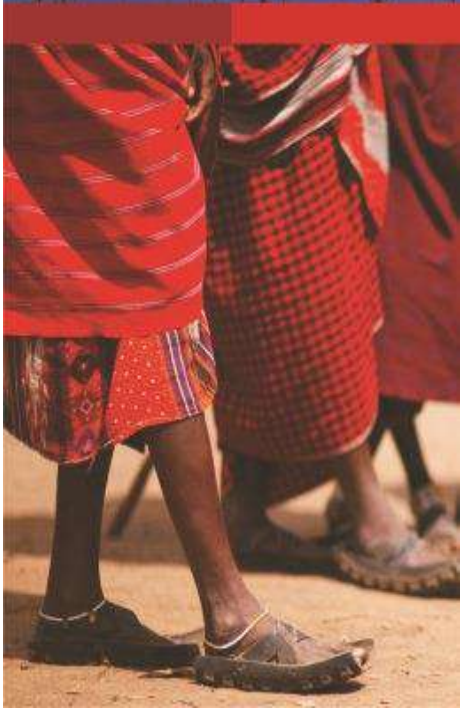

DIGBY WELLS
ENVIRONMENTAL

Environmental Regulatory Process in terms of the Thubelisha, Trichardtsfontein and Vaalkop Mining Right areas

Heritage Impact Assessment

Project Number:

SAS3869

Prepared for:

Sasol Mining (Pty) Ltd

August 2017

Digby Wells and Associates (South Africa) (Pty) Ltd
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This document has been prepared by Digby Wells Environmental.

Report Type:	**Heritage Impact Assessment**
Project Name:	**Environmental Regulatory Process in terms of the Thubelisha, Trichardtsfontein and Vaalkop Mining Right areas**
Project Code:	**SAS3869**

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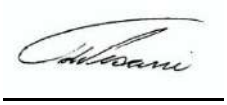
I, Justin du Piesanie as duly authorised representative of Digby Wells and Associates (South Africa) (Pty) Ltd., hereby confirm my independence (as well as that of Digby Wells and Associates (South Africa) (Pty) Ltd.) and declare that neither I nor Digby Wells and Associates (South Africa) (Pty) Ltd. have any interest, be it business, financial, personal or other, in any proposed activity, application or appeal in respect of Sasol Mining (Pty) Ltd, other than fair remuneration for work performed, specifically in connection with the Heritage Resources Management (HRM) Process for the Section 102 Environmental Management Programme Amendment of the Thubelisha, Trichardtsfontein and Vaalkop Mining Right areas, located near Trichardt, Mpumalanga Province.



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ABBREVIATIONS AND GLOSSARY OF TERMS

Abbreviation	Meaning
ASAPA	Association of Southern African Professional Archaeologists
BA	Bachelor of Arts
BID	Background Information Document
BSc	Bachelor of Science
c.	circa, meaning approximately
CE	Common Era
CFP	Chance Find Protocol
CMP	Conservation Management Plan
CRR	Comments and Response Report
CS	Cultural Significance
Digby Wells	Digby Wells Environmental
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
EFC	Early Farming Community (also known as Early Iron Age)
EIA	Environmental Impact Assessment
EMPr	Environmental Management Programme
ESA	Early Stone Age
GIS	Geographical Information System
GN R	Government Notice Regulation
GPS	Global Positioning System
HIA	Heritage Impact Assessment
Hons	Honours degree
HRAs	Heritage Resources Authorities
HRM	Heritage Resources Management
ICOMOS	International Council on Monuments and Sites
Kya	Thousand years ago
LED	Local Economic Development
LFC	Late Farming Community also known as Late Iron Age
LSA	Late Stone Age
MIA	Middle Iron Age
MPRHA	Mpumalanga Provincial Heritage Resources Authority

Abbreviation	Meaning
MPRDA	Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002)
MSA	Middle Stone Age
MSc	Master of Science
NEMA	National Environmental Management Act, 1998 (Act No. 107 of 1998)
NHRA	National Heritage Resources Act, 1999 (Act No. 25 of 1999)
NID	Notification of Intent to Develop
RoD	Record of Decision
SAHRA	South African Heritage Resources Agency
SAHRIS	South African Heritage Resources Information System
SCF	Statutory Comment Feedback
SEP	Stakeholder Engagement Process
SoW	Scope of Work
ToR	Terms of Reference
Wits	University of the Witwatersrand

Term	Definition
Alter	Any action affecting the structure, appearance or physical properties of a place or object, whether by way of structural or other works, by painting, plastering or other decoration or any other means.
Archaeological	Material remains resulting from human activity that are in a state of disuse and older than 100 years, including artefacts, human and hominid remains and artificial features and structures. Rock art created through human agency older than 100 years, including any area within 10 m of such representation. Wrecks older than 60 years - either vessels or aircraft - or any part thereof that was wrecked in South Africa on land, internal or territorial waters, and any cargo, debris or artefacts found or associated therewith. Features, structures and artefacts associated with military history that are older than 75 years and the sites on which they are found, e.g. battlefields.
Archaeologist	A trained professional who uses scientific methods to excavate record and study archaeological sites and deposits.
Artefact	Any object manufactured or modified by human beings.
Ceramic (syn. pottery)	In an archaeological context any vessel or other object produced from natural clay that has been fired. Indigenous ceramics associated with Farming Communities are low-fired wares, typically found as potsherds. Imported and more historic ceramics generally include high-fired wares such as porcelain, stoneware, etc.

Term	Definition
Ceramic facies / facies	Subgroups of a primary ceramic tradition or sequence. Typically used in ceramic analyses. Various facies are attributed to different temporal periods based of radiometric dates obtained from archaeological contexts. Facies are often used to infer cultural identity of archaeological groups. However, in context of this study identified ceramic facies merely provide a relative temporal context for archaeological sites in the landscape.
Ceramic tradition	The sequence of ceramic styles that develop out of each other and form a continuum. A tradition is the primary group to which subsequent ceramic facies belong. A ceramic tradition can be broadly associated with various linguistic and cultural groups, but do not represent any given ethnic identity, especially during the LFC period.
Ceramic classification	Ceramic classification is universally used by archaeologists to establish relative cultural-historical temporal sequences within southern African Farming Communities. In this way, relative dates can be assigned to sites, as well as inferring tenuous cultural similarities or associations. Huffman (1970) postulated that the migration of farming communities could be recognised via a technique of 'ceramic seriation'. Ceramic seriation is based on the premise that certain styles of ceramics, including vessel shape and decorative motifs, follow each other chronologically, and can be attributed to certain archaeological 'cultures' (Huffman, 1970; 1980). Huffman (1970) and Phillipson (1977) demonstrated that Bantu-speaking groups may have migrated southwards in three 'streams' from a possible central homeland, over different periods (See Figure 6 4). These streams are generally associated with diverse Eastern Bantu-speaking societies and various farming community periods. Although these hypotheses have since undergone meaningful reviews and received significant opposition, a general consensus remains that ceramic seriation can be used to reconstruct population movements.
Compulsory repair order	A heritage resources authority may serve on the owner of a heritage site an order to repair or maintain such site, to the satisfaction of the heritage resources authority, within a reasonable period of time as specified in the order where the heritage resources authority considers that such site: ▪ Has been allowed to fall into disrepair for the purpose of effecting or enabling its destruction or demolition, enabling the development of the designated land, or enabling the development of any land adjoining the designated land. ▪ Is neglected to such an extent that it will lose its potential for conservation.
Conservation	In relation to heritage resources includes the protection, maintenance, preservation and sustainable use of places or objects so as to safeguard their cultural significance.

