ZERO-WASTE RECOVERY PLANT, MPUMALANGA PROVINCE

Heritage Scoping Report

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Declaration of Independence

I, Wouter Fourie, 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;

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SIGNATURE: _____

ACKNOWLEDGEMENT OF RECEIPT

Report Title	*ZERO-WASTE RECOVERY PLANT, MPUMALANGA PROVINCE*		
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Reviewed	**Gideon Raath**		**Savannah Environmental (Pty) Ltd**

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EXECUTIVE SUMMARY

PGS Heritage (Pty) Ltd (PGS) was appointed by Savannah Environmental (Pty) Ltd (Savannah) to undertake a Heritage Impact Assessment (HIA) which will serve to inform the Environmental Impact Assessment Process (EIA) and Environmental Management Programme (EMPr) for the proposed Zero Waste Recovery Plant is located on Portion 4 of Farm No. 309, eMalahleni LM within the Nkangala District Municipality (DM) in Mpumalanga.

This Heritage Scoping Report (HSR) addresses the proposed development.

This HSR has shown that the proposed Zero Waste Recovery Plant will have a projected minimal impact on heritage resources within the project area due to the extensive disturbance of the footprint by industrial activity.

The SAHRIS palaeontological sensitivity map rates the study as underlain by geological strata with a Very High palaeontological significance.

Preliminary impact analysis

The preliminary impact analysis shows that a deskbased assessment cannot exclude the presence of archaeological/historical remains. The current deskbased evaluation has not identified structrues or archaeological features in the study area. Due to the subsurface nature of such heritage resources the possibility of a low to medium impact cannot be excluded

The impact on the possible fossil heritage assosciated with the geological formation is provisionally rated as high based on the SAHRIS maps

Based on the above the it is recommended that a field survey of the footprint area is done inclusive of a palaeontological field assessment to confirm the assessed status of the site.

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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; and
- 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 3 300 000 years ago.

Fossil

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 Iron Age

The archaeology of the period between 900-1300AD, associated with the development of the Zimbabwe culture, defined by class distinction and sacred leadership.

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.

Table 1 – List of abbreviations used in this report

Abbreviations	Description
AIA	Archaeological Impact Assessment
APHP	Association of Professional Heritage Practitioners
ASAPA	Association of South African Professional Archaeologists
CRM	Cultural Resource Management
DEFF	Department of Environment, Forestry and Fisheries
EIA	Environmental Impact Assessment
EMPr	Environmental Management Programme
EIAs practitioner	Environmental Impact Assessment Practitioner
ESA	Earlier Stone Age
GN	Government Notice
GPS	Global Positioning System
HIA	Heritage Impact Assessment
I&AP	Interested & Affected Party
LIA	Late Iron Age
LSA	Late Stone Age
MIA	Middle Iron Age
MSA	Middle Stone Age
NEMA	National Environmental Management Act, 1998 (Act No 107 of 1998)
NHRA	National Heritage Resources Act, 1999 (Act No 25 of 1999)
NCW	Not Conservation Worthy
PGS	PGS Heritage (Pty) Ltd
PHRA	Provincial Heritage Resources Authority
SADC	Southern African Development Community
SAHRA	South African Heritage Resources Agency
SAHRIS	South African Heritage Resources Information System

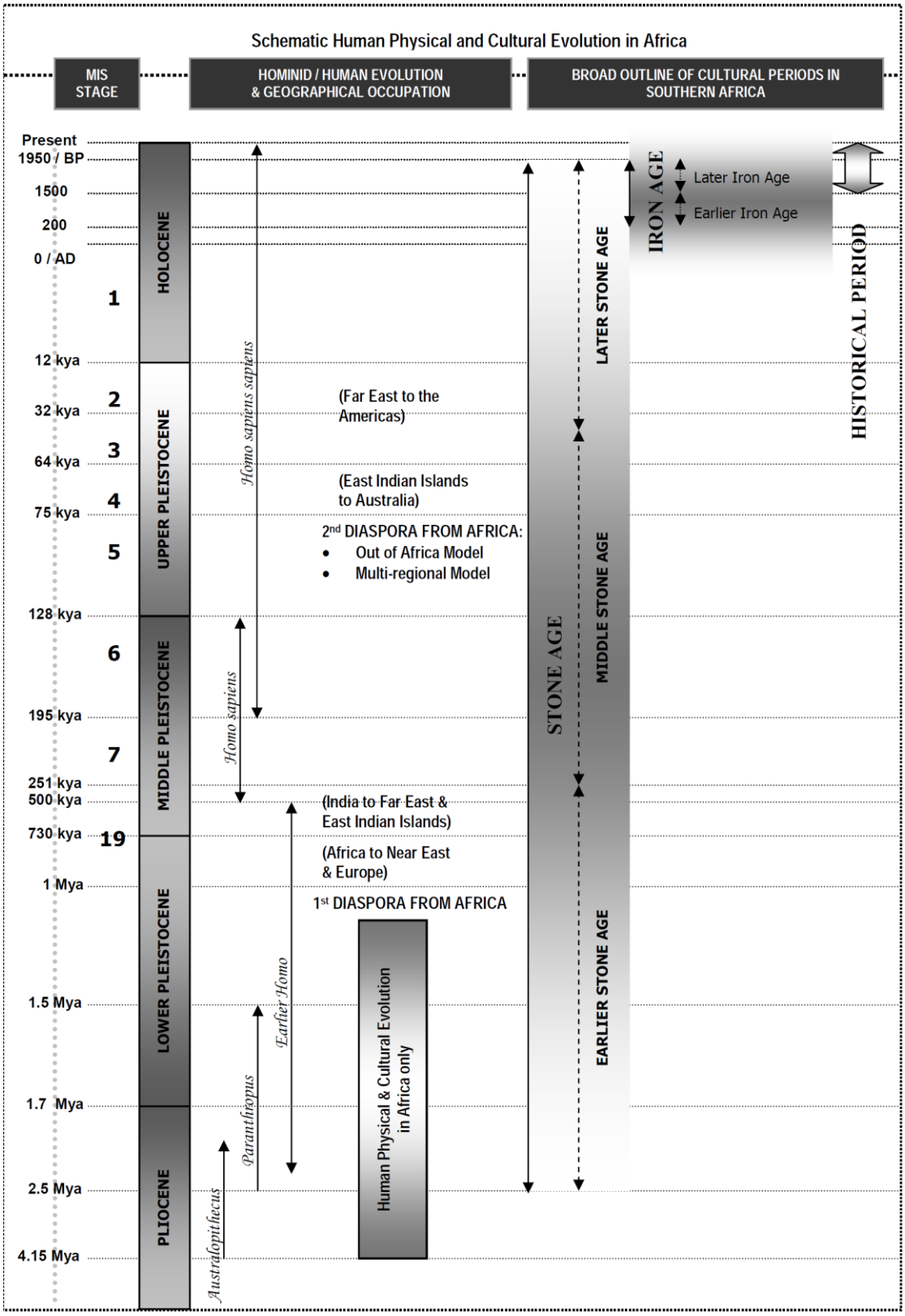


Figure 1 – Human and Cultural Timeline in Africa

1 INTRODUCTION

PGS Heritage (Pty) Ltd (PGS) was appointed by Savannah Environmental (Pty) Ltd (Savannah) to undertake a Heritage Impact Assessment (HIA) which will serve to inform the Environmental Impact Assessment Process (EIA) and Environmental Management Programme (EMPr) for the proposed Zero Waste Recovery Plant is located on Portion 4 of Farm No. 309, eMalahleni LM within the Nkangala District Municipality (DM) in Mpumalanga.

This Heritage Scoping (HS) report addresses the proposed development.

1.1 Scope of the Study

The aim of the study is to identify possible heritage sites and finds that may occur in the proposed development area. The HIA aims to inform the EIA in the development of a comprehensive EMPr to assist the project applicant in responsibly managing the identified heritage resources in order to protect, preserve, and develop them within the framework provided by the National Heritage Resources Act (Act 25 of 1999) (NHRA).

1.2 Specialist Qualifications

This Heritage Scoping Report (HSR) was compiled by PGS.

The staff at PGS have 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 author and Project Coordinator, is registered with the 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).

1.3 Assumptions and Limitations

This report excludes fieldwork that is to be completed as part of the HIA Report During the EIA phase of the project development.

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 2** and the applicable section in this report noted.

