact Assessment Report for the Proposed SANRAL Thabong Interchange Development, Welkom Region, Free State Province. **No archaeological, cultural, or historical material was identified during the survey.**
- Birkholtz, P.D. 2017a. Heritage Impact Assessment for the Proposed Tetra4 Cluster 1 Gas Production Project. Prepared for EIMS. **The survey was conducted approximately 4km south of the current study area. The identified sites comprise the following: cemeteries, Stone Age sites, historic structures believed to be older than 100 years, historic structures believed to be older than 60 years, historical buildings of low significance, historic to recent sites with possible stillborn baby graves, possible grave sites and a site comprising a single lower grinder.**
- Birkholtz, P.D. 2017b. Heritage Audit Report for the Beatrix Mining Areas of Sibanye Gold, Between Welkom and Theunissen, Lejweleputswa District, Orange Free State Province. Prepared for Sibanye Gold (Pty Ltd). **A total of 66 heritage sites were identified within the total study area. These identified heritage sites comprise 9 graves or burial grounds, 30 historical structures believed to be older than 60 years, of which 11 are believed to be older than 100 years, and 12 archaeological (Stone Age) sites. Sites where possible unmarked (infant) graves could occur were also identified (15). These sites include the remains of black homesteads. In terms of black African tradition, stillborn babies were often buried in unmarked graves underneath or adjacent to the homesteads of their parents.**

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- Fourie, W. 2021. Heritage Impact Assessment for The Proposed Harmony FSS6 Reclamation Pipeline, Welkom, Free State Province. **The survey was conducted approximately 2.5km east of the current study area. No archaeological, cultural, or historical material was identified during the survey.**

- Kruger, N. 2021a. Archaeological Impact Assessment (AIA) On Portions Of The Farms Bloemhoek 509, Welgelegen 382, Mooi Uitzig 352, Florida 633, Le Roux 717 And Detente 744 For The Proposed Virginia Solar Park Power Lines Ba Project, Lejweleputswa District Municipality, Free State Province. **The survey was conducted approximately 13km south-south-east of the current study area. The study noted the remains of a later Historical Period settlement (possibly a farmworkers compound of houses). The site was poorly preserved and of medium to low significance.**

- Kruger, N. 2021b. Archaeological Impact Assessment (AIA) On Portions Of The Farm Blomskraal 216 For The Proposed Virginia 1, 2 & 3 Solar Parks Eia Project, Lejweleputswa District Municipality, Free State Province. **The survey was conducted approximately 13km south-south-east of the current study area. The study noted the remains of a large Iron Age occupation, several Historical Period settlements, and farmsteads, and three burial sites.**

5.5 Palaeontology

According to the Palaeosensitivity Map available on the South African Heritage Resources Information System database (SAHRIS), the Palaeontological Sensitivity of the proposed development areas are mostly rated as high (orange) and moderate (green) (**Figure 48**). The proposed project is not going to disturb more than the topsoil and loose subsoil. Therefore, it is unlikely that the small footprint of the proposed project will impact on palaeontological resources.

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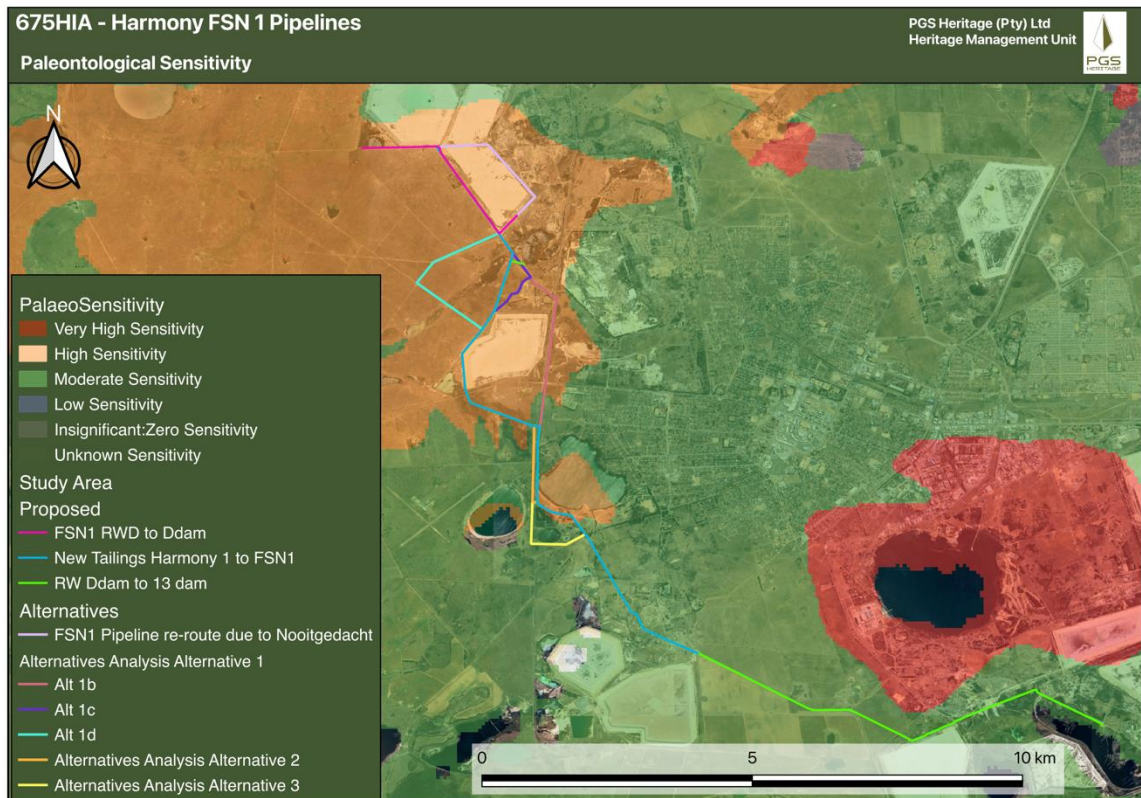