Term	Definition
Cultural significance (CS)	The aesthetic, architectural, historical, scientific, social, spiritual, linguistic or technological value or significance. A heritage may have cultural significance or other special value because of its: ▪ Importance in the community, or pattern of South Africa's history. ▪ Possession of uncommon, rare or endangered aspects of South Africa's natural or cultural heritage ▪ Potential to yield information that will contribute to an understanding of South Africa's natural or cultural heritage. ▪ Importance in demonstrating the principal characteristics of a particular class of South Africa's natural or cultural places or objects. ▪ Importance in exhibiting particular aesthetic characteristics valued by a community or cultural group. ▪ Importance in demonstrating a high degree of creative or technical achievement at a particular period. ▪ Strong or special association with a particular community or cultural group for social, cultural or spiritual reasons. ▪ Strong or special association with the life or work of a person, group or organisation of importance in the history of South Africa. ▪ Significance relating to the history of slavery in South Africa.
Development	Any physical intervention, excavation, or action, other than those caused by natural forces, which may in the opinion of a heritage authority in any way result in a change to the nature, appearance or physical nature of a place, or influence its stability and future well-being, including: ▪ Construction, alteration, demolition, removal or change of 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 hoardings. ▪ Any change to the natural or existing condition or topography of land. ▪ Any removal or destruction of trees, or removal of vegetation or topsoil.
Early Farming Community/ies	The first Farming Communities (also known as Early Iron Age) that appear in the southern archaeological record during the early first millennium CE. The EFC period is generally dated from c. 200 CE to 1000 CE.
Early Stone Age	The South African ESA dates from ~3 Mya to c. 250 Kya. This period is associated with later *Australopithecus and* early *Homo* species. The lithic industries that characterise the ESA include Oldowan and Early Acheulian, typically as simple core tools, choppers handaxes and cleavers.
Excavation	The scientific excavation, recording and retrieval of archaeological deposit and objects through the use of accepted archaeological procedures and methods, and excavate has a corresponding meaning.

Term	Definition
Farming Community/ies	Term signifying the appearance in the southern African archaeological of Bantu-speaking agricultural based societies from the early first millennium CE. The term replaces the *Iron Age* as a more accurate description for groups who practiced agriculture and animal husbandry, extensive manufacture and use of ceramics, and metalworking. The Farming Community period is divided into an Early and Late phase. The use of Later Farming Communities especially removes the artificial boundary between archaeology and history.
Field Rating	SAHRA requires heritage resources to be provisionally rated in accordance with Section 7 of the NHRA that provides a three tier grading system of resources that form part of the national estate. The rating system distinguishes between four categories: ▪ Grade I: Heritage resources with qualities so exceptional that they are of special national significance. ▪ Grade II: Heritage resources which, although forming part of the national estate, can be considered to have special qualities which make them significant within the context of a province or a region. ▪ Grade III: Other heritage resources worthy of conservation. ▪ General Protected: i.e. generally protected in terms of Sections 33 to 37 of the NHRA.
General protection	General protections are afforded to: ▪ Objects protected in terms of laws of foreign states. ▪ Structures older than 60 years. ▪ Archaeological and palaeontological sites and material and meteorites. ▪ Burial grounds and graves. ▪ Public monuments and memorials.
Grave	A place of interment and includes the contents, headstone or other marker of such a place, and any other structure on or associated with such place.
Heritage Impact Assessment (HIA)	An assessment of the cultural significance of, and possible impacts on, diverse heritage resources that may be affected by a proposed development. A HIA may include several specialist elements such as archaeological, built environment and palaeontological studies. The HIA must supply the heritage authority with sufficient information about the sites to assess, with confidence, whether or not it has any objection to a development, indicate the conditions upon which such development might proceed and assess which sites require permits for destruction, which sites require mitigation and what measures should be put in place to protect sites that should be conserved. The content of HIA reports are clearly outlined in Section 38(3) of the NHRA and SAHRA Minimum Standards.
Heritage resource	Any place or object of cultural significance.

Term	Definition
Heritage resources management	Process required when development is intended categorised as: ▪ Any linear development exceeding 300m in length. ▪ Construction of a bridge or similar structure exceeding 50 m in length. ▪ Any activity which will change the character of a site exceeding 0.5 hectares in extent or involving three or more existing erven or subdivisions thereof or that have been consolidated within the past five years or costs of which will exceed a sum set in terms of regulations by SAHRA or a provincial heritage resources authority. ▪ Re-zoning of a site exceeding one hectare in extent. ▪ Any other category of development provided for in regulations by SAHRA or a provincial heritage resources authority.
Heritage site	Any place declared to be a national heritage site by SAHRA or a place declared to be a provincial heritage site by a provincial heritage resources authority.
Late Farming Community/ies	Farming Communities who either developed / evolved from EFC groups, or who migrated into southern African from the late first millennium / early second millennium CE. The LFC period evidences distinct changes in socio-political organisation, settlement patterns, trade and economic activities, including extensive trade routes. The LFC period is generally dated from c. 1000 CE well into the modern historical period of the nineteenth century.
Late Stone Age	The South African LSA dates from ~30 Kya. This period is associated with modern *Homo sapiens sapiens* and the complex hunter-gatherer societies, ancestral to the Bushmen / San and Khoi. The LSA lithic assemblage contains microlithic technology and composite tools such as arrows commonly produced from fine-grained cryptocrystalline, quarts and chert. The LSA is also associated with archaeological rock art including both paintings and engravings.
Living / intangible heritage	The intangible aspects of inherited culture that could include cultural tradition, oral history, performance, ritual, popular memory, skills and techniques, indigenous knowledge systems, the holistic approach to nature, society and social relationships.
Management	In relation to heritage resources, includes the conservation, presentation and improvement of a place protected in terms of the NHRA.
Middle Stone Age	The South African MSA dates from ~300 Kya to c. 30 Kya. This period is associated with the changing behavioural patterns and the emergence of modern cognitive abilities in early *Homo sapiens species.* The lithic industries that characterise the MSA are typically more complex tools with diagnostic identifiers, including convergent flake scars, multi-faceted platforms, retouch and backing. Assemblages are characterised as refined lithic technologies such as prepared core techniques, retouched blades and points manufactured from good quality raw material.

Term	Definition
National estate	The national estate as defined in Section 3 of the NHRA, i.e. heritage resources of South Africa which are of cultural significance or other special value for the present community and for future generations. The national estate may include: ▪ 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, including ancestral graves, royal graves and graves of traditional leaders, graves of victims of conflict, graves of individuals designated by the Minister by notice in the Gazette, historical graves and cemeteries, and other human remains which are not covered in terms of the National Health Act, 2003 (Act No. 61 of 2003). ▪ Sites of significance relating to the history of slavery in South Africa. ▪ Movable objects, including objects recovered from the soil or waters of South Africa, including archaeological and palaeontological objects and material, meteorites and rare geological specimens; objects to which oral traditions are attached or which are associated with living heritage; ethnographic art and objects; military objects; objects of decorative or fine art; objects of scientific or technological interest. ▪ Books, records, documents, photographic positives and negatives, graphic, film or video material or sound recordings, excluding those that are public records as defined in section 1(xiv) of the National Archives of South Africa Act, 1996 (Act No. 43 of 1996).
Object	Any movable property of cultural significance which may be protected in terms of any provisions of this Act, including: any archaeological artefact; palaeontological and rare geological specimens; meteorites; and other objects referred to in Section 3 of the NHRA.
Pedestrian survey	A method of examining a site in which surveyors, spaced at regular intervals, systematically walk over the area being investigated.
Phase 1 Archaeological Impact Assessment (AIA)	Phase 1 AIAs generally involve the identification and assessment of sites during a field survey of a portion of land that is going to be affected by a potentially destructive or landscape-altering activity.
Phase 2 Archaeological Impact Assessment (AIA)	Phase 2 AIAs are primarily based on salvage or mitigation excavations preceding development that will destroy or impact on a site. This may involve collecting of artefacts from the surface and / or excavation of representative samples of the artefactual material to allow characterisation of the site and the collection of suitable materials for dating the sites. Phase 2 AIAs aim to obtain a general idea of the age, significance and meaning of the site that is to be lost and to store a sample that can be consulted at a later date for research purposes. Phase 2 excavations can only be done under a permit issued by SAHRA, or other appropriate heritage agency, to the appointed archaeologist.