Table 2 - Reporting requirements for GN648

GN 648	**Relevant section in report**	**Where not applicable in this report**
2.2 (a) a desktop analysis, using satellite imagery;	Section 4.3	
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.	To be done during he HIA	-
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;	To be done during he HIA	-
2.3(b) contains motivation and evidence (e.g. photographs) of either the verified or different use of the land and environmental sensitivity;	To be done during he HIA	-

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. The HIA report will be in compliance of Appendix 6 and include a table guide for ease of reference.

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.

2 SITE LOCATION AND DESCRIPTION

2.1 Locality and Site Description (provided by GAE)

The waste recovery plant is located on Portion 4 of Farm No. 309 (SG ID: T0JS00000000030900004) (the 'site'), and comprises an area of approximately 4,10ha footprint within the property, located in the eMalahleni LM within the Nkangala District Municipality (DM) in Mpumalanga, approximately 17km west of eMalahleni town. The site may be reached directly off the R104, from the N4 turnoff near Kwa-Guqa informal settlement (**Figure 2** and **Figure 3**).

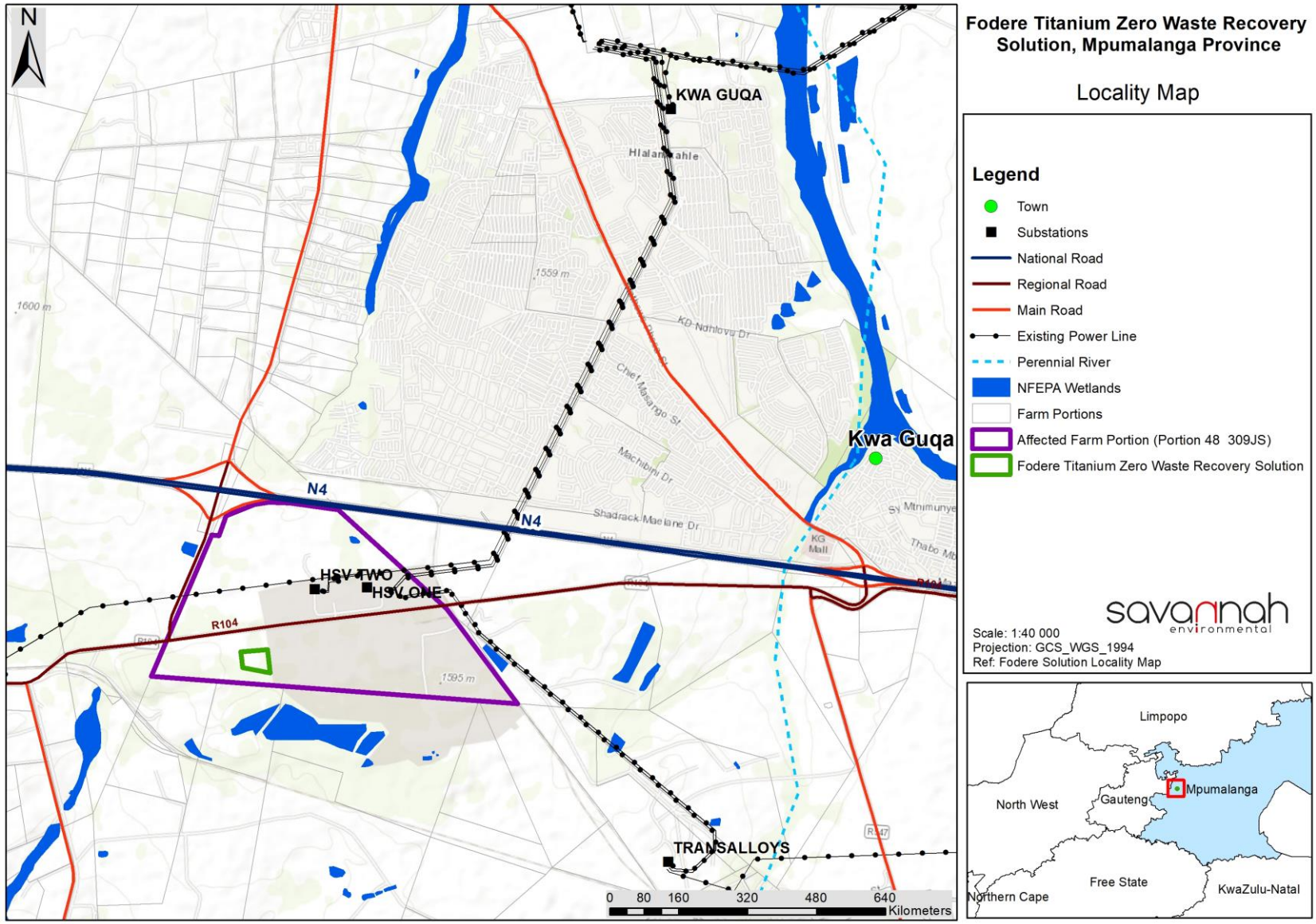


Figure 2 – Regional locality of the study area

Figure 3 – Locality of the study area

2.2 Project description (provided by Savannah)

Anglo African Metals (Pty) Ltd (the South African registered company of Fodere Titanium) has identified a suitable tailings/slag resource at Highveld Steel in Mpumalanga between Balmoral and Emalahleni. A site for a small-scale industrial plant has been defined within the Highveld Steel property. It is understood that the following is relevant to the proposed facility:

- The plant would be developed to process 2000 tonnes of tailings/slag per month, approximately 3 tons per day. This plant would be developed within the Highveld industrial plant owned property. The purpose of this plant would be to confirm the process inputs and outputs and refine the extraction processes as necessary.
- The plant would be primarily fuelled by LPG and Sasol gas brought into site by dedicated transport truck deliveries.
- As the sites are located within the highveld Steel property, it is assumed that the studies to be undertaken for the EIA process would be informed by existing information available for this site. Project-specific specialist studies required to be undertaken relate to air quality, socio-economic impacts and heritage impacts.

The plan will comprise the following infrastructure, all wholly contained within Portion 4 of Farm No. 3:

- Acid plant area, where process chemicals are produced, stored and handled as required by the waste recovery process;
- Substation and plant utility unit as interface and controlling unit for the electricity utilised by the plant during operation;
- Slag stockpile
- Crushing plant;
- Mill;
- Product area for storage of the various products produced through the recovery process;
- Reagent area, for the storage and handling of reactants utilised in the waste recovery process;
- A security area
- Parking lot;
- Admin and control room including offices and ablutions for staff.

Operation of the plan is anticipated for 24 hours per day, 365 per year (i.e. non-stop operation) and will utilise the slag produced by the highveld steel operations. The process offers solutions for simultaneously extracting both vanadium and titanium oxide from slag materials. The technology developed by the Fodere Group is also demonstrated to extract aluminium as aluminium oxide (Al_2O_3), magnesium as magnesium oxide (MgO) and calcium as calcium sulphate/gypsum ($CaSO_4$), and involves the following approximate process (please note, due to intellectual property and commercial sensitivity of this process, various technical details are omitted):

- Crushing and milling of titanium dioxide (TiO_2) slag to the appropriate size for further treatment;

- Magnetic separation of entrained metallic iron from the crushed slag, which is used in a separate ferroalloy production processes;
- Alkali roasting of the remaining feedstock using a gas fired kiln. Off-gases from the kiln is a combination of carbon monoxide (CO) and sulphur dioxide (SO_2). By comparison, sulphur dioxide (SO_2) is only 3-5% of the carbon monoxide gas. These off gases are passed through the off-gas scrubber to remove SO_2 and the remaining CO_2 is reused in the kiln to supply part of the required heat.
- The material produced during alkali roasting from the kiln is then leached in water to dissolve vanadium and alumina.
- A further process produces vanadium pentoxide and recovers aluminium oxide from the leached products in the steps above.
- The remaining solid or residue after extracting vanadium is treated via leaching and roasting with sulphuric acid. The SO_2 gases or fumes given out during leaching or roasting are scrubbed off.
- Iron, magnesium and TiO2 are recovered from solution via precipitation steps.
- Precipitated TiO2 is heated in order to remove water of hydration.
- The leach solution is neutralised with lime form calcium sulphate and respective sulphates. The mixture of sulphates is heated in the furnace to produce sulphuric acid which is then used in the leaching step. The solid material after heating in the furnace is mainly calcium silicate which is used for cement production and construction.
- The remaining material after leaching of titanium, magnesium, aluminium oxide etc is mainly silica sand which is also used for construction.

This process therefore recovers vanadium and titanium oxide from slag materials, with water, carbon dioxide, gypsum and synthetic rutile produced at the various stages. These materials are all useful in other processes and are collected and sold to third parties with uses therefore, and thus the process itself results in no further waste production, while simultaneously utilising a common waste type – slag.