Figure 48 - Extract of the 1: 250 000 SAHRIS Palaeosensitivity Map (Council of Geosciences), overlain with the location of the study area.

Colour	Sensitivity	Required Action
RED	VERY HIGH	field assessment and protocol for finds is required
ORANGE/YELLOW	HIGH	desktop study is required and based on the outcome of the desktop study, a field assessment is likely
GREEN	MODERATE	desktop study is required
BLUE	LOW	no palaeontological studies are required however a protocol for finds is required
GREY	INSIGNIFICANT/ZERO	no palaeontological studies are required
WHITE/CLEAR	UNKNOWN	these areas will require a minimum of a desktop study. As more information comes to light, SAHRA will continue to populate the map.

Figure 49 – Key to the SAHRIS palaeontological map.

5.6 Findings of the Historical Desktop Study

5.6.1 Heritage Screening

A heritage screening report was compiled by the Department of Environmental Affairs National Web-based Environmental Screening Tool as required by Regulation 16(1)(v) of the Environmental Impact Assessment Regulations 2014, as amended. According to the heritage screening report,

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the project area has a Low Heritage Sensitivity (**Figure 2**). The field work that was conducted in the study area demonstrates that there were no archaeological or historical sites of heritage significance that warrant conservation. Therefore, in the case of this study area, the DFFE screening tool sensitivity map is supported based on the findings of this fieldwork.

5.6.2 Heritage Sensitivity

Analysis of maps and satellite imagery enabled the identification of possible heritage sensitive areas. By superimposition and analysis, it was possible to rate these structures according to age and thus their level of protection under NHRA. **Table 5** lists the possible tangible heritage sites identified in the vicinity of the study area and the relevant legislative protection.

Table 5 - Tangible heritage site in the study area.

Name	Description	Legislative protection
Archaeology	Older than 100 years	NHRA Sections 3 and 35
Structures	Possibly older than 60 years	NHRA Sections 3 and 34
Burial grounds	Graves	NHRA Sections 3 and 36 and MP Graves Act

Additionally, evaluation of satellite imagery has indicated the following areas that may be sensitive from a heritage perspective. The analysis of the studies conducted in the area assisted in the development of the following landform type to heritage find matrix (**Table 6**).

Table 6 - Landform type to heritage find matrix

LANDFORM TYPE	HERITAGE TYPE
Crest and foot hill	LSA and MSA scatters, LIA settlements
Crest of small hills	Small LSA sites – scatters of stone artefacts, ostrich eggshell, pottery and beads
Water holes/pans/rivers	MSA and LSA sites, LIA settlements
Farmsteads	Historical archaeological material
Ridges and drainage lines	LSA sites, LIA settlements

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6 FIELDWORK FINDINGS¹

The fieldwork component of the study was aimed at identifying tangible remains of archaeological, historical and heritage significance. The fieldwork was conducted by an archaeologist (Nikki Mann) and field assistant (Xander Fourie) from PGS on 26 January 2023. An additional survey was conducted by one archaeologist (Wouter Fourie) and one field assistant (Xander Fourie) from PGS on 5 April 2023.

The fieldwork comprised a controlled exclusive survey of the proposed development footprint areas. The fieldwork teams recorded track logs with their hand-held GPS devices. These track logs are depicted in yellow in **Figure 50** and show the areas assessed by the archaeologists during the fieldwork.

During the fieldwork, the only heritage resource identified is the Welkom Municipal cemetery which is within 50 meters from the alternative 1b and 1c alignments.

It should be noted that owing to the location of two of the proposed alternatives (Alternative 1b and Alternative 1c) close to a large cemetery, these pipeline options are less preferred (Figure 51).

¹ Site in this context refers to a place where a heritage resource is located and not a proclaimed heritage site as contemplated under s27 of the NHRA.