Term	Definition
Phase 3 Management Plan / Conservation Management Plan (CMP)	On occasion, a site may require a Phase 3 programme involving the modification of the site or the incorporation of the site into the development itself as a site museum, a special conservation area or a display. Alternatively it is often possible to relocate or plan the development in such a way as to conserve the archaeological site or any other special heritage significance the place may have. For example, in a wilderness area or open space when sites are of public interest the development of interpretative material is recommended and adds value to the development. Permission for the development to proceed can be given only once the heritage resources authority is satisfied that measures are in place to ensure that the archaeological sites will not be damaged by the impact of the development or that they have been adequately recorded and sampled. Careful planning can minimise the impact of archaeological surveys on development projects by selecting options that cause the least amount of inconvenience and delay. The process as explained above allows the rescue and preservation of information relating to our past heritage for future generations. It balances the requirements of developers and the conservation and protection of our cultural heritage as required of SAHRA and the provincial heritage resources authorities (ASAPA).
Place	A place includes: a site, area or region; a building or other structure which may include equipment, furniture, fittings and articles associated with or connected with such building or other structure; a group of buildings or other structures which may include equipment, furniture, fittings and articles associated with or connected with such group of buildings or other structures; an open space, including a public square, street or park; and in relation to the management of a place, includes the immediate surroundings of a place.
Pre-disturbance survey (syn. reconnaissance)	A survey to record a site as it exists, with all the topographical and other information that can be collected, without excavation or other disturbance of the site.
Presentation	In relation to a heritage resource, site or place includes: the exhibition or display of; the provision of access and guidance to; the provision, publication or display of information in relation to; and performances or oral presentations related to, heritage resources protected in terms of the NHRA.
Provisional protection	A protected area or heritage resource provisionally protected by SAHRA or a provincial heritage resources authority by a notice in the Gazette or Provincial Gazette.
Reconnaissance	A broad range of techniques involved in the location of archaeological sites, e.g. surface survey and the recording of surface artefacts and features, the sampling of natural and mineral resources, and sometimes testing of an area to assess the number and extent of archaeological resources. However, in terms of South African practice, reconnaissance during a so-called Phase 1 AIA never includes sampling as this is a permitted activity, usually undertaken during so-called Phase 2 AIAs (ASAPA).
Site	Any area of land, including land covered by water, and including any structures or objects thereon.

Term	Definition
Stop work order	An order served on a person by the Minister on advice of SAHRA or MEC to immediately cease all work in and around a heritage site for a period not exceeding 10 years. The order attaches to land is binding on the current owner and any future owner.
Structure	Any building, works, device or other facility made by people and which is fixed to land, and includes any fixtures, fittings and equipment associated therewith.
Tangible heritage	Physical heritage resources such as archaeological sites, historical buildings, burial grounds and graves, fossils, etc. Tangible heritage may be associated with intangible elements, e.g. the living cultural traditions, rituals and performances associated with burial grounds and graves and deceased persons.

EXECUTIVE SUMMARY

Digby Wells Environmental (hereinafter Digby Wells) are providing specialist services to Sasol Mining (Pty) Ltd (hereinafter Sasol) to comply with the national legislative process for the consolidation of their Twistdraai Colliery: Thubelisha Shaft (TCTS), Trichardtsfontein and Vaalkop Mining Right areas ("*the Project*"). The proposed consolidation of the Mining Right areas will be completed in terms of Section 102 of the Minerals and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) (MPRDA).

The aim of the HRM process was to comply with regulatory requirements contained within Section 38 of the National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA) through the following:

- Defining the cultural landscape within which the Project is situated;
- Identify, as far as is feasible, heritage resources that may be impacted upon by the project as well as define the Cultural Significance (CS);
- Assess the possible impacts to the identified heritage resources;
- Consider the socio-economic benefits of the Project; and
- Provide feasible mitigation and management measures to avoid, remove or reduce perceived impacts and risks.

Through an understanding of various heritage resources distribution within the site-specific study area, the statement of CS as presented in the table below demonstrates an average medium significance rating for the defined cultural landscape.

Resource ID	Description	INTEGRITY	CS Value	Cultural Significance
Vryheid Formation	Geological strata with palaeontological sensitivity	4	20	Very High
LFC Sites	LFC sites with good integrity	4	13	Medium High
LFC Sites	LFC sites with poor integrity	1	3	Negligible
Historical Built Environment	Historical structures associated with living groups with good integrity	4	12	Medium
Historical Built Environment	Historical structures associated with living groups with poor integrity	1	3	Negligible
Historical Built Environment	Historical structures not associated with living groups with good integrity	4	12	Medium
Historical Built Environment	Historical structures not associated with living groups with poor integrity	1	3	Negligible

Resource ID	Description	INTEGRITY	CS Value	Cultural Significance
Burial grounds and graves	Burials / graves	4	20	Very High

Furthermore, based on the distribution of known heritage resources, none occur within or in proximity to the development of the proposed ventilation shafts on TCTS and Trichardtsfontein respectively. Therefore no direct impacts to heritage resources from the construction and operation of the ventilations shafts are envisaged.

The proposed mining methodologies will all occur at sub-surface levels, with no mining occurring on the surface. These methodologies avoid potential direct impacts to identified heritage resources occurring within or in proximity to the underground operations. The inclusion of high-extraction mining however, does increase the risk of subsidence during operation and decommissioning phases.

A summary of the potential risk to protected heritage resources is presented in the following table:

Phase	Activity	Risk	Potential Impact
Operational	High extraction mining method	High extraction mining method may result in subsidence	Damage or destruction of NHRA Section 34 resources, i.e. structures and built environment resources older than 60 years.
			Destruction of or disturbance to NHRA Section 35 resources, i.e. archaeological and/or palaeontological resources.
			Damage or destruction of, and loss of access to, NRHA Section 36 resources, i.e. burial grounds and graves.
Decommissioning	Closure	Underground mining voids may result in subsidence	Destruction or alteration of NHRA Section 34 resources, i.e. structures and built environment resources older than 60 years.
			Destruction of or disturbance to NHRA Section 35 resources, i.e. archaeological and/or palaeontological resources.

Phase	Activity	Risk	Potential Impact
			Damage or destruction of, and loss of access to, NRHA Section 36 resources, i.e. burial grounds and graves.

Based on Digby Wells' understanding of the Project while considering the defined cultural landscape and known heritage resources, no impacts are envisaged by the construction and operation of the proposed TCTS and Trichardtsfontein ventilations shafts, or the inclusion of high-extraction mining methodologies. This notwithstanding, the following recommendations have been made:

- An RfE from further palaeontological assessment based on the motivations and conditions presented in Section 10; and
- The development and implementation of a CMP for the consolidated site-specific study area to proactively manage the identified risk of subsidence.

Where these recommendations are adopted, Digby Wells does not object to the implementation of the Project.

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1 Introduction

Digby Wells Environmental (hereinafter Digby Wells) are providing specialist services to Sasol Mining (Pty) Ltd (hereinafter Sasol) to comply with the national legislative process for the consolidation of their Twistdraai Colliery: Thubelisha Shaft (TCTS), Trichardtsfontein and Vaalkop Mining Right areas ("*the Project*"). The proposed consolidation of the Mining Right areas will be completed in terms of Section 102 of the Minerals and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) (MPRDA).

This report constitutes the Heritage Impact Assessment (HIA). The HIA was completed to comply with the requirements of the National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA) and specifically inform the South African Heritage Resources Agency (SAHRA) and Mpumalanga Provincial Heritage Resources Authority (MPRHA) of the proposed Project.

1.1 Project background

Sasol owns the Mining Right for the TCTS (Ref: MP 30/5/1/2/2/138MR). In 2013, Duiker Mining (Pty) Ltd, a wholly owned subsidiary of Xstrata Coal, now Glencore Operations South Africa (Pty) Ltd (Glencore), appointed Digby Wells to undertake a Scoping and Environmental Impact Assessment (S&EIA) process. The S&EIA process was in support of a Mining Right Application (MRA) for the proposed Trichardtsfontein Mine in accordance with Section 39(1) and Regulation 49 of the MPRDA. Glencore's strategic objective was to cede the Trichardtsfontein Mining Right to Sasol once granted. The Trichardtsfontein Mine is intended as a link between two other Sasol operations.

In support of the S&EIA process, Digby Wells' heritage specialists undertook a review of an existing heritage assessment for the TCTS (van Schalkwyk J. A., Heritage Impact Assessment for the planned Twistdraai Colliery: Thubelisha Shaft in the Highveld Ridge and Bethal Municipal Districts, Mpumalanga Province, 2007), and compiled a gap analysis (Refer to Section 5 below). The S&EIA process concluded with the awarding of the Trichardtsfontein Mine Mining Right (Ref: MP30/5/1/2/2/10056MR). Complying with Section 11 of the MPRDA, Glencore has subsequently successfully transferred the approved Mining Right for Trichardtsfontein to Sasol. Sasol is now accountable for implementation of the approved Environmental Management Programme (EMPr) for the Trichardtsfontein Mine Mining Right.