3 METHODOLOGY & PLAN OF STUDY FOR EIA

The methodology to be utilised for the whole HIA study will be as follows

The applicable maps, tables and figures, will be included as stipulated in the NHRA (no 25 of 1999), the NEMA (no 107 of 1998). The HIA process consists of three steps:

- HSR - Step I – Literature Review and sensitivity analysis[1]: The background information to the field survey relies greatly on previous studies completed for the project to determine known sensitivities, as well as the heritage background research completed for this report.
- Step II – Physical Survey: A physical survey will be conducted of proposed project area by a qualified heritage specialist. The survey is aimed at locating and documenting sites falling within and adjacent to the proposed development footprint.

[1] *According to Notice 648 of the Government Gazette 45421*

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

3.1 Site Significance

Site significance classification standards use is based on the heritage classification of Section 3 in the NHRA and developed for implementation keeping in mind the grading system approved by SAHRA for archaeological impact assessments (2012). The updated classification and rating system as developed by Heritage Western Cape (2016) is implemented in this report. Although the SAHRA guidelines for Archaeological and Palaeontological Impact Assessments (2012) provide a grading system the system as published by HWC Is seen as more comprehensive (**Table 3** and
Table 4).

Table 3 - 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 HWC. 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

Table 4 - Rating system for built environment resources

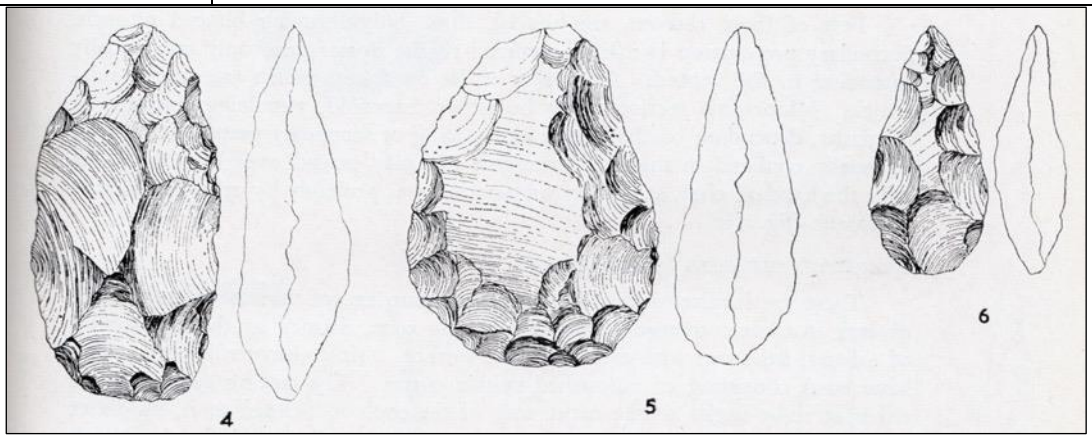
Grading	Description of Resource	Examples of Possible Management Strategies	Heritage Significance
I	Heritage resources with qualities so exceptional that they are of special national significance. Current examples: Robben Island	May be declared as a National Heritage Site managed by SAHRA.	Highest Significance
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 HWC.	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
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

4 CURRENT STATUS QUO

4.1 Site Description

The proposed plant falls within the boundaries of the existing Highveld Steel industrial site and is completely transformed due to the industrial activities within the site. The site is presently characterised by large volume of slag waste dumped from the surrounding industrial activity since ~1975.

4.2 Archaeological Background to the Study Area and Surroundings

DATE	DESCRIPTION
The South African Stone Age is the longest archaeologically-identified phase identified in human history and lasted for millions of years. Very little is known about the Stone Age archaeology of the study area and its immediate surroundings.	
2.5 million to 250 000 years ago	The Earlier Stone Age is the first and oldest phase identified in South Africa's archaeological history and comprises two technological phases. The earliest of these technological phases is known as Oldowan which is associated with crude flakes and hammerstones and dates to approximately 2 million years ago. The second technological phase in the Earlier Stone Age of Southern Africa is known as the Acheulian and comprises more refined and better-made stone artefacts such as the cleaver and bifacial handaxe. The Acheulian phase dates back to approximately 1.5 million years ago. No information with regard to Early Stone Age sites from the surrounding area could be found. However, it seems possible for such sites to exist here.
 *Figure 4 – Example of Early Stone Age Later Acheulian handaxes. These handaxes were identified at Blaaubank near Rooiberg. Cropped section of an illustration published in Mason (1962:199).*	
250 000 to 40 000 years ago	The Middle Stone Age (MSA) dates to between 250 000 to 40 000 years BP. MSA dates of around 250 000 BP originate from sites such as Leopards Kopje in Zambia, while the late Pleistocene (125 000 BP) yields a number of important dated sites associated with modern humans (Deacon & Deacon, 1999). The MSA is characterised by flake and blade industries, the first use of grindstones, wood and bone artefacts, personal ornaments, use of red ochre, circular hearths and hunting and gathering lifestyle. Two low-density surface scatters of Middle Stone Age lithics are located 6.1km south-east of the closest point along the boundaries of the present study area alternatives. These surface scatters (TAV 3 & TAV 5) were identified on the western bank of the Steenkoolspruit during a heritage impact assessment undertaken in 2001 by a team which also included the author of this report (CRM Africa & Matakoma, 2001). During the present study a low density

	scatter of MSA lithics was identified in the southwestern section of the project area (refer site GRS 32). The flakes were found in a disturbed field between the R555 an a railway track.
40 000 years ago to the historic past	The Later Stone Age (LSA) is the third phase identified in South Africa's Stone Age history. This phase in human history is associated with an abundance of very small stone artefacts or microliths. A large number of Later Stone Age materials are found around the general vicinity of the study area. Unfortunately, these are mostly in the form of surface material which has been eroded out of dongas and riverbeds. As a result, the primary context of these sites and associated material is often in doubt (Van Schalkwyk, 2001). A natural sandstone shelter containing some Later Stone Age lithics is located 6km south-east of the closest point along the boundaries of the present study area alternatives. This sandstone shelter (TAV 6) was identified during a heritage impact assessment undertaken in 2001 by a team which also included the author of this report (CRM Africa & Matakoma, 2001).
The arrival of early farming communities during the first Millenium 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 who practised cultivation and pastoralist farming activities, metalworking, cultural customs such as lobola and whose settlement layouts show the tangible representation of the significance of cattle (known as the Central Cattle Pattern) (Huffman, 2007).	
AD 1700 – AD 1840	The Buispoort facies of the Moloko branch of the Urewe Tradition is the first association of the study area's surroundings with the Iron Age. It is most likely dated to between AD 1700 and AD 1840. The key features on the decorated ceramics of this facies include rim notching, broadly incised chevrons and white bands, all with red ochre (Huffman, 2007). Buispoort can be associated with the Western Sotho-Tswana, including the Hurutshe and Kwena, and the settlement layouts of Buispoort sites are known as Molokane-type walling (Huffman, 2007). According to the map published by Huffman (2007:203), the present study area is located on the far eastern edge of the known distribution of Buispoort facies sites and settlements.
AD 1821 – AD 1823	After leaving present-day KwaZulu-Natal the Khumalo Ndebele (more commonly known as the Matabele) of Mzilikazi migrated through the general vicinity of the study area under discussion before reaching the central reaches of the Vaal River in the vicinity of Heidelberg in 1823 (www.mk.org.za). Two different settlement types have been associated with the Khumalo Ndebele. The first of these is known as Type B walling and was found at Nqabeni in the Babanango area of KwaZulu-Natal. These walls stood in the open without any military or defensive considerations and comprised an inner circle of linked cattle enclosures (Huffman, 2007). The second settlement type associated with the Khumalo Ndebele is known as Doornspruit, and comprises a layout which from the air has the appearance of a 'beaded necklace'. This layout comprises long scalloped walls (which mark the back of the residential area) which closely surround a complex core which in turn comprises a number of stone circles. The structures from the centre of the settlement can be interpreted as kitchen areas and enclosures for keeping small stock. It is important to note that the Doornspruit settlement type is associated with the later settlements of the Khumalo Ndebele in areas such as the Magaliesberg Mountains and Marico and represent a settlement under the influence of the Sotho with whom the Khumalo Ndebele intermarried. The Type B settlement is associated with the early Khumalo Ndebele settlements and conforms more to the typical Zulu form of settlement. As the Khumalo Ndebele passed through the general vicinity of the study areas shortly after leaving Kwazulu-Natal, one can assume that their settlements here would have conformed more to the Type B than the Doornspruit type of settlement. It must be stressed however that no published information could be found which indicates the presence of Type B sites in the general vicinity of the study area.