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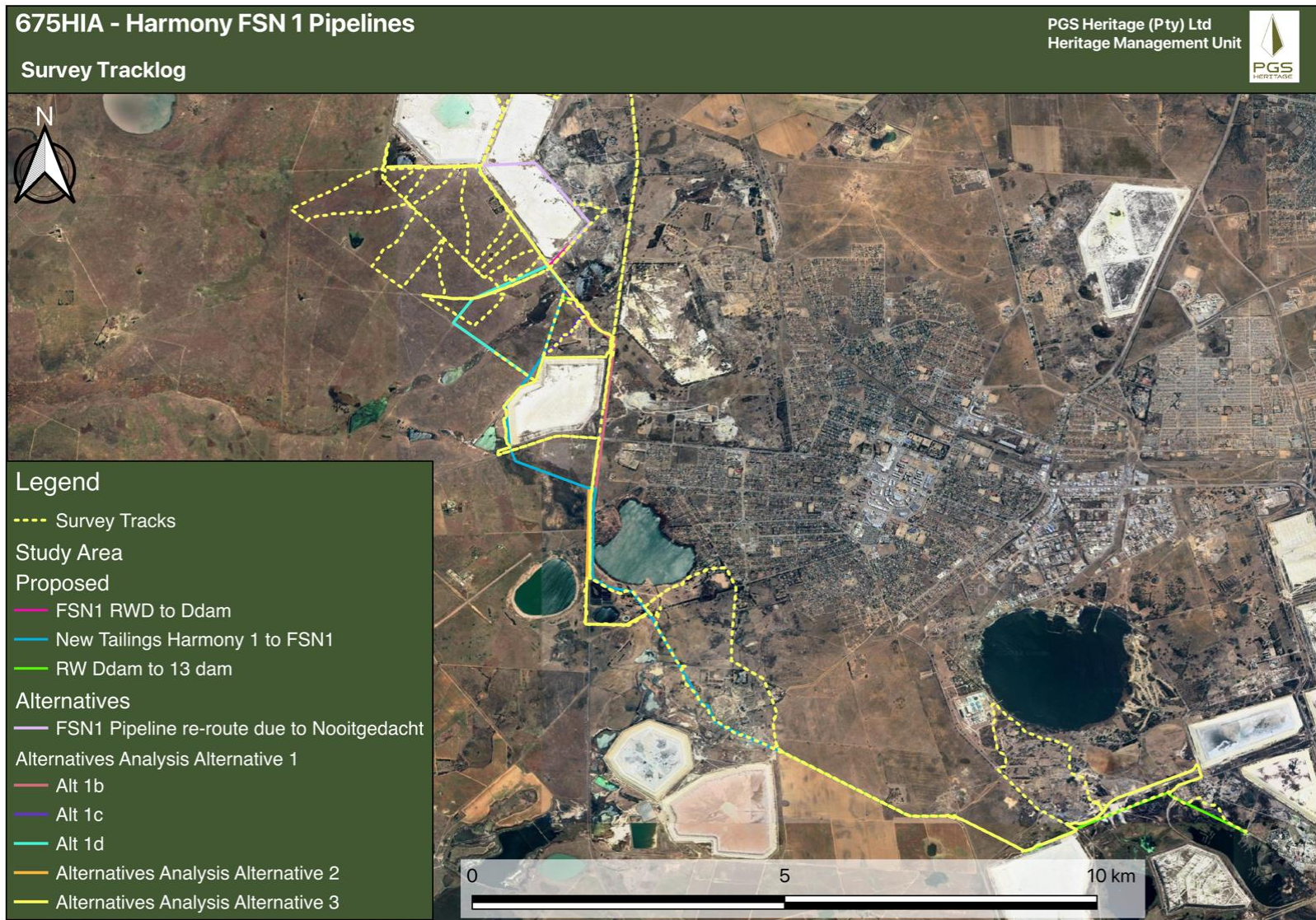


Figure 50 - Map depicting the track logs (yellow lines) recorded during the fieldwork.