Furthermore, Sasol is also the holder the Vaalkop Mining Right (Ref MP30/5/1/2/2/138MR). While this Mining Right has been awarded, no specialist studies or EMPr was compiled as part of the application process. The Vaalkop Mining Area is situated directly adjacent and north of the TCTS area. In response to the location of this Mining Right, it was amended for inclusion into the TCTS right and is currently waiting on registration with the relevant competent authorities.

1.2 Project Description

Sasol are presently exploring options for the amendment to and consolidation of their three aforementioned Mining Rights. Sasol will accomplish this objective through the development of a consolidated EMPr for all three operations to promote more efficient and effective management. To this effect, they have proposed the following:

- To include high-extraction mining methodologies in addition to the approved bord and pillar mining method;
- To convey all waste rock and Run of Mine (RoM) from mine workings to the TCTS;
- To construct two ventilation shafts within their TCTS and Trichardtsfontein Mining Right areas respectively;
- To undertake the necessary specialist studies on the Vaalkop Mining Right area to assess the potential impacts of aforementioned construction and operational activities; and
- To consolidate their TCTS and Trichardtsfontein EMPr and include the results of the Vaalkop specialist studies into a single EMPr as part of the greater "Secunda Complex".

These proposed activities do not exceed thresholds contained within the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA) Environmental Impact Assessment (EIA) Regulations (GN R 982), promulgated in 2014. This does not, however, preclude the requirement to obtain Environmental Authorisation (EA) for these infrastructures. Furthermore, consolidating the various Mining Rights will require adjudication by the Department of Mineral Resources (DMR) in terms of Section 102 of the MPRDA.

1.3 Project Location

The Project is located between Secunda / Trichardt and Bethal in the Govan Mbeki Local Municipality (GMLM), Mpumalanga Province.

The area is predominantly characterised by urban settlements, farmsteads, intensive agricultural and grazing. Industrial coal mining is the dominant secondary activity, with Syferfontein and Isibonelo operations situated to the northwest of the Project.

Table 1-1 presents a summary of the Project location detail.

Table 1-1: Project location summary

Towns	Trichardt Secunda	
Location	Off the N17, North-east of Secunda, and north-west of Bethal	
Erf or farm number/s	Caley 77 IS Driefontein 137 IS	Ongezien 105 IS Ongezien 567 IS

	Driehoek 275 IS Elandsfontein 147 IS Frischgewaagd 142 IS Frischgewaagd 294 IS Grootvlei 293 IS Grootvlei 565 IS Holfontein 111 IS Holfontein 138 IS K-Kraal 148 IS Klipkraal 114 IS K-Stad 79 IS Leddaar 78 IS Moedig 574 IS Montrose 290 IS	Palmietfontein 110 IS Pieksdal 298 IS Rietfontein 146 IS Rooipoort 143 IS Rooipoort 144 IS Rustfontein 109 IS Trichardtsfontein 140 IS Tweedraai 139 IS Vaalkop 104 IS Witrand 103 IS Witrand 569 IS Ystervarkfontein 140 IS Zeekoegat 145 IS
Coordinates of approximate centre of project area	29.327865	
	-26.441962	
District Municipality	Gert Sibande District Municipality (GSDM)	
Local Municipality	GMLM	
Extent of properties	23 316.81 ha	
Current use	Settlement; Agriculture	
Predominant land use/s of surrounding properties	Settlement; Agriculture and Mining	

1.4 Specified Mining Methods

Sasol propose using underground mining methodologies to access the ore body at ~160 – 180 m depth through the existing shafts at TCTS. Currently, Sasol employ a high-extraction mining method at TCTS, and propose the same for both Trichardtsfontein and Vaalkop mining areas[1]. A mechanised bord and pillar method achieves extraction through development of a series of roadways (bords) in the coal seam connected by splits (cut-through) to form pillars. In a high-extraction model, the remaining pillars are eventually extracted allowing for controlled collapse (stooping). Extracted coal will be transported a via conveyor system to the surface at TCTS. The processed coal is first stockpiled and then transported via the existing overland conveyor system to the current Twistdraai Export Plant for beneficiation or sale as raw coal.

[1] The Project proposes to amend the approved bord and pillar mining method for Trichardtsfontein and Vaalkop to high-extraction.

Situated at TCTS is the required infrastructure to complete the proposed mining activities. Sasol do, however, propose constructing two additional ventilation shafts within the TCTS and Trichardtsfontein areas respectively.

1.5 Terms of Reference

The Terms of Reference (ToR) for the specialist heritage study was to conduct a Heritage Resources Management (HRM) Process in support of the authorisation application applicable to this Project. Digby Wells completed the HRM Process in accordance with Section 38(8) of the NHRA.

1.6 Scope of Work

The Scope of Work (SoW) for the specialist HRM process included the compilation of an HIA to comply with Section 38(3) of the NHRA. The following activities were completed as part of this SoW:

- Completing a literature review to assist in defining the predominant cultural landscape;
- Undertaking historical layering to identify potential structures older than 60 years that are protected under Section 34 of the NHRA, or any other tangible heritage resources;
- Identification and mapping (*as far as feasible*) of all heritage resources in the proposed site-specific study area;
- Assessment of Cultural Significance (CS) of identified heritage resources;
- Identification of potential impacts to heritage resources based on Project activities;
- An evaluation of the impact of the operation on heritage resources relative to the sustainable socio-economic benefits that may be derived from the Project;
- Present the results of consultation with Interested and Affected Parties (I&APs) and/or stakeholders;
- Recommend feasible management or mitigation measures to avoid and/or reduce negative impacts and enhance positive ones; and
- Submission of the HIA report to the SAHRA and MPRHA for Statutory Comment as required under Section 38(8) of the NHRA.

1.7 Expertise of the Specialist

The expertise of the HRM specialist is presented in Table 1-2:

Table 1-2: Expertise of the specialist

Team Member	Bio Sketch
Justin du Piesanie ASAPA Member 270 AMAFA Registered ICOMOS Member 14274 IAIAsa Member Years' Experience: 11	Justin is the HRM Unit Manager at Digby Wells. Justin joined the company in August 2011 as an archaeologist and was subsequently made unit manager in the Social and Heritage Services Department. He obtained his Master of Science (MSc) degree in Archaeology from the University of the Witwatersrand in 2008, specialising in the Southern African Iron Age. Justin also attended courses in architectural and urban conservation through the University of Cape Town's Faculty of Engineering and the Built Environment Continuing Professional Development Programme in 2013. Justin is a professional member of the Association of Southern African Professional Archaeologists (ASAPA), and accredited by the association's Cultural Resources Management (CRM) section. He is also a member of the International Council on Monuments and Sites (ICOMOS), an advisory body to the UNESCO World Heritage Convention. He has over 10 years combined experience in HRM in South Africa, including heritage assessments, archaeological mitigation, grave relocation, and NHRA Section 34 application processes. Justin has gained further generalist experience since his appointment at Digby Wells in Botswana, Burkina Faso, the Democratic Republic of Congo, Liberia and Mali on projects that have required compliance with IFC requirements such as Performance Standard 8: Cultural Heritage. Furthermore, Justin has acted as a technical expert reviewer of HRM projects undertaken in Cameroon and Senegal. Justin's current focus at Digby Wells is to develop the HRM process as an integrated discipline following international HRM principles and standards. This approach aims to provide clients with comprehensive, project-specific solutions that promote ethical heritage management and assist in achieving strategic objectives.

1.8 Structure of the Report

The remainder of the report, with references to the relevant information required in terms of Section 38(3) of the NHRA, is structured as per the below table.