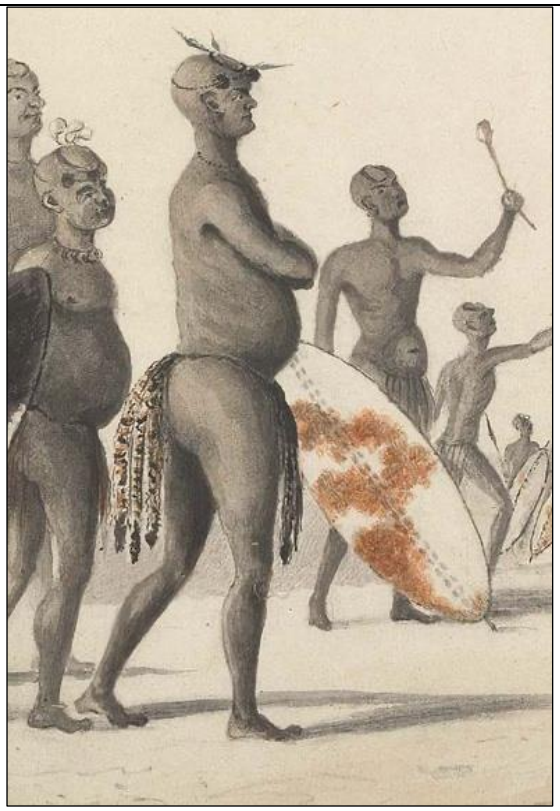


Figure 5 - King Mzilikazi of the Matabele. This depiction was made by Captain Cornwallis Harris in c. 1838 (www.sahistory.org.za).

The early Historical Period within the study area and surroundings were characterised by the arrival of newcomers to this area. The first arrivals would almost certainly have been travellers, traders, missionaries, hunters and fortune seekers. However, with time, this initial trickle was replaced by a flood of white immigrants during the 1830s, when 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).

1836	The first Voortrekker parties crossed over the Vaal River (Bergh, 1999).
1845	Both the district and town of Lydenburg was established in this year (Bergh, 1999). The study area fell within the Lydenburg district at the time.
The 1850s - 1860s	In general terms, this period saw the early establishment of farms by white farmers in the general vicinity of the study area. The archival research undertaken for this study has shown that most of the farms from within the study area were formally inspected by one P.J. Fourie, as representative of the government of the Zuid-Afrikaansche Republiek, during the late 1960s. It seems likely for P.J. Fourie to have been the local *veldkornet* or commandant. The archival record shows that the farms Blaauwkrans and Groenfontein were both inspected on 8 January 1868, the farm Klippan on 19 February 1868 and the farm Klipfontein on 8 June 1869 (National Archives, RAK, 3082). Interestingly, the farm Klippoort was inspected some time before the other farms, namely on 19 July 1862 by one C.A. van Niekerk (National Archives, RAK, 3081). While these inspection dates provide an indication as to when these farms were officially proclaimed and registered with the government of the day, these dates do not necessarily mean that none of these farms was already settled and farmed before these dates.

	The permanent settlement of white farmers in the general vicinity of the study area would have resulted in the proclamation of individual farms and the establishment of permanent farmsteads. Features that can typically be associated with the early farming history of the area include farm dwellings, sheds, rectangular stone kraals and cemeteries. The other sites often associated with these early farms are graves and cemeteries for farmers and farm workers, and their respective families. These sites are often all that remains of the farmsteads of the mid to late nineteenth century. This may be due to their age as well as the destruction of farmsteads by the British forces during the South African War in accordance with the so-called 'scorched earth' policy.

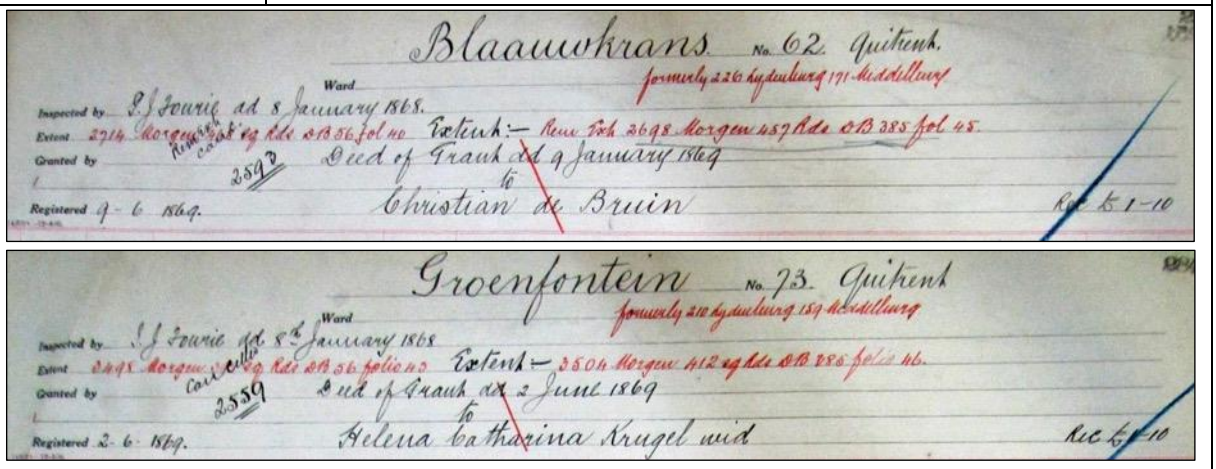


Figure 6 – These two images provide sections of the actual farm ownership records for the farms Blaauwkrans and Groenfontein held in the National Archives (RAK, 3082). These sections of the farm ownership records indicate that Christian de Bruin and the widow Helena Catharina Krugel became the first registered owners of these two farms on 9 January and 2 June 1869 respectively.

1872	The study area now fell within the district of Middelburg (Bergh, 1999). During the same year, the general surroundings of the study area were visited by a geologist from Eastern Europe, Woolf Harris. During his visit, Harris identified coal in the Van Dyksdrift area. He is also believed to have started the Maggie's Mine the following year (Falconer, 1990).
1872 – 1894	During this time a number of small coal mining operations were started in the general vicinity of the study area. With no railway line connecting this area with the coal markets further to the west, these early coal mines proved a difficult commercial undertaking. Four coal mines were in existence in the Witbank area by 1889, namely Brugspruit Adit, Maggie's Mine, Steenkoolspruit and Douglas (Falconer, 1990). Although not certain, it would appear that the Brugspruit Adit was the closest of these four mines to the present study area.

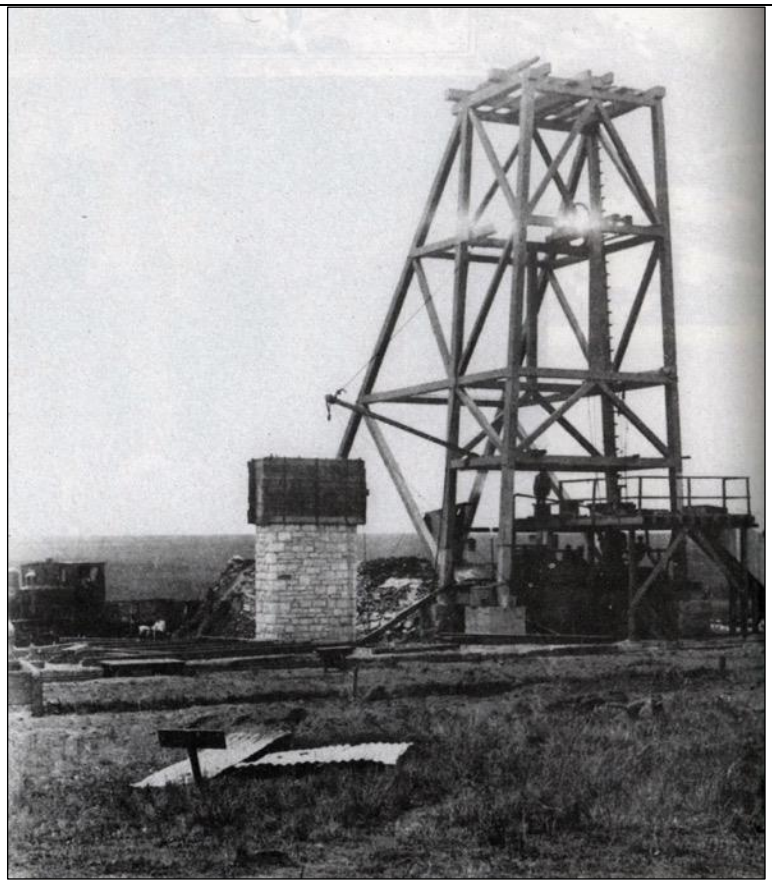


Figure 7 - Historic photograph of the coal mine at Brugspruit (Lang, 1995).