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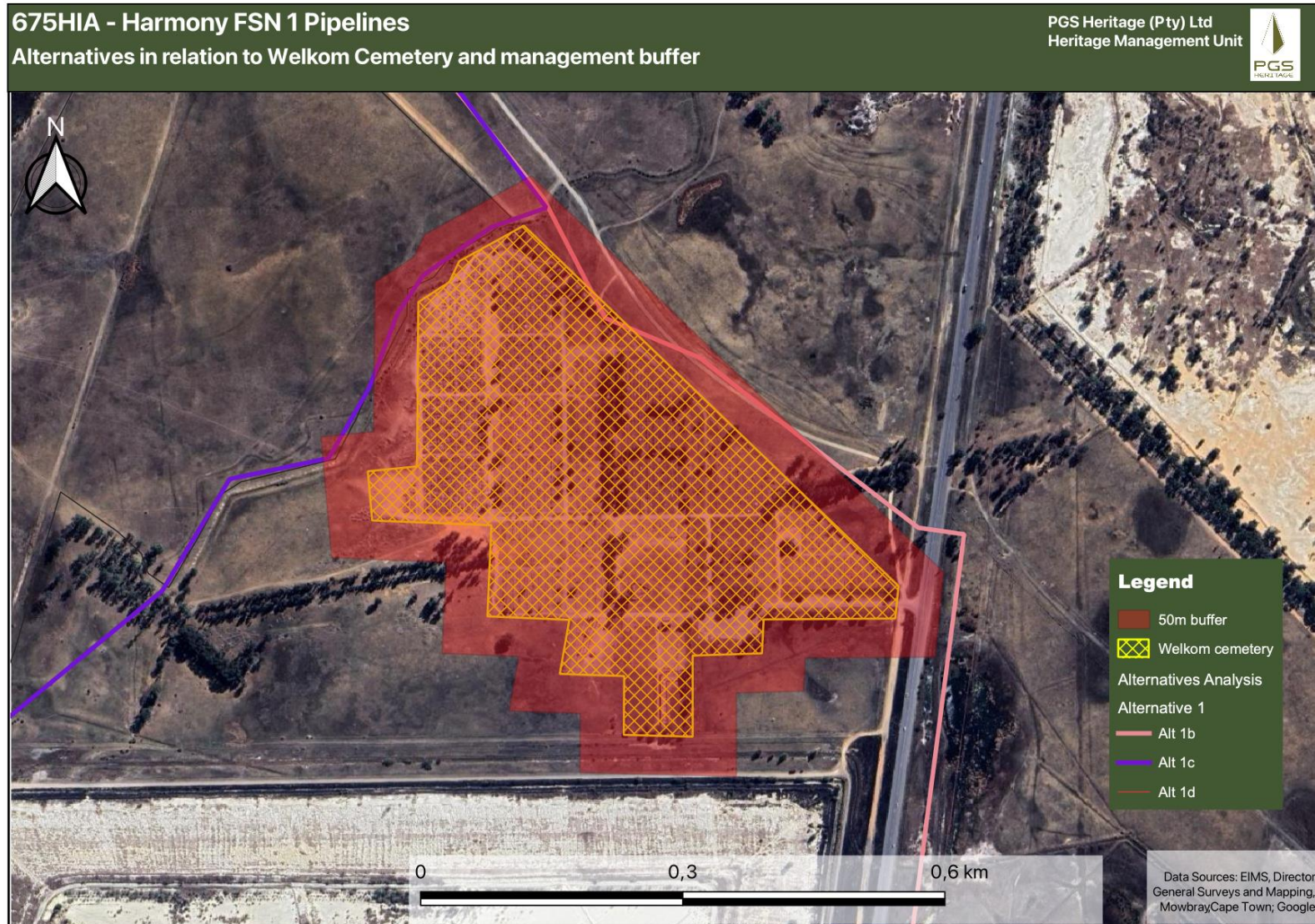


Figure 51 - Map depicting the location of the Welkom Cemetery.

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7 IMPACT ASSESSMENT

The impact significance rating methodology, as provided by EIMS, is guided by the requirements of the NEMA EIA Regulations 2014 (as amended). The broad approach to the significance rating methodology is to determine the environmental risk (ER) by considering the consequence (C) of each impact (comprising Nature, Extent, Duration, Magnitude, and Reversibility) and relate this to the probability/likelihood (P) of the impact occurring. This determines the environmental risk. In addition, other factors, including cumulative impacts and potential for irreplaceable loss of resources, are used to determine a prioritisation factor (PF) which is applied to the ER to determine the overall significance (S). The impact assessment will be applied to all identified alternatives. Where possible, mitigation measures will be recommended for the impacts identified.

7.1 Determination of Environmental Risk

The significance (S) of an impact is determined by applying a prioritisation factor (PF) to the environmental risk (ER). The environmental risk is dependent on the consequence (C) of the particular impact and the probability (P) of the impact occurring. The consequence is determined through the consideration of the Nature (N), Extent (E), Duration (D), Magnitude (M), and reversibility (R) applicable to the specific impact.

For the purpose of this methodology, the consequence of the impact is represented by:

$$C = (E+D+M+R) \times N$$

4

Each individual aspect in the determination of the consequence is represented by a rating scale as defined in **Table 7** below.

Table 7 - Criteria for Determining Impact Consequence

Aspect	Score	Definition
Nature	- 1	Likely to result in a negative/ detrimental impact
	+1	Likely to result in a positive/ beneficial impact
Extent	1	Activity (i.e. limited to the area applicable to the specific activity)
	2	Site (i.e. within the development property boundary),
	3	Local (i.e. the area within 5 km of the site),
	4	Regional (i.e. extends between 5 and 50 km from the site)
	5	Provincial / National (i.e. extends beyond 50 km from the site)
Duration	1	Immediate (<1 year)
	2	Short term (1-5 years),
	3	Medium term (6-15 years),
	4	Long term (the impact will cease after the operational life span of the project),

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Aspect	Score	Definition
	5	Permanent (no mitigation measure of natural process will reduce the impact after construction).
Magnitude/ Intensity	1	Minor (where the impact affects the environment in such a way that natural, cultural and social functions and processes are not affected),
	2	Low (where the impact affects the environment in such a way that natural, cultural and social functions and processes are slightly affected),
	3	Moderate (where the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way),
	4	High (where natural, cultural or social functions or processes are altered to the extent that it will temporarily cease), or
	5	Very high / don't know (where natural, cultural or social functions or processes are altered to the extent that it will permanently cease).
Reversibility	1	Impact is reversible without any time and cost.
	2	Impact is reversible without incurring significant time and cost.
	3	Impact is reversible only by incurring significant time and cost.
	4	Impact is reversible only by incurring prohibitively high time and cost.
	5	Irreversible Impact

Once the C has been determined, the ER is determined in accordance with the standard risk assessment relationship by multiplying the C and the P. Probability is rated/ scored as per Table 8.