Table 1-3: Structure of the report

Chapter	Description	NHRA information requirements
2	Outlines the legislative framework relevant to the specialist heritage study.	-
3	Identifies the specific constraints and limitations of the HIA.	-
4	Describes the methodology employed in the compilation of this HIA.	-
5	Summarises the results of the gap analysis completed on the previous heritage assessment.	-
6	Provides the baseline cultural landscape.	38(3)(a)
7	Motivates for the defined CS of the identified heritage resources and landscape.	38(3)(b)
	Considers the potential impacts to heritage resources by project related activities.	38(3)(c)
	Outlines possible risks to heritage resources and heritage related risks to the project.	

Chapter	Description	NHRA information requirements
8	Considers the development context to assess the socio-economic benefits of the project in relation to the presented impacts and risks.	38(3)(d)
9	Presented the results of consultation.	38(3)(e)
10	Details the specific recommendations based on the contents of the HIA.	38(3)(g)
11	Collates the most salient points of the HIA and concludes with the specific outcomes and recommendations of the study.	38(3)(f) 38(3)(g)
12	Lists the source material used in the development of the report.	-

2 Legislative and Policy Framework

The HRM process is governed by the national legislative framework. This section provides a brief summary of the relevant legislation pertaining to the conservation and responsible management of heritage resources.

Table 2-1: Applicable legislation considered in the HRM process

Applicable legislation used to compile the report	Reference where applied
Constitution of the Republic of South Africa, 1996 (Act No. 108 of 1996) Section 24 of the Constitution states that everyone has the right to an environment that is not harmful to their health or well-being and to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures, that – i. Prevent pollution and ecological degradation; ii. Promote conservation; and iii. Secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development	The EIA amendment process and associated HRM process is being undertaken to identify heritage resources and determine heritage impacts associated with the project. As part of the HRM process, mitigation measures and monitoring plans will be recommended to ensure that any potential impacts are managed to acceptable levels to support the rights as enshrined in the Constitution.

Applicable legislation used to compile the report	Reference where applied
Mineral and Petroleum Resource Development Act. 2002 (Act No. 28 of 2002) The MPRDA sets out the requirements relating to the development of the nation's mineral and petroleum resources. It also aims to ensure the promotion of economic and social development through exploration and mining-related activities. The MPRDA requires that mining companies assess the socio-economic impacts of their activities from start to closure and beyond. Companies must develop and implement a comprehensive Social and Labour Plan (SLP) to promote socio-economic development in their host communities and to prevent or lessen negative social impacts. Section 102 of this Act applies in respect of proposed amendments to the existing mining rights. A Section 102 Amendment does not explicitly require a heritage study and therefore does not trigger a NHRA section 38(8) application. However, a Section 102 Amendment does require an EA application to be completed which entails a BAR or EIA to be conducted. The EIA or BAR must therefore be conducted in accordance with Section 39 of the MPRDA that give effect to the general objectives of integrated environmental management encapsulated in Chapter 5 of the NEMA. The EIA must furthermore speak to impacts that the mining will have on the environment in accordance with section 24(7) of the NEMA.	This HIA, which relates specifically to the Twistdraai Colliery: TCTS, Trichardtsfontein and Vaalkop Mining Rights Section 102 and 31 amendment has been compiled in accordance with the MPRDA and the EIA Regulations, 2014.
National Environmental Management Act, 1998 (Act No. 107 of 1998) The NEMA, as amended, was set in place in accordance with section 24 of the Constitution of the Republic of South Africa. Certain environmental principles under NEMA have to be adhered to, to inform decision making on issues affecting the environment. Section 24 (1)(a), (b) and (c) of NEMA state that: *The potential impact on the environment, socio-economic conditions and cultural heritage of activities that require authorisation or permission by law and which may significantly affect the environment, must be considered, investigated and assessed prior to their implementation and reported to the organ of state charged by law with authorizing, permitting, or otherwise allowing the implementation of an activity.* The Environmental Impact Assessment (EIA) Regulations, Government Notice Regulation (GN) R.982 were published on 04 December 2014 and promulgated	The amendment process is being undertaken in accordance with the principles of Section 2 of NEMA as well as with the EIA 2014 Regulations, promulgated in terms of NEMA. Based on the regulatory process, it has been identified that a amendment process is required for the project. An application for the amendment and consolidation of the various EMPrs will be submitted to the DMR who is the relevant Competent Authority in terms of this application for authorisation.

Applicable legislation used to compile the report	Reference where applied
on 08 December 2014. Together with the EIA Regulations, the Minister also published GN R.983 (Listing Notice No. 1), GN R.984 (Listing Notice No. 2) and GN R.985 (Listing Notice No. 3) in terms of Sections 24(2) and 24D of the NEMA, as amended.	
GN R. 982: Environmental Impact Assessment Regulations, 2014 These three listing notices set out a list of identified activities which may not commence without an Environmental Authorisation from the relevant Competent Authority through one of the following processes: ▪ Regulation GN R. 983 - Listing Notice 1: This listing notice provides a list of various activities which require environmental authorisation and which must follow a basic assessment process. ▪ Regulation GN R. 984 – Listing Notice 2: This listing notice provides a list of various activities which require environmental authorisation and which must follow an environmental impact assessment process. ▪ Regulation GN R. 985 – Listing Notice 3: This notice provides a list of various environmental activities which have been identified by provincial governmental bodies which if undertaken within the stipulated provincial boundaries will require environmental authorisation. The basic assessment process will need to be followed.	Listing Notice 1 Activity 27 will be triggered due to the construction of the ventalation shafts
National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA) The NHRA is the overarching legislation that protects and regulates the management of heritage resources in South Africa, with specific reference to the following Sections: ▪ 5. General principles for HRM ▪ 6. Principles for management of heritage resources ▪ 7. Heritage assessment criteria and grading ▪ 38. Heritage resources management The Act requires that Heritage Resources Authorities (HRAs), in this case the South African Heritage Resources Agency (SAHRA) and the Mpumalanga Provincial Heritage Resources Authority (MPRHA), be notified as early as possible of any developments that may exceed certain minimum thresholds in terms of	This HIA will be submitted to the SAHRA and MPHRA. The HIA was compiled to comply with of subsection 3(3)(a) and (b), 38(3), (4) and (8) of the NHRA.

Applicable legislation used to compile the report	Reference where applied
Section 38(1), or when assessments of impacts on heritage resources are required by other legislation in terms of Section 38(8) of the Act.	

Table 2-2: Applicable policies considered in the HRM process

Applicable policies used to compile the report	Reference where applied
SAHRA Archaeology, Palaeontology and Meteorites (APM) Guidelines: Minimum Standards for the Archaeological and Palaeontological Components of Impact Assessment Reports (2007) The guidelines provide the minimum standards that must be adhered to for the compilation of a HIA Report. Chapter II Section 7 outlines the minimum requirements for inclusion in the heritage assessment as follows: ▪ Background information on the Project; ▪ Background information on the cultural baseline; ▪ Description of the properties or affected environs; ▪ Description of identified sites or resources; ▪ Recommended field rating of the identified sites to comply with Section 38 of the NHRA; ▪ A statement of Cultural Significance in terms of Section 3(3) of the NHRA; and ▪ Recommendations for mitigation or management of identified heritage resources.	The HIA was compiled to adhere to the minimum standards as defined by Chapter II of the SAHRA APM Guidelines (2007)

3 Constraints and Limitations

The following constraints and limitations were experienced during compilation of this HIA:

- The HIA only considers the amendment to authorised activities in the assessment of potential impacts to identified heritage resources as outlined in Section 1.4 above;
- All authorised activities across the various Mining Rights are considered relevant and remain applicable;
- Whilst every attempt to obtain the latest available information was made, the reviewed literature does not represent an exhaustive list of information sources for the various study areas;
- The HIA does not present an exhaustive list of heritage resources in the various study areas;
- The pre-disturbance survey was limited to the Vaalkop Mining Right to assess the current cultural landscape not previously subjected to a specialist heritage study;

- Results from the previously completed heritage studies were not subject to an assessment of CS or verified during the field survey;
- Palaeontological and archaeological resources commonly occur at subsurface levels. These types of resources may not be adequately recorded or documented by assessors without intrusive and destructive methodologies. Therefore, the reviewed literature and previously completed assessments are in themselves limited to surface observations; and
- The HIA was compiled prior to the initiation of the regulated consultation process. No results from formal consultation were considered in the compilation of this HIA. All heritage related comments will be addressed as part of the required Comments and Response Report (CRR) after the public commenting period to further satisfy the requirements Section 38(3) of the NHRA.