20 October 1894 – 2 November 1894	On this day the railway line between Pretoria and Delagoa Bay (present-day Maputo) was completed, with the last work on the line taking place near Balmoral, some 19 km north-west of the study area. However, the symbolic completion of the line's construction took place at Brugspruit Station, where the last rail screw was fastened by President Paul Kruger on 2 November 1894 (De Jong, 1996). Brugspruit (later Clewer) Station was located 3.3km north-west of the present study area. The completion of the NZASM Eastern Line, as it was known, was very significant for the study area and surroundings. This is due to the fact that the vast deposits of coal known to have existed in this area since the mid 19th century, could now be commercially mined (Bulpin, 1989) and easily transported to the Witwatersrand gold mines and the populated centres of Pretoria and Johannesburg where it was most required. As a result, the completion of the Eastern Line created a massive stimulus not only for the mining of coal but also for the establishment of coal mines. As will be seen below, a number of coal mines were established in the years following on the completion of the Eastern Line.
1895	According to Schalekamp (2006), the Landau Colliery was established in 1895 by the Cassel Coal Company on the farm Klipfontein to supply coal to the gold mines along the Witwatersrand. If this date is correct, it would mean that the Landau Colliery was the earliest coal mine to be established in close proximity to the present study area and in all likelihood also one of the first such collieries to be established in proximity to present-day Emalahleni. However, other sources such as the South African Mining Yearbook of 1911 indicate that the Cassel Coal Company was registered in August 1895 as a reconstruct of the Cassel Colliery Company Limited. According to this source, the property of the Cassel Coal Company at the time of its registration was restricted to sections of a farm near Springs. In November 1898 the Cassel

	Coal Company resolved to acquire the property and assets of Landau's Transvaal Colliery comprising 26 860 acres on the farms Klipfontein, Klippan, Kleinkopje, Wolvekrans and Blaauwkrans. This means that the Cassel Coal Company became involved in properties located within and surrounding the present study area in November 1898.
1896	A coal mine shaft was sunk on the farm Witbank in this year by Samuel Stanfield (Erasmus, 2004). In September 1896, Witbank Colliery Limited was established (South African Mining Yearbook, 1941/1942).
9 April 1897	The Anglo-French (Transvaal) Navigation Coal Estates Limited was registered on 9 April 1897. This company was established to purchase the undertaking of the Anglo-French Collieries Syndicate Limited. Possibly at the time of its establishment and certainly before 1911, the company acquired the coal leasehold rights to the farm Blaauwkrans (South African Mining Yearbook, 1911). A section of the present study area is located on the farm Blaauwkrans.
The South African War (also known as the Anglo Boer War) between Great Britain and her allies and the Boer Republics of the Transvaal (known as the *Zuid-Afrikaansche Republiek*) and Free State took place between October 1899 and May 1902. No battles or skirmishes associated with this war are known from within the study area or its direct surroundings, although a number are known from the surrounding landscape. The primary battles from the surrounding landscape include the Battle of Rhenosterkop of 29 November 1900 (43km north-west of the study area), the Battle of Wilmansrust of 12 June 1901 (27.9 km south-east of the study area) and the Battle of Bakenlaagte of 30 October 1901 (located 31.3km to the south) (Van der Westhuizen & Van der Westhuizen, 2000). During the war, the railway line between Pretoria and Delagoa Bay (present-day Maputo) was of immense strategic significance for both sides. As a result, and especially during the guerrilla phase of the war, the Boer forces spent considerable energy in blowing up and derailing trains and also damaging and destroying bridges and culverts. These Boer activities were aimed at suppressing the rapid movement of British troops, ammunition and supplies by rail. In response, the British Army built a series of fortifications and blockhouses along the railway line and also made use of armoured trains.	
13 December 1899 – 21 December 1899	On 13 December 1899 the future Prime Minister of Great Britain, Winston Churchill, escaped from a Prisoner of War Camp in Pretoria. He escaped from the Boer capital in an open coal truck (some sources indicate that Churchill walked) and travelled by rail to Clewer Siding, some 3.2km north-west of the present study area. Near Clewer Siding, Churchill jumped off the train and headed for lights he could see in the distance. These lights turned out to be the Transvaal and Delagoa Bay Colliery, where Churchill knocked on the first house he found. He was fortunate to have knocked on the door of the English mine manager, John Howard, who as a pro-Briton decided to assist Winston Churchill. With the assistance of a small number of pro-British mine employees, Howard hid Churchill for a couple of days in one of the colliery's mineshafts and subsequently for a few more days behind packing cases at the mine office. Early on the morning of 19 December 1899 Winston Churchill was taken to the colliery siding by John Howard and hidden in one of the train wagons carrying a cargo of wool. He safely reached Lourenco Marques (present-day Maputo) on 21 December 1899. After the war, Winston Churchill sent engraved gold watches to everyone at the Transvaal and Delagoa Bay Colliery who assisted in his escape (Sandys, 1999) (Van der Westhuizen & Van der Westhuizen, 2000). The Transvaal and Delagoa Bay Colliery where Winston Churchill was hidden appears to have been located near the boundary between the farms Schoongezicht and Driefontein, some 8 km north of the present study area.

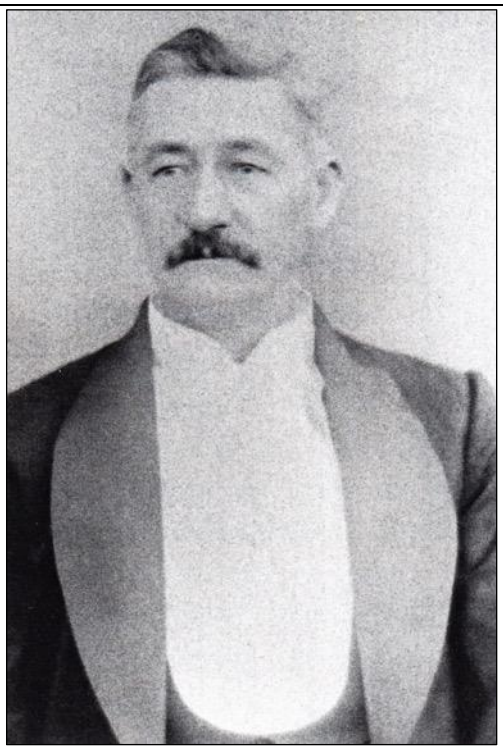


Figure 8 – John Howard, the mine manager of the Transvaal and Delagoa Bay Colliery, who was a key figure in Winston Churchill's escape from the Transvaal Republic (Sandys, 1999).

Figure 9 – Sir Winston Leonard Spencer Churchill as Prime Minister of the United Kingdom during the Second World War (www.wikipedia.org).

7 October 1900	On this day a railway culvert near Brugspruit was destroyed by Boer forces (Aitken, 2000). The blowing up and derailment of trains, as well as the acts of sabotage against the Eastern Line by Boer forces, formed part of their tactics during the guerrilla war to try and suppress the rapid movement of British troops, ammunition and supplies by rail.
Late 1900	One of the closest known skirmishes to the present study area appears to be mentioned in the published war memoir of General Ben Viljoen (1902), which states that a skirmish between his commando and the British forces took place near Witbank Station. This skirmish appears to have taken place during the latter part of 1900. As mentioned elsewhere, the Witbank railway station is located approximately 5.3 km north of the present study area.
17 January 1901	A British train was derailed near Brugspruit Station on the morning of 17 January 1901. This was the work of the infamous Irish-born train-wrecker of the Boer forces, namely Captain Jack Hindon (Aitken, 2000). As mentioned elsewhere, Brugspruit Station was located 3.3km north-west of the present study area.
11 April 1901	On 11 April 1901, a British train was blown up by Boer forces near Witbank (Meijer, 2000).
The general surroundings of the study area underwent significant changes and development during the twentieth century, including extensive development in the form of coal mining, railway and transportation development as well as the establishment of nearby towns such as Witbank (present-day Emalahleni), Ogies and Kriel.	
1903	The town of Witbank was formally proclaimed (Erasmus, 2004).

Figure 10 – Historic photograph of Witbank taken in 1936 (Delius, 2007:340).