Table 8 - Probability Scoring

Probability	1	Improbable (the possibility of the impact materialising is very low as a result of design, historic experience, or implementation of adequate corrective actions; <25%),
	2	Low probability (there is a possibility that the impact will occur; >25% and <50%),
	3	Medium probability (the impact may occur; >50% and <75%),
	4	High probability (it is most likely that the impact will occur- > 75% probability), or
	5	Definite (the impact will occur)

The result is a qualitative representation of relative ER associated with the impact. ER is therefore calculated as follows:

$$ER = C \times P$$

Table 9 - Determination of Environmental Risk

Consequence	5	5	10	15	20	25
	4	4	8	12	16	20
	3	3	6	9	12	15
	2	2	4	6	8	10
	1	1	2	3	4	5
	0	1	2	3	4	5
	Probability					

The outcome of the environmental risk assessment will result in a range of scores, ranging from 1 through to 25. These ER scores are then grouped into respective classes as described in **Table 10**.

Table 10 - Significance Classes

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Environmental Risk Score	
Value	Description
< 9	Low (i.e. where this impact is unlikely to be a significant environmental risk).
≥9 - <17	Medium (i.e. where the impact could have a significant environmental risk),
≥17	High (i.e. where the impact will have a significant environmental risk).

The impact ER will be determined for each impact without relevant management and mitigation measures (pre-mitigation), as well as post-implementation of relevant management and mitigation measures (post-mitigation). This allows for a prediction in the degree to which the impact can be managed/mitigated.

7.2 Impact Prioritisation

Further to the assessment criteria presented in the section above, it is necessary to assess each potentially significant impact in terms of:

1. Cumulative impacts; and
2. The degree to which the impact may cause irreplaceable loss of resources.

To ensure that these factors are considered, an impact prioritisation factor (PF) will be applied to each impact ER (post-mitigation). This prioritisation factor does not aim to detract from the risk ratings but rather to focus the attention of the decision-making authority on the higher priority/significance issues and impacts. The PF will be applied to the ER score based on the assumption that relevant suggested management/mitigation impacts are implemented.

Table 11 - Criteria for Determining Prioritisation

Cumulative Impact (CI)	Low (1)	Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is unlikely that the impact will result in spatial and temporal cumulative change.
	Medium (2)	Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is probable that the impact will result in spatial and temporal cumulative change.
	High (3)	Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is highly probable/ definite that the impact will result in spatial and temporal cumulative change.
Irreplaceable Loss of Resources (LR)	Low (1)	Where the impact is unlikely to result in irreplaceable loss of resources.
	Medium (2)	Where the impact may result in the irreplaceable loss (cannot be replaced or substituted) of resources but the value (services and/or functions) of these resources is limited.
	High (3)	Where the impact may result in the irreplaceable loss of resources of high value (services and/or functions).

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The value for the final impact priority is represented as a single consolidated priority, determined as the sum of each individual criteria represented in Table 12. The impact priority is therefore determined as follows:

$$\text{Priority} = \text{CI} + \text{LR}$$

The result is a priority score which ranges from 2 to 6 and a consequent PF ranging from 1 to 1.5 (Refer to **Table 12**).

Table 12 - Determination of Prioritisation Factor

Priority	Ranking	Prioritisation Factor
2	Low	1
3	Medium	1.125
4	Medium	1.25
5	Medium	1.375
6	High	1.5

In order to determine the final impact significance, the PF is multiplied by the ER of the post-mitigation scoring. The ultimate aim of the PF is an attempt to increase the post-mitigation environmental risk rating by a full ranking class if all the priority attributes are high (i.e. if an impact comes out with a medium environmental risk after the conventional impact rating, but there is significant cumulative impact potential and significant potential for irreplaceable loss of resources, then the net result would be to upscale the impact to a high significance).

Table 13 - Final Environmental Significance Rating

Environmental Significance Rating	
Value	Description
< -17	High negative (i.e. where the impact must have an influence on the decision process to develop in the area).
≥ -17 ≤ -9	Medium negative (i.e. where the impact could influence the decision to develop in the area).
> -9, <0	Low negative (i.e. where this impact would not have a direct influence on the decision to develop in the area).
0	No impact
<0, <9	Low positive (i.e. where this impact would not have a direct influence on the decision to develop in the area).
≥ 9 ≤ 17	Medium positive (i.e. where the impact could influence the decision to develop in the area).
≥ 17	High positive (i.e. where the impact must have an influence on the decision process to develop in the area).

The significance ratings and additional considerations applied to each impact will be used to provide a quantitative comparative assessment of the alternatives being considered. In addition, professional

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expertise and opinion of the specialists and the environmental consultants will be applied to provide a qualitative comparison of the alternatives under consideration. This process will identify the best alternative for the proposed project.

7.3 Heritage Impacts

The only area identified as having a high sensitivity rating is the Welkom cemetery within 50 meters from the alignment alternatives 1b and 1c.

Table 14 indicates the rating of the possible impacts and the overall impact inclusive of cumulative impact is low. The possibility of chance finds of unidentified heritage resources, can be mitigated through the proposed management measures contained in the next section of this report.