4 Methodology

4.1 Defining the study area

Heritage resources do not exist in isolation to the greater natural and social (including socio-cultural, -economic and -political) environment. In addition, the NHRA requires the grading of heritage resources in terms of national, provincial and local concern based on their importance and consequent official (i.e. State) management effort required. The type and level of baseline information required to adequately predict heritage impacts varies between these categories. Three 'concentric' study areas were defined for the purposes of this study. The three defined study areas include the following:

- The *site-specific* study area – the farm portions extent associated with the proposed project including a 500 m buffer area. The site-specific study area may extend linearly. In such instances, the defined site-specific study area includes the linear development, e.g. a road, and a 200 m buffer either side of the development footprint;
- The *local* study area – the area most likely to be influenced by any changes to heritage resources in the project area, or where project development could cause heritage impacts. Defined as the area bounded by the local municipality, in this instance the GMLM, with particular reference to the immediate surrounding properties / farms. The local study area was specifically examined to offer a backdrop to the socio-economic conditions within which the proposed development will occur. The local study area furthermore provided the local development and planning context that may contribute to cumulative impacts; and
- The *regional* study area – defined as the area bounded by the district municipality demarcation. Where necessary, the regional study area was extended outside the boundaries of the district municipality to include much wider regional expressions of specific types of heritage resources and historical events. The regional study area

also provided the regional development and planning context that may contribute to cumulative impacts.

4.2 Gap analysis

The heritage gap analysis considered criteria contained in Section 38 of the NHRA in terms of the minimum HIA report requirements listed in subsection 38(3) and the HRM process as per subsection 38(4) (Refer to Table 4-1). The aim of the gap analysis is to determine compliance and adequacy of information to enable the relevant heritage resource authorities (HRAs) to make appropriate decisions. Determining adequacy, however, is too subjective to rate and was rather included in the analysis as recommendations for additional information.

The gap analysis employed a compliance matrix to identify gaps and rate the level of compliance and adequacy. The sum of a simple "yes/no" rating was used with each criterion divided by nine to provide the compliance rating. Non-compliance was considered as a total less than one, partial compliance as a total rating from one to eight, and full compliance as a rating of nine.

Table 4-1: NHRA Section 38 criteria

NHRA Section	Description of criteria
38(3)(a)	Identification and mapping of heritage resources
38(3)(b)	Evaluation of significance
38(3)(c)	Heritage impact on resources
38(3)(d)	Heritage impact relative to sustainable social and economic benefits
38(3)(e)	Results of consultation
38(3)(f)	Consideration of alternatives
38(3)(g)	Mitigation plans
38(4)	Report submission to responsible Heritage Resources Authority (HRA)
38(4)	Statutory Comment issued by responsible HIA

Table 4-2: Compliance rating system

		Compliance rating																		
Criteria		-9	-8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9
	1	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9
	2	-5	-4	-4	-3	-3	-2	-2	-1	-1	0	1	1	2	2	3	3	4	4	5
	3	-3	-3	-2	-2	-2	-1	-1	-1	0	0	0	1	1	1	2	2	2	3	3
	4	-2	-2	-2	-2	-1	-1	-1	-1	0	0	0	1	1	1	1	2	2	2	2
	5	-2	-2	-1	-1	-1	-1	-1	0	0	0	0	0	1	1	1	1	1	2	2
	6	-2	-1	-1	-1	-1	-1	-1	0	0	0	0	0	1	1	1	1	1	1	2
	7	-1	-1	-1	-1	-1	-1	0	0	0	0	0	0	0	1	1	1	1	1	1
	8	-1	-1	-1	-1	-1	-1	0	0	0	0	0	0	0	1	1	1	1	1	1

	9	-1	-1	-1	-1	-1	0	0	0	0	0	0	0	0	0	1	1	1	1	1

4.3 Statement of cultural significance

Digby Wells designed the significance rating process to provide a numerical rating of the CS[2] of identified heritage resources. This process considered heritage resources assessment criteria set out in subsection 3(3) of the NHRA, which determined the intrinsic, comparative and contextual significance of identified heritage resources. A resource's importance rating was based on information obtained through review of available credible sources and representativity or uniqueness (i.e. known examples of similar resources to exist).

The rationale behind the heritage value matrix takes into account that a heritage resource's value is a direct indication of its sensitivity to change (i.e. impacts). Value, therefore, was determined prior to completing any assessment of impacts.

The matrix rated the potential, or importance, of an identified resource relative to its contribution to certain values – aesthetic, historical, scientific and social. Resource significance was directly related to the impact on it that could result from project-related activities, as it provided minimum accepted levels of change to the resource.

4.4 Data collection

4.4.1 Primary data collection

Primary data was collected by Justin du Piesanie and Johan Nel through a pre-disturbance survey of the Vaalkop site-specific study area from 23 – 27 January 2017. The survey was non-intrusive (i.e. no sampling was undertaken) with the objectives to:

- Visually record the current state of the cultural landscape;
- Ground-truth certain heritage resources and sites identified through the literature; and
- Record a representative sample of visible tangible heritage resources present within the Vaalkop site-specific and local study areas.

Anthropogenic activities has greatly altered the landscape over time. The main activities that caused the changes are agriculture related, with several agricultural fields covering approximately 72% of the Vaalkop project area (*roughly 5 572 ha*).

Based on this understanding of the site-specific study area, the pre-disturbance survey was primarily vehicular based, with undisturbed areas or noted points of interest, including koppies, pans and watercourses, subject to pedestrian survey.

[2] Cultural significance is defined in the NHRA as the intrinsic "aesthetic, architectural, historical, scientific, social, spiritual, linguistic or technological value or significance" of a heritage resource. These attributes are combined and reduced to four themes used in the Digby Wells significance matrix: aesthetic, historical, scientific and social.

Identified heritage resources were recorded as waypoints using handheld GPS and documented through written and photographic records. The survey was recorded as track logs.

4.4.2 Secondary data collection

Data collection assists in the development of a cultural heritage baseline profile of the study area under consideration. Qualitative data was collected to inform this HIA and primarily obtained through secondary information sources, i.e. desktop literature review and historical layering.

A survey of diverse information repositories was made to identify appropriate relevant information sources. These sources were analysed for credibility and relevance. Credible, relevant sources were then critically reviewed. The objectives of the literature review were to:

- Gain an understanding of the cultural landscape within which the proposed Project is located; and
- Identify any potential fatal flaws, sensitive areas, current social complexities / issues and known or possible tangible heritage.

Repositories that were surveyed included the South African Heritage Resources Information System (SAHRIS), online / electronic journals and platforms, and certain internet sources. This HIA only includes a summary and discussion of the most relevant findings. Relevant sources were cited and included in the literature review's reference list.

Historical layering is a process whereby diverse cartographic sources from various time periods are layered chronologically using Geographic Information System (GIS). The rationale behind historical layering is threefold, as it:

- Enables a virtual representation of changes in the land use of a particular area over time;
- Provides relative dates based on the presence / absence of visible features; and
- Identifies potential locations where heritage resources may exist within an area.