1905	While no details are available, it would appear that the Cassel Coal Company's Landau Colliery started producing coal in 1905. The coal output for this year was 181,071 tons (The Mining Yearbook, 1911). The mine continued to operate during the subsequent years.
1906	The town of Witbank received its first Health Board (Bulpin, 1989).
December 1906	The new railway line from near Johannesburg all the way to Witbank (present-day Emalahleni) was officially opened on 26 December 1906 (www.wikipedia.org). The opening of this line meant that a direct route between the coal mines from the surroundings of Witbank and the markets in the Witwatersrand now became available. The importance of this new railway line for the coal mines from within the study area and its surroundings can *inter alia* be seen in the fact that during its early development, the Anglo-French (Transvaal) Navigation Colliery built a railway siding which connected it with this new railway link between Witbank and Johannesburg (The Mining Yearbook, 1911). The nearest railway station along this new railway line to the present study area was Blackhill Station, located 1.5km south-west of the present study area. The railway line originally built in 1906 also passes through a small section of the present study area, however, many changes and development would have taken place to this line over the course of the last 113 years. It is interesting to note that in many books and documents referring to the Navigation and Landau Collieries, Blackhill Station is indicated to be the nearest railway station.
December 1906	In December 1906 the Anglo-French (Transvaal) Navigation Colliery produced its first coal output. This followed on the striking of four coal seams during shaft sinking activities (South African Mining Yearbook, 1911). This mine also continued to operate during the subsequent years.
1914	The town of Witbank became a municipality in this year (Bulpin, 1989).
13 April 1921	On 13 April 1921 the South African Coal Estates (Witbank) Limited was established to acquire the assets of the Cassel Coal and Anglo-French companies (South African Mining Yearbook, 1941/2). These companies were

	amalgamated into this newly established company, and as a result of both the Landau and Navigation Collieries now formed part of the South African Coal Estates (Witbank) Limited.
1923 - 1926	Based on the information that is presently available, it would appear that the village of Clewer was established during this period by the South African Coal Estates (Witbank) Limited. The company owned Clewer for some time after its establishment. In a number of inscriptions in these mining yearbooks, Clewer is referred to as '*the garden township'.* See for example the South African Mining Yearbook that was published in 1941/2.
1928	The town of Ogies was established (Erasmus, 2004). Ogies is located 20 km south-west of the present study area.

Figure 11 – Historic photograph was taken during the late 1940s of an unknown colliery near Witbank (Delius, 2007:159).

4.3 Heritage Screening

4.3.1 Previous Heritage Impact Assessment Reports from the Study Area and Surroundings

An assessment of the South African Heritage Resources Information System (SAHRIS) of SAHRA was undertaken to establish whether any previous archaeological and heritage impact assessments had revealed archaeological and heritage sites within the present study area components. Previous reports were also made available by the client.

This assessment has revealed that a number of previous studies had been undertaken in the surroundings of the study area. However, although a few sites were identified in proximity to the present study area, no sites from these studies were identified within the present study area.

All previous studies that were located on the SAHRIS system and/or received from the client, will be briefly discussed in chronological order below. In each case, the results of each study is shown in bold.

- KUSEL, U. 2006. Cultural Heritage Resources Impact Assessment of Portion 1 of the farm Klippoort 334 JS (A Portion of 71) of the farm Klipfontein 322 JS, Witbank, Mpumalanga. **No sites were identified during the study.**
- BIRKHOLTZ, P.D. 2008. Heritage Impact Assessment for the Proposed Development of the Remaining Extent of Portion 71 of the farm Klipfontein 322 JS, eMalahleni Municipality, Mpumalanga Province. **Two sites were identified during the study, namely a historic homestead and a cemetery. These sites are located 1.84km and 1.74km respectively north-east from the corresponding closest points along the study area boundary.**
- PISTORIUS, J.C.C. 2010. Phase 1 Heritage Impact Assessment (HIA) Study for the Proposed Landau Expansion Project near eMalahleni (Witbank) in the Mpumalanga Province of South Africa. **The study identified three cemeteries, three historic houses and one railway bridge. The closest of any of these seven identified sites to the present study area, is a cemetery located 1.66 km north of the closest point along the study area boundary.**
- CELLIERS, J.P. 2010. Phase 1 Archaeological Impact Assessment for Aurecon Environmental Consultants concerning the proposed Khanyisa Power Station on portions of the farms Klippan 332 JS, Groenfontein 331 JS and Klipfontein 322 JS near Witbank, Mpumalanga Province. **The study identified a total of six sites, comprising one cemetery, one building, one demolished dwelling, two ruins and one site where traces of a previous settlement were identified. None of these sites is located within the present study area. The most significant of these sites is the cemetery, which is located 610m from the closest point along the study area boundary.**
- PISTORIUS, J.C.C. 2014. Phase 1 Heritage Impact Assessment (HIA) Study for Anglo Operations Limited Greenside Colliery's New Discard Facility near eMalahleni on the Eastern Highveld in the Mpumalanga Province. **Two cemeteries were identified during the study. These cemeteries are located 442m and 330m respectively from the corresponding closest points along the study area boundary.**
- KUSEL, U. 2016. Phase 1 Cultural Heritage Resources Impact Assessment for a Temporary Road for a Large Dragline to be Moved from Kromdraai Coal Mine to Clewer in the eMalahleni District Mpumalanga Province. **Two cemeteries were identified during the study. The closest of these two cemeteries to the present study area is a cemetery comprising seven graves located 5.1 km north-west of the closest point along the study area boundary.**
- MLILO, T. & F. BANDAMA 2017. Phase 1 Heritage Impact Assessment for the Proposed Reclaiming of Clinker (Ash from Old Power Stations) in Witbank, eMalahleni Local Municipality in Mpumalanga Province. **No sites were identified during the study.**
- BIRKHOLTZ, P.D. 2019. Pre-Feasibility Heritage Study for the SACE Lifex Project, near eMalahleni, Mpumalanga Province. An unpublished report for SRK Consulting (Pty) Ltd. **The fieldwork resulted in the identification of 39 heritage sites. Seven sites identified within the Landau 1 & Landau 2 areas of the Khwezela Colliery. These sites comprise one cemetery, one historic Farm Worker Dwelling where the risk exists for unmarked stillborn graves to be buried and five historic structures and buildings. Nine sites were identified within the Clydesdale area of the Greenside Colliery. These nine sites comprise three cemeteries,**

five historic Farm Worker Dwellings where the risk exist for unmarked stillborn graves to be buried and one historic structure and building. Twenty-three (23) sites were identified within the North West Pit area. These 23 sites comprise two cemeteries, six historic Farm Worker Dwellings where the risk exist for unmarked stillborn graves to be buried and 15 historic structures and buildings.

4.4 Findings of the historical desktop study

4.4.1 Palaeontological Heritage

The sensitivity maps were produced by overlying the Palaeontological sensitivity maps from the SAHRIS database (**Figure 12**).

Based on the SAHRIS database a fieldbase Palaeontological assessment will be required as part of the HIA study.

Figure 12 – Palaeontological Heritage Sensitivity map. As can be viewed, most of the area is of very highly sensitive (red shading). Yellow outline demarcates the approximate study area.

4.4.2 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 **(Figure 14**). According to the Heritage screening report, the

directly affected area has a Medium heritage sensitivity. This is however extremely unlikely for the footprint area that is completely transformed By current and historical land use.

4.4.3 Heritage Sensitivity

The sensitivity maps were produced by overlying:

- Satellite Imagery;
- Current Topographical Maps; and
- First edition Topographical Maps dating to 1960 (**Figure 13**).

The map analysis shows that no heritage sensitive features were identified in the study area.