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Table 14 - Impact rating for heritage resources

IMPACT DESCRIPTION		Pre-Mitigation							Post Mitigation								Priority Factor Criteria			
Identifier	Impact	Nature	Extent	Duration	Magnitude	Reversibilit	Probability	Pre-mitigation ER	Nature	Extent	Duration	Magnitude	Reversibilit	Probability	Post-mitigation ER	Confid ence	Cumulative Impact	Irreplaceabl e loss	Priority Factor	Final score
10.1.1	Impact on heritage resources	-1	1	2	1	3	2	-3.5	-1	1	2	1	2	1	-1.5	High	1	1	1.00	-1.5
10.1.1	Impact on Burial Ground	-1	1	4	3	5	3	-9.75	-1	1	2	1	2	1	-1.5	High	1	1	1.00	-1.5

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8 MANAGEMENT RECOMMENDATIONS AND GUIDELINES

8.1 Construction Phase

The project will encompass a range of activities during the Construction Phase, including very minor disturbance to the soil surface and small-scale infrastructure development (i.e., Booster pump station) associated with the project.

It is always possible that cultural material may be exposed during construction and may be recoverable, keeping in mind delays can be costly during construction and as such must be minimised.

During the Construction Phase, it is important to recognize any significant material being unearthed, making the correct judgment on which actions should be taken. It is recommended that the following chance find procedure should be implemented.

8.2 Chance Find Procedure

- An appropriately qualified heritage practitioner / archaeologist must be identified to be called upon if any possible heritage resources or artefacts are identified.
- Should an archaeological site or cultural material be discovered during construction (or operation), the area should be demarcated, and construction activities halted.
- The qualified heritage practitioner / archaeologist will then need to come out to the site and evaluate the extent and importance of the heritage resources and make the necessary recommendations for mitigating the find and the impact on the heritage resource.
- The contractor therefore should have some sort of contingency plan so that operations could move elsewhere temporarily while the materials and data are recovered.
- Construction can commence as soon as the site has been cleared and signed off by the heritage practitioner / archaeologist.

8.3 Possible Finds During Construction Phases

The study area occurs within a greater historical and archaeological context as identified during the desktop and fieldwork phase. The project aims to install the pipeline above ground on pre-cast concrete plinths and will not disturb more than the topsoil and loose subsoil. Therefore, it is unlikely that the small footprint of the proposed project will impact on heritage resources.

8.4 Timeframes

It must be kept in mind that mitigation and monitoring of heritage resources discovered during construction activity will require permitting for collection or excavation of heritage resources and lead

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times must be worked into the construction time frames. The table below gives guidelines for lead times on permitting.

Table 15 - Lead times for permitting and mobilisation

Action	Responsibility	Timeframe
Preparation for field monitoring and finalisation of contracts	The contractor and service provider	1 month
Application for permits to do necessary mitigation work	Service provider – Archaeologist and SAHRA	3 months
Documentation, excavation and archaeological report on the relevant site	Service provider – Archaeologist	3 months
Handling of chance finds – Graves/Human Remains	Service provider – Archaeologist and SAHRA	2 weeks
Relocation of burial grounds or graves in the way of construction	Service provider – Archaeologist, SAHRA, local government and provincial government.	6 months

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8.5 Heritage Management Plan for EMPR Implementation

Table 16 - Heritage Management Plan for EMPr implementation

Area and site no.	Mitigation measures	Phase	Timeframe	The responsible party for implementation	Monitoring Party (frequency)	Target	Performance indicators (monitoring tool)
General project area	<ul style="list-style-type: none"> Implement a chance find procedures in case where possible heritage finds are uncovered. 	Construction	During construction	Applicant ECO/EO Heritage Specialist	ECO/ EO (monthly / as or when required)	Ensure compliance with relevant legislation and recommendations from SAHRA under Section 34-36 and 38 of NHRA	ECO/EO Monthly Checklist/Report
Burial Ground and Graves	<ul style="list-style-type: none"> The Welkom cemetery located adjacent to the proposed development should be demarcated with a 50-meter no-go-buffer-zone and the graves should be avoided and left in situ. If the site is going to be impacted directly and the graves need to be removed, a grave relocation process for these sites is recommended as a mitigation and management measure. This will involve the necessary social consultation and public participation process before grave relocation permits can be applied for with SAHRA under the 	Construction	During construction	Applicant ECO/EO	ECO/ EO (monthly / as or when required)	Ensure compliance with relevant legislation and recommendations from SAHRA under Section 34-36 and 38 of NHRA	ECO/EO Monthly Checklist/Report

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Area and site no.	Mitigation measures	Phase	Timeframe	The responsible party for implementation	Monitoring Party (frequency)	Target	Performance indicators (monitoring tool)
	NHRA and National Health Act regulations.						

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9 CONCLUSIONS

PGS was appointed by EIMS to undertake a HIA, which forms part of the environmental process for the proposed pipeline from Harmony One Plant to FSN 1 TSF, located within the Matjhabeng Local Municipality, Lejweleputswa District Municipality, near Welkom, Free State Province.