Table 4-3: Qualitative data sources

Reviewed Qualitative Data		
Databases		
University of the Witwatersrand (Wits) Archaeological Database (2010)	Genealogical Society of South Africa (GSSA)	SAHRIS
SAHRIS Cases		
Case ID 138	Case ID 5472	Map ID 00687

Reviewed Qualitative Data		
Case ID 166	Case ID 5621	Map ID 00710
Case ID 174	Case ID 5914	Map ID 00711
Case ID 466	Case ID 6251	Map ID 00719
Case ID 756	Case ID 6299	Map ID 01025
Case ID 846	Case ID 6357	Map ID 01121
Case ID 1144	Case ID 6392	Map ID 01147
Case ID 1487	Case ID 6492	Map ID 01153
Case ID 1722	Case ID 6810	Map ID 01164
Case ID 1724	Case ID 6944	Map ID 01165
Case ID 1803	Case ID 7359	Map ID 01179
Case ID 2261	Case ID 7364	Map ID 01668
Case ID 3020	Case ID 8410	Map ID 01718
Case ID 3135	Case ID 8481	Map ID 02179
Case ID 3745	Map ID 00648	Map ID 02418
Case ID 3907	Map ID 00654	Map ID 02859
Case ID 4249	Map ID 00659	Map ID 02907
Case ID 4309	Map ID 00662	
Case ID 4919	Map ID 00672	

Cited Text		
Bamford, 2012	Karodia & Nel, 2014b	Rubidge, 2013b
Bamford, 2014	Laurier, 2006	SAHRA, 2013a
Bamford, 2016	Lombard, et al., 2012	SAHRA, 2013b
Brodie, 2008	Maggs, 1974	Schirmer, 2007
Clark, 1982	Maggs, 1976	Seliane, 2013
Deacon & Deacon, 1999	Magoma, 2013	Smith & Zubieta, 2007
Delius & Cope, 2007	Makhura, 2007	Statistics SA, 2011
Delius, et al., 2014	Mitchell, 2002	Swanepoel, et al., 2008
du Piesanie & Nel, 2013	Mucina & Rutherford, 2006	The Voortrekkers, 2014
du Piesanie & Nel, 2016	Ouzman, 2009	von der Hyde, 2013
Eastwood, et al., 2002	Pakenham, 1979	Willsworth, 2006
Fourie & van der Walt, 2007	Pelser, 2013a	van Schalkwyk, 2003a

Reviewed Qualitative Data		
Gert Sibande District Municipality, 2014	Pelser, 2013b	van Schalkwyk, 2003b
Gert Sibande District Municipality, 2016	Pistorius, 2008a	van Schalkwyk, 2007
Goven Mbeki Local Municipality, 2016	Pistorius, 2008b	van Schalkwyk, 2003c
Holden & Mathabatha, 2007	Pistorius, 2007	van Schalkwyk, 2003d
Huffman, 2004	Pistorius, 2011	van Schalkwyk, 2012
Huffman, 2007	Potgieter, 1955	van Wyk Rowe, 2014
Johnson, et al., 1996	Raper, 1987	von der Heyde, 2013
Johnson, et al., 2006	Rubidge, 2008	
Karodia & Nel, 2014a	Rubidge, 2013a	

Table 4-4: Historical imagery sources

Historical Imagery						
Map Series			**Name / Number**		**Date**	
Jeppes			Jeppes Map of the Transvaal		1899	
Major Jackson			Bethal – February 1902		1902	
Major Jackson			Bethal – April 1905		1905	
Aerial photographs						
Job no.	**Flight plan**	**Photo no.**	**Map ref.**	**Area**	**Date**	**Ref.**
548	7	01457-01459	2629, 2630	Bethal	1968	548/1968
	8	00973-00974				
	9	00458-00461				
	10	00491-00500				
	11	00537-00545				
	12	01457-01459				
750	5	00178-00179	2628, 2629	Bethal	1975	750/1975
	6	00240-00243				
	7	00222-00227				
881	9	01201	2527, 2528, 2529, 2530, 2627, 2628, 2629, 2630	Central/Eastern Tvl.	1984	881/1984
	10	1243				
952	5	00060	262,726,282,629	Johannesburg	1991	952/1991
	6	00099				
	7	05107-05109				
	8	03058-03062				

4.5 Site naming convention

Heritage resources identified by Digby Wells during the pre-disturbance survey were prefixed by the SAHRIS case identification generated for this Project. Information on the relevant period / feature code and site number followed (e.g. 12164/BGG-001). This number may be shortened on plans or figures to the period / feature code and site number (e.g. BGG-001).

Heritage resources identified through the secondary data collection were prefixed by the relevant SAHRIS case or map identification (*where applicable*), and the original site name used by the author (e.g. 1233/Site1).

5 Gap Analysis Summary

Digby Wells undertook a gap analysis of the heritage assessment completed for the Twistdraai Colliery: Thubelisha Shaft Project (van Schalkwyk J. A., Heritage Impact Assessment for the planned Twistdraai Colliery: Thubelisha Shaft in the Highveld Ridge and Bethal Municipal Districts, Mpumalanga Province, 2007) in 2013. The original gap analysis was reviewed and updated utilising the methodologies presented in Section 4.2 above. This section provides a summary of the results.

The initial heritage assessment complied with four of the nine criteria assessed, and evaluated as partially compliant. The report did not, however, adhere to the following NHRA Sections:

- 38(3)(d) - Heritage impact relative to sustainable social and economic benefits;
- 38(3)(e) - Results of consultation;
- 38(3)(f) - Consideration of alternatives; and
- 38(4) - Report submission to responsible HRA and issuing of Statutory Comment.

Notwithstanding addressing the aforementioned gaps, Digby Wells recommended including additional information. This comprised providing location details of identified heritage resources in relation to the proposed development footprints, providing detailed / replicable methodologies for determining CS and impact ratings, and specific mitigation measures for avoiding / reducing identified negative impacts.

The current HRM process aims to, in as far as possible; address the identified gaps to promote compliance with the requirements of the NHRA.

Table 5-1: Gap analysis summary of initial heritage assessment

NHRA HRM Criteria				
HIA report requirements	**Addressed in HIA**	**HIA reference**	**Adequacy**	**Information required**
38(3)(a) - Identification and mapping of heritage resources	Yes	Appendix 3	Inadequate	Photographs of identified heritage resources; Location of identified heritage resources in relation to proposed development footprint; GPS track logs
38(3)(b) - Evaluation of significance	Yes	Section 5, Appendix 3	Inadequate	No methodology or formula was supplied detailing how the significance rating of the heritage resources was achieved
38(3)(c) - Heritage impacts on resources	Yes	Section 5, Appendix 4	Inadequate	Potential impacts on heritage resources were identified however no impact assessment methodology, formula or assessment was completed, detailing the magnitude, duration and spatial impacts in relation to the proposed project activities
38(3)(d) - Heritage impact relative to sustainable social and economic benefits	No	Non-compliance	Inadequate	Not addressed in HIA
38(3)(e) - Results of consultation	No	Non-compliance	Inadequate	Not addressed in HIA
38(3)(f) - Consideration of alternatives	No	Non-compliance	Inadequate	Not addressed in HIA
38(3)(g) - Mitigation plans	Yes	Appendix 3	Inadequate	Detailed mitigation measures for inclusion into the Environmental Management Plan for each identified heritage resources / heritage resource type.
NHRA HIA requirement compliance (out of 7)	4	Partial compliance		
HRM Process Requirements	**Action**	**Report / Case Reference**	**Date**	**Responsible HRA**
38(4) - Report submission to responsible HRA	No	N/A	N/A	SAHRA and MPHRA
38(4) - Statutory Comment issued by responsible HIA	No	N/A	N/A	SAHRA and MPHRA
HRM process compliance (out of 2)	0	Non-compliance		
Overall compliance (out of 9)	4	Partial compliance		

6 Cultural Heritage Baseline Description

The cultural heritage baseline description considered the predominant landscape based on the identified heritage resources within the regional study area. The tangible heritage resources of the regional study area demonstrate affiliations with the historical period, dominated by the historical built environment and, burial grounds and graves.

This notwithstanding, expressions of palaeontological, Middle Stone Age (MSA), Late Stone Age (LSA) and Later Farming Community (LFC) periods within the greater study area occur in addition to the tangible resources associated with the historical period.

This chapter considers the identified landscapes and provides a brief description to offer the reader context and identify potential heritage risks and impacts as discussed in Sections 7.2 and 7.4 respectively.