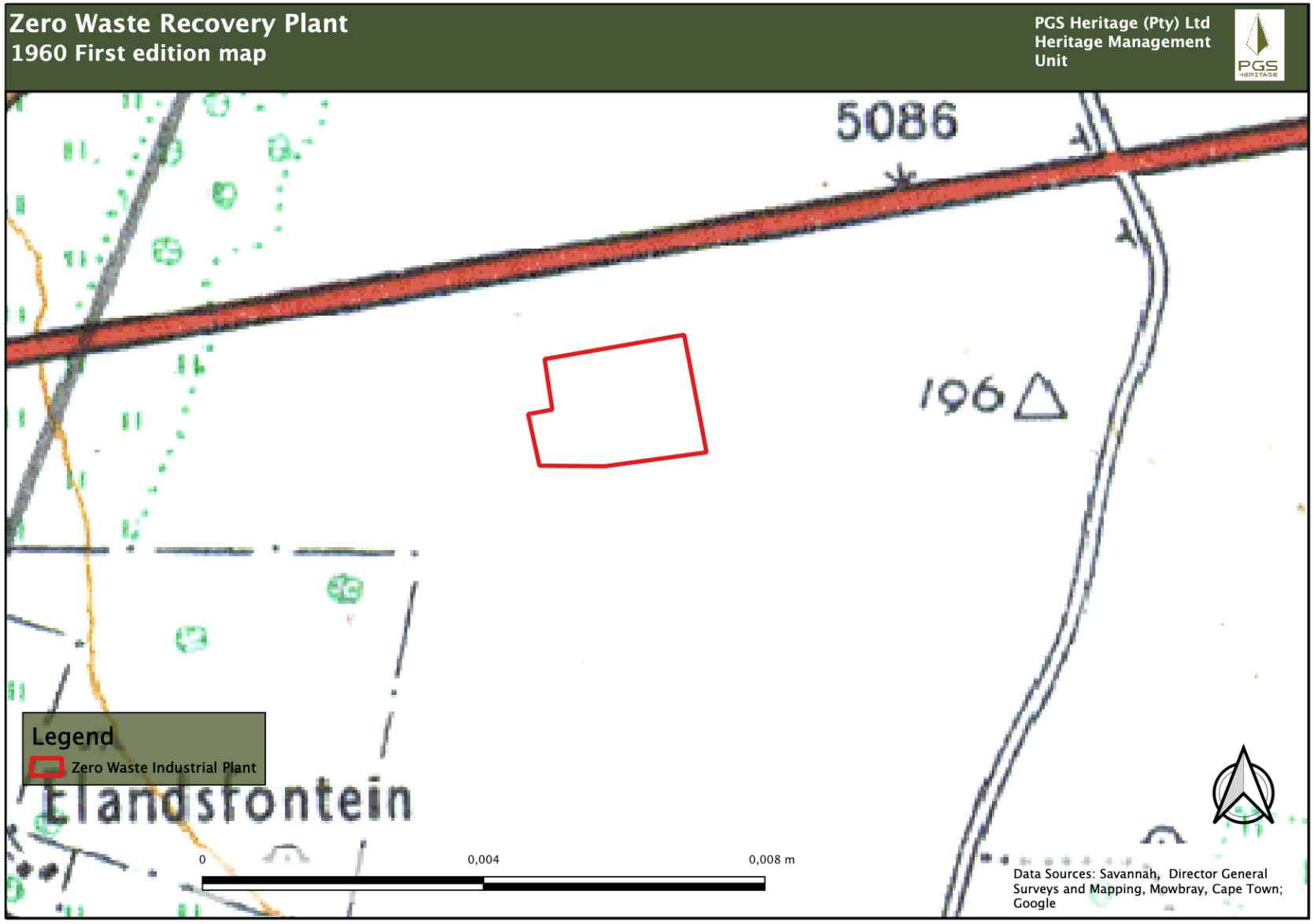


Figure 13 – First Edition of 2529CC Topographic Map 1:50000 dating to 1960

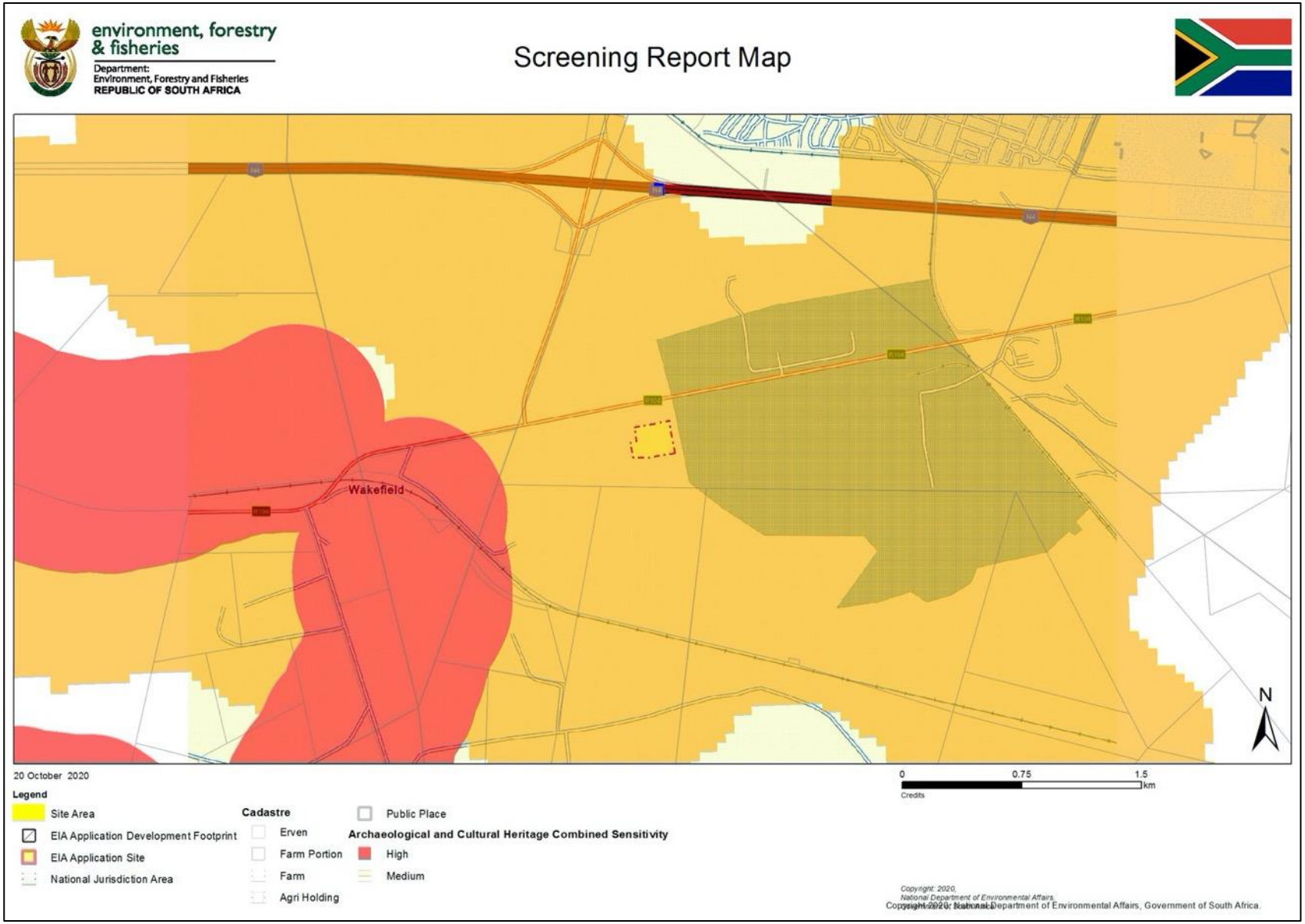


Figure 14 - Heritage Screening map. Source: Department of Environment, Forestry and Fisheries (DEFF)

5 IMPACT ASSESSMENT

The impact assessment methodology to be utilised in the HIA will be that supplied by Savannah Environmental and is included below.

The impact significance rating process serves two purposes: firstly, it helps to highlight the critical impacts requiring consideration in the management and approval process; secondly, it shows the primary impact characteristics, as defined above, used to evaluate impact significance.

The impacts will be ranked according to the methodology described below. Where possible, mitigation measures will be provided to manage impacts. In order to ensure uniformity, a standard impact assessment methodology will be utilised so that a wide range of impacts can be compared with each other. The impact assessment methodology makes provision for the assessment of impacts against the following criteria:

Direct, indirect and cumulative impacts associated with the projects must be assessed in terms of the following criteria:

- **Nature**, which shall include a description of what causes the effect, what will be affected and how it will be affected.
- The **extent**, wherein it will be indicated whether the impact will be local (limited to the immediate area or site of development) or regional, and a value between 1 and 5 will be assigned as appropriate (with 1 being low and 5 being high):
- The **duration**, wherein it will be indicated whether:
    - the lifetime of the impact will be of very short duration (0–1 year) – assigned a score of 1;
    - the lifetime of the impact will be of short duration (2-5 years) - assigned a score of 2;
    - medium-term (5–15 years) – assigned a score of 3;
    - long term (> 15 years) - assigned a score of 4; or
    - permanent - assigned a score of 5;
- The **magnitude**, quantified on a scale from 0-10, where 0 is small and will have no effect on the environment, 2 is minor and will not result in an impact on processes, 4 is low and will cause a slight impact on processes, 6 is moderate and will result in processes continuing but in a modified way, 8 is high (processes are altered to the extent that they temporarily cease), and 10 is very high and results in the complete destruction of patterns and permanent cessation of processes.
- The **probability** *of occurrence*, which shall describe the likelihood of the impact actually occurring. The probability will be estimated on a scale of 1–5, where 1 is very improbable

(probably will not happen), 2 is improbable (some possibility, but low likelihood), 3 is probable (a distinct possibility), 4 is highly probable (most likely) and 5 is definite (impact will occur regardless of any prevention measures).