This HIA aims to evaluate the possible impacts on heritage resources present within the proposed development footprint. The HIA has shown that the study area has no heritage resources situated within the proposed development boundaries.

9.1 Heritage Sites

The fieldwork component of the study was aimed at identifying tangible remains of archaeological, historical and heritage significance. The fieldwork was undertaken by way of intensive walkthroughs of the proposed pipeline footprint areas. One archaeologist (Nikki Mann) and one field assistant (Xander Fourie) from PGS conducted the fieldwork on 26 January 2023. One archaeologist (Wouter Fourie) and one field assistant (Xander Fourie) from PGS conducted an additional survey on 5 April 2023.

Throughout the fieldwork, hand-held GPS devices were used to record tracklogs showing the routes followed by the fieldwork teams. It is important to note that although as intensive a fieldwork coverage as possible was undertaken, sections of the study area are in areas which are more densely overgrown and/or disturbed, which limited visibility in those areas of the study area.

During the fieldwork, the only heritage resource identified is the Welkom Municipal cemetery which is within 50 meters from the alternative 1b and 1c alignments.

It should be noted that owing to the location of two of the proposed alternatives (Alternative 1b and Alternative 1c) close to a large cemetery, these pipeline options are less preferred (Figure 51).

9.2 Palaeontology

According to the Palaeosensitivity Map available on the South African Heritage Resources Information System database (SAHRIS), the Palaeontological Sensitivity of the proposed development areas are mostly rated high (orange) and moderate (green). The proposed project is not going to disturb more than the topsoil and loose subsoil. Therefore, it is unlikely that the small footprint of the proposed project will impact on palaeontological resources.

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9.3 Impact Assessment

An intensive walkthrough of the proposed alignments has not shown heritage resources within their direct footprint areas. However, the Welkom municipal cemetery is close to alignments 1c and 1b. There will be no impact if the 50m buffer around the cemetery is implemented. If either alignments 1c and 1b are considered, they must be realigned to be outside of the proposed 50-meter buffer.

9.4 Mitigation Measures

Refer to **Section 8** of this report.

9.5 General

If heritage resources are discovered during site clearance, construction activities that may impact the find must stop, and a qualified archaeologist must be appointed to evaluate and make recommendations on mitigation measures.

It is the considered opinion of the author of this report that the overall impact of the proposed development on heritage resources will be Low.

Owing to the location of two of the proposed alternatives (Alternative 1b and Alternative 1c) close to a large cemetery, these pipeline options are less preferred. However, all alternatives are acceptable subject to the recommended mitigation.

Therefore, the proposed development can be placed anywhere within the assessed alignments, provided that the cemetery is avoided, and the recommended mitigations are applied. The management and mitigation measures as described in **Section 8** of this report have been developed to minimise the project impact on heritage resources.

Considering the overall assessment, the impact of the proposed development would be acceptably Low or could be totally mitigated. As such, the project could be approved from a heritage perspective.

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10.3 Google Earth

All the aerial depictions and overlays used in this report are from Google Earth.

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APPENDIX A
PGS TEAM CVS

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PROFESSIONAL CURRICULUM VITAE FOR NIKKI MANN

Professional Archaeologist for PGS Heritage

Name: Nikki Mann
Profession: Archaeologist
Date of birth: 1992-10-13
Parent Firm: PGS Heritage (Pty) Ltd
Position at Firm: Archaeologist
Years with firm: 2
Years of experience: 7
Nationality: South African
HDI Status: White

EDUCATION:

Name of University or Institution : University of Cape Town
Degree obtained : BSc
Major subjects : Archaeology, Environmental and Geographical Sciences
Year : 2013

Name of University or Institution : University of Cape Town
Degree obtained : BSc [Hons]
Major subjects : Archaeology
Year : 2014

Name of University or Institution : University of Cape Town
Certificate obtained : MSc – Archaeology (phytolith analysis)
Year : 2017

Professional Qualifications:

Professional Archaeologist - Association of Southern African Professional Archaeologists -
 Professional Member – No 472

Languages:

English
 French

KEY QUALIFICATIONS

- 3 years of work in the heritage consulting field;

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- 7 years working experience in archaeological excavations;
- Proven experience in report writing and report deliverables;

HERITAGE IMPACT ASSESSMENTS

South African

2021- Current – Archaeologist – PGS Heritage (Pty) Ltd

HMPs for the Khangela and Umsinde WEFs and associated grid infrastructure, near Murraysburg, Western Cape. Nala Environmental. **Position:** Heritage Specialist.

Proposed new 132kV grid connection for the authorised Emoyeni WEF, near Murraysburg, Western Cape. Nala Environmental. **Position:** Heritage Specialist.

Proposed Apollo PV Plant, near Atlantis, Western Cape – Desktop study. TerraManzi. **Position:** Heritage Specialist.

Proposed Eskom Witkop-Pietersburg 132kV Powerline, Limpopo. Polokwane. Acer. **Position:** Heritage Specialist.

Proposed deviations to Eskom Nhlavuko-Tshebela 132kV Powerlines, Limpopo. Polokwane. Acer. **Position:** Heritage Specialist.

Proposed Tetra4 Cluster 2 gas production project, near Welkom. EIMS. **Position:** Heritage Specialist.