- the **significance**, which shall be determined through a synthesis of the characteristics described above and can be assessed as low, medium or high; and
- the **status**, which will be described as either positive, negative or neutral.
- the degree to which the impact can be reversed.
- the degree to which the impact may cause irreplaceable loss of resources.
- the *degree* to which the impact can be *mitigated.*

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

S=(E+D+M)P

S = Significance weighting
E = Extent
D = Duration
M = Magnitude
P = Probability

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

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

5.1 Heritage Impacts

Due to the level of disturbance of the area, **no impact on heritage resources is envisaged**. **Table 5** provides a preliminary assessment of the possible impacts on heritage resources from the plant development.

The very high sensitivity rating for palaeontological heritage resources requires a separate impact assessment rating

Table 5 – Projected impact on heritage resources

Impacts

Impacts on heirtae resources that includes archaeological, historical and palaeontological is evisaged and cannot be excluded without a field assessment of the site.

Desktop Sensitivity Analysis of the Site:

The SAHRIS palaeontological map (***Figure 12***) indetifies the geology of the area as palaeontological highly sensitive.

Issue	Nature of Impact	Extent of Impact	No-Go Areas
Impact on archaeological / historical resources	A deskbased assessment cannot exclude the presence of archaeological / historical remains. The current deskbased evaluation has not identifeifed structrues or archaeological features in the study area. Due to the subsurface nature of such heritage resources the possibility of a low to medium impact cannot be excluded	Local	N/A
Impact on palaeontological resources	The impact on the possible fossil heritage assosciated with the geological formation is provisionally rated as high based on the SAHRIS maps	Local	N/A

Gaps in knowledge & recommendations for further study

» it is recommended that a field survey of the footprint area is done inclusive of a palaeontological field assessment to confirm the assessed status of the site.

6 CONCLUSIONS

This HSR has shown that the proposed Zero Waste Recovery Plant will have a projected minimal impact on heritage resources within the project area due to the extensive disturbance of the footprint by industrial activity.

The SAHRIS palaeontological sensitivity map rates the study as underlain by geological strata with a Very High palaeontological significance.

Preliminary impact analysis

The preliminary impact analysis shows that a deskbased assessment cannot exclude the presence of archaeological/historical remains. The current deskbased evaluation has not identified structrues or archaeological features in the study area. Due to the subsurface nature of such heritage resources the possibility of a low to medium impact cannot be excluded

The impact on the possible fossil heritage assosciated with the geological formation is provisionally rated as high based on the SAHRIS maps

Based on the above the it is recommended that a field survey of the footprint area is done inclusive of a palaeontological field assessment to confirm the assessed status of the site.

7 REFERENCES

7.1 Published Sources

AITKEN, D.W. 2000. Guerrilla Warfare, October 1900 – May 1902: Boer Attacks on the Pretoria-Delagoa Bay Railway Line. *South African Military History Journal* Vol. 11 No. 6.

BERGH, J.S. 1999. *Geskiedenisatlas van Suid-Afrika: die Vier Noordelike Provinsies*. Van Schaik, Pretoria.

BULPIN, T.V. 1989. *Lost Trails of the Transvaal*. Southern Book Publishers.

DEACON, H.J. & J. DEACON. 1999. *Human Beginnings in South Africa: Uncovering the Secrets of the Stone Age*. David Philip Publishers. Cape Town.

DE JONG, R.C. 1996. "The Iron Road to the Sea": The Pretoria-Maputo Railway, 1895-1995. *Pretoriana. No 108 (pp. 3-16).*

ERASMUS. B.P.J. 2004. *On Route in South Africa*. Johnathan Ball Publishers.

GLUCKSTEIN, S.M. n.d. *The South African Year-book, Volumes 1903-1904*. A. Bywater, London.

HAMMOND-TOOKE, W. D. (ed.) 1974. *The Bantu- speaking peoples of Southern Africa*. London & Boston: Routledge & Kegan Paul.

HAYDEN, B. 1980. Confusion in the bipolar world: bashed pebbles and splintered pieces. *Lithic Technology* 9: 2-7.

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

LANG, J. 1995. *Power Base: Coal Mining in the Life of South Africa*. Jonathan Ball Publishers, Johannesburg.

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

MEIJER, J.W. n.d. *Generaal Ben Viljoen: 1868 – 1917*. Protea Boekhuis, Pretoria.

SANDYS, C. 1999. *Churchill: Wanted Dead or Alive*. De Capo Press.

SCHALEKAMP, E.E. 2006. *The Financial Viability of Coal Reserves within Previously Mined Areas of the Witbank Coalfield*. Unpublished M.Sc. Dissertation, University of Pretoria, Pretoria.

SOUTH AFRICAN MINING AND ENGINEERING JOURNAL. 1982.

SOUTH AFRICAN MINING YEARBOOK, 1911

SOUTH AFRICAN MINING YEARBOOK. 1941/2. *The South African Mining Journal Syndicate*, Johannesburg.

VAN DER WESTHUIZEN, G. & E. VAN DER WESTHUIZEN 2000. *Guide to the Anglo Boer War in the Eastern Transvaal*. Transo Press, Roodepoort.

VISAGIE, J.C. 2011. *Voortrekkerstamouers: 1835 – 1845*. Protea Boekhuis, Pretoria.

7.2 Unpublished Sources

BIRKHOLTZ, P.D. 2008. Heritage Impact Assessment for the Proposed Development of the

Remaining Extent of Portion 71 of the farm Klipfontein 322 JS, Emalahleni Municipality, Mpumalanga Province.
BIRKHOLTZ, P.D. 2019. Pre-Feasibility Heritage Study for the SACE Lifex Project, near Emalahleni,
Mpumalanga Province. An unpublished report for SRK Consulting (Pty) Ltd
BIRKHOLTZ, P.D., SALOMON, A., STEYN, H. & W. FOURIE. 2000. Phase 1 Archaeological Survey of the Impunzi Division of Duiker Mining, Witbank/Ogies Area. An unpublished report by CRM Africa and Matakoma. SAHRIS MAP ID_01164.
CELLIERS, J.P. 2010. Phase 1 Archaeological Impact Assessment for Aurecon Environmental Consultants concerning the proposed Khanyisa Power Station on portions of the farms Klippan 332 JS, Groenfontein 331 JS and Klipfontein 322 JS near Witbank, Mpumalanga Province.
KUSEL, U. 2006. Cultural Heritage Resources Impact Assessment of Portion 1 of the farm Klippoort 334 JS (A Portion of 71) of the farm Klipfontein 322 JS, Witbank, Mpumalanga.
KUSEL, U. 2016. Phase 1 Cultural Heritage Resources Impact Assessment for a Temporary Road for a Large Dragline to be Moved from Kromdraai Coal Mine to Clewer in the Emalahleni District Mpumalanga Province.
PISTORIUS, J.C.C. 2010. Phase 1 Heritage Impact Assessment (HIA) Study for the Proposed Landau Expansion Project near Emalahleni (Witbank) in the Mpumalanga Province of South Africa.
PISTORIUS, J.C.C. 2014. Phase 1 Heritage Impact Assessment (HIA) Study for Anglo Operations Limited Greenside Colliery's New Discard Facility near Emalahleni on the Eastern Highveld in the Mpumalanga Province.
MLILO, T. & F. BANDAMA 2017. Phase 1 Heritage Impact Assessment for the Proposed Reclaiming of Clinker (Ash from Old Power Stations) in Witbank, Emalahleni Local Municipality in Mpumalanga Province.
VAN SCHALKWYK, J.A. 2001. A Survey of Cultural Resources for the Kriel Colliery Haul Road, Mpumalanga Province. An unpublished report on file at SAHRA as: 2001-SAHRA-0007.

7.3 Archival References

National Archives, RAK, 3081
National Archives, RAK, 3082

7.4 Historical Topographic Maps

All the historic topographical maps used in this report were obtained from the Directorate: National Geo-spatial Information of the Department of Rural Development and Land Reform in Cape Town.

7.5 Internet

www.angloboerwar.com
www.mk.org.za
www.sahistory.org.za
www.sanbi.org
www.wikipedia.org

7.6 Google Earth

At least some of the aerial depictions of the study área were obtained using Google Earth

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 – Professional Grave Solutions (Pty) Ltd

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

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

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, Mozambique, Malawi, Mauritius, Zimbabwe and the Democratic Republic of the Congo