Kathu Tyre Management Plant HIA. Kathu. EXM. **Position:** Heritage Specialist.

Kathu Borrow Pit Screening. Kathu. EXM. **Position:** Heritage Specialist.

Kolomela Mine Expansion. Postmasburg. EXM. **Position:** Heritage Specialist.

Kudumane HIA update. Hotazel. SRK. **Position:** Heritage Specialist.

Victoria West Pipeline project. Victoria West. iXEng. **Position:** Heritage Specialist.

10MW Chelsea Solar PV. Gqeberha, Eastern Cape. SLR. **Position:** Heritage Specialist.

Koup 1 and Koup 2 WEF. Beaufort West, Western Cape. SiVEST. **Position:** Heritage Specialist.

Victoria West Pipelines. Victoria West, Northern Cape. iXEng. – **Position:** Heritage Specialist.

East Orchards Poultry Farm Project. Delmas, Mpumalanga. EcoSphere. – **Position:** Heritage Specialist.

Gunstfontein WEF and OHL. Sutherland, Northern Cape. Savannah– **Position:** Heritage Specialist.

Overhead power line for Oya PV Facility. Sutherland, Northern Cape. SiVEST– **Position:** Heritage Specialist.

Infrastructure for Kudusberg WEF. Sutherland, Northern Cape. SiVEST– **Position:** Heritage Specialist.

Proposed SKA fibre optic cable, between Beaufort West and Carnarvon, Northern and Western Cape. **Position:** Heritage Specialist.

Proposed SANSA Space Operations. Matjiesfontein, Western Cape. **Position:** Heritage Specialist.

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Pienaarspoort WEF 1 and 2. North-west of Matjiesfontein, Western Cape. Savannah- **Position:** Heritage Specialist.

Swellendam WEF. Swellendam, Western Cape. – **Position:** Heritage Specialist.

Matjiesfontein Road Extension Project. Matjiesfontein, Western Cape. **Position:** Heritage Specialist.

MITIGATION WORK

2020 – Coega Zone 10, Coega IDZ, Eastern Cape Province. Colonial Period Phase 2 Mitigation Archaeological Excavation. **Archaeologist.**

2019 – 2020 - **Lesotho Highland Development Authority – Polihali Dam Project - Heritage Management Plan development and Implementation.** Mokhotlong, Kingdom of Lesotho. **Archaeologist.**

2018- Proposed development of boreholes and associated pipelines for the Langebaan Aquifer within the Hopefield Private Nature Reserve, Hopefield, Western Cape. **Archaeologist.**

POSITIONS HELD

2021 – current: Archaeologist - PGS (Pty) Ltd

2019 – 2020: Archaeologist - PGS (Pty) Ltd Lesotho

2018 – 2020: Contract Archaeologist – CTS Heritage

REFERENCES

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nic.wiltshire@ctsheritage.com

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WOUTER FOURIE

Professional Heritage Specialist and Professional Archaeologist and Director PGS Heritage

Summary of Experience

Specialised expertise in Archaeological Mitigation and excavations, Cultural Resource Management and Heritage Impact Assessment Management, Archaeology, Anthropology, Applicable survey methods, Fieldwork and project management, Geographic Information Systems, including *inter alia* -

Involvement in various grave relocation projects (some of which relocated up to 1000 graves) and grave “rescue” excavations in the various provinces of South Africa

Involvement with various Heritage Impact Assessments, within South Africa, including -

- Archaeological Walkdowns for various projects
- Phase 2 Heritage Impact Assessments and EMPs for various projects
- Heritage Impact Assessments for various projects
 - Iron Age Mitigation Work for various projects, including archaeological excavations and monitoring
 - Involvement with various Heritage Impact Assessments, outside South Africa, including -
- Archaeological Studies in Democratic Republic of Congo
- Heritage Impact Assessments in Mozambique, Botswana and DRC
- Grave Relocation project in DRC

Key Qualifications

BA [Hons] (Cum laude) - Archaeology and Geography - 1997

BA - Archaeology, Geography and Anthropology - 1996

Professional Archaeologist - Association of Southern African Professional Archaeologists (ASAPA)
- Professional Member

Accredited Professional Heritage Specialist – Association of Professional Heritage Practitioners (APHP)

CRM Accreditation (ASAPA) -

- Principal Investigator - Grave Relocations
- Field Director – Iron Age
- Field Supervisor – Colonial Period and Stone Age
- Accredited with Amafa KZN

Key Work Experience

2003- current - Director – PGS Heirtage (Pty) Ltd

2007 – 2008 - Project Manager – Matakoma-ARM, Heritage Contracts Unit, University of the Witwatersrand

2005-2007 - Director – Matakoma Heritage Consultants (Pty) Ltd

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2000-2004 - CEO– Matakoma Consultants

1998-2000 - Environmental Coordinator – Randfontein Estates Limited. Randfontein, Gauteng

1997-1998 - Environmental Officer – Department of Minerals and Energy. Johannesburg, Gauteng

Worked on various heritage projects in the SADC region including, Botswana, Mauritius, Malawi, Zambia, Mozambique, and the Democratic Republic of the Congo