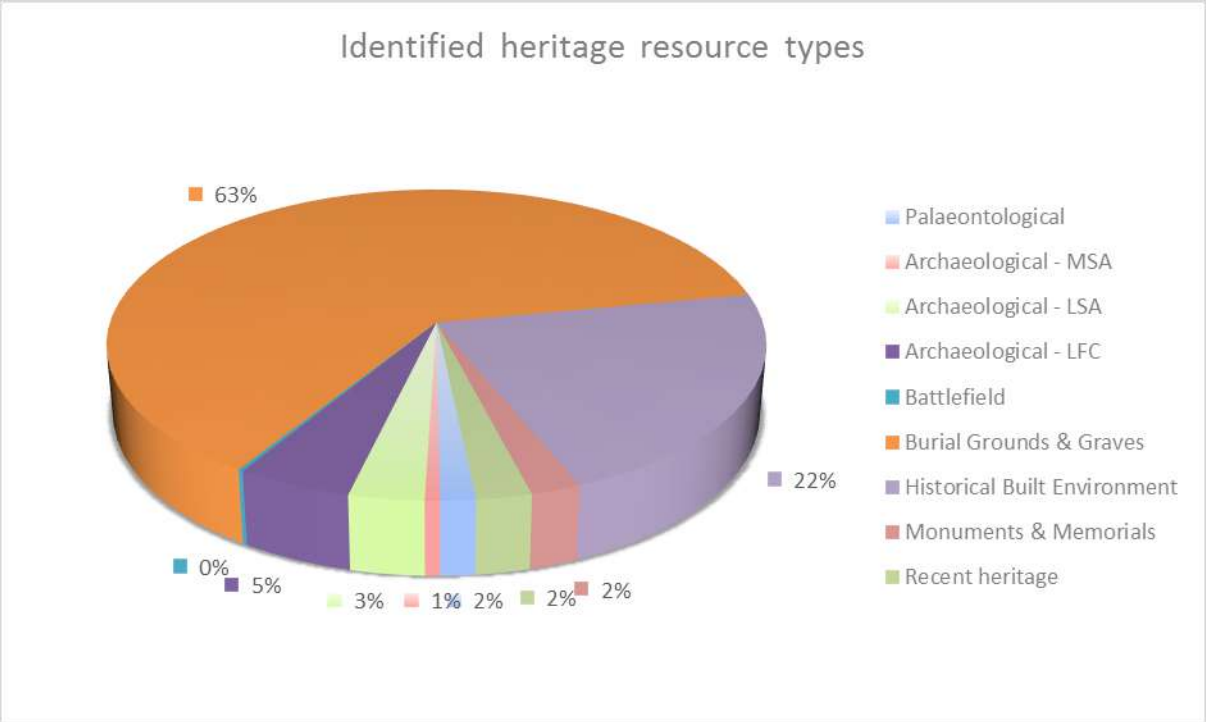


Figure 6-1: Identified heritage resources within the study area under consideration

6.1 Regional and local study area

6.1.1 Geology and palaeontological context

The regional and local study areas comprise portions of the Highveld Coalfield, extending an approximate 7 000 km^2. This area is underlain predominantly by the Main Karoo Basin. The Main Karoo Basin comprises lithostratigraphic units associated with the Karoo Supergroup, dating to the Late Carboniferous to Middle Jurassic periods (~320 - 145 million years ago [Ma]).

Briefly, the Main Karoo Basin constitutes a retro-arc foreland basin. Johnson, *et al*. (2006) bases this designation as a retro-arc foreland basin on the following:

- It has a thick flysch-molasse succession which wedges out northwards over the adjacent craton;
- Its position behind an inferred magmatic arc; and

- The associated fold thrust belt produced by northward subduction of oceanic lithosphere located south of the arc.

These processes allowed sedimentation of the basin through which the various groups, sub-groups and formations of the Karoo Supergroup of the Project Area were formed. Covering an approximate extent of 700 000 km^2, the Karoo Supergroup is famously known for its terrestrial vertebrate fossils, distinctive plant assemblages, thick glacial deposits and extensive dolerite dykes and sills (Johnson, Van Vuuren, Hegenberger, Key, & Shoko, 1996; Johnson, et al., 2006). Digby Wells (du Piesanie & Nel, Heritage Impact Assessment for the Consbrey Colliery Project, 2629BB and 2629 BD, Mpumalanga Province, 2013) identified seven palaeontological resources within the local study area. These include fossilised plants and bone embedded within sandstone outcrops.

Significantly, this included identification of at least four examples of the rare *Breytenia* plant fossil near Breyten. As of 2013, there was only one specimen of the fossil *Breytenia* available for research.

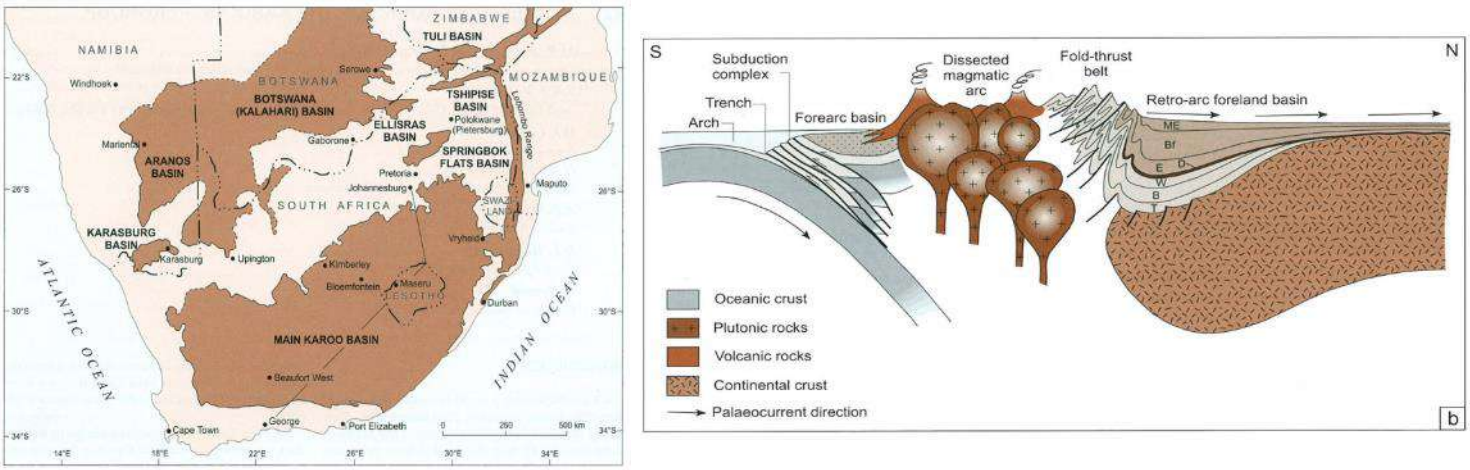


Figure 6-2 Location and envisaged plate tectonic setting of the Main Karoo Basin during the Late Triassic. E = Ecca Group (adapted from Johanson, *et al.*, 2006)

Table 6-1: Geological sequence and palaeontological sensitivity for the local study area

Eon	Era	Period	Epoch	Ma	Lithographic Units				Significance	Fossils
					Supergroup	Group	Sub-group	Formation		
Phanerozoic	Cenozoic	Quaternary	Holocene Pleistocene	1.8		Kalahari Group			Low	Kalahari Group formation comprise Palynomorphs, root casts (rhizomorphs) and burrows (eg termitaria), rare vertebrate remains (mammals, fish, ostrich egg shell etc.), diatom-rich limestones, freshwater stromatolites, freshwater and terrestrial shells (gastropods, bivalves), ostracods, charophytes
	Mesozoic	Jurassic		145 200				Karoo dolerites	Negligible	None
	Palaeozoic	Permian		300	Karoo Supergroup	Ecca Group		Volkrust	High	The Volksrust Formation comprises of trace fossils, rare temnospondyl amphibian remains, invertebrates (bivalves, insects), minor coals with plant remains, petrified wood, organic microfossils (acritarchs), low-diversity marine to non-marine trace fossil assemblages.
								Vryheid	Very-high	Abundant plant fossils of Glossopteris and other plants. Trace fossils. The reptile Mesosaurus has been found in the southern part of the Karoo Basin. Rich fossil plant assemblages of the Permian Glossopteris Flora (lycopods, rare ferns and horsetails, abundant glossopterids, cordaitaleans, conifers, ginkgoaleans), rare fossil wood, diverse palynomorphs. Abundant, low diversity trace fossils, rare insects, possible conchostracans, non-marine bivalves, fish scales.

6.1.2 Stone Age

Defined by the production of lithic tools by various hominid species, the Stone Age comprises three broad periods. This include:

- The Early Stone Age (ESA);
- The MSA; and
- The LSA.

The review of available information demonstrated that the regional study area contains very few expressions of the MSA (3 records) and LSA (15 records) (Refer to Figure 6-3). No ESA accumulations are known to occur within the regional study area. The EIA period is not considered further in this assessment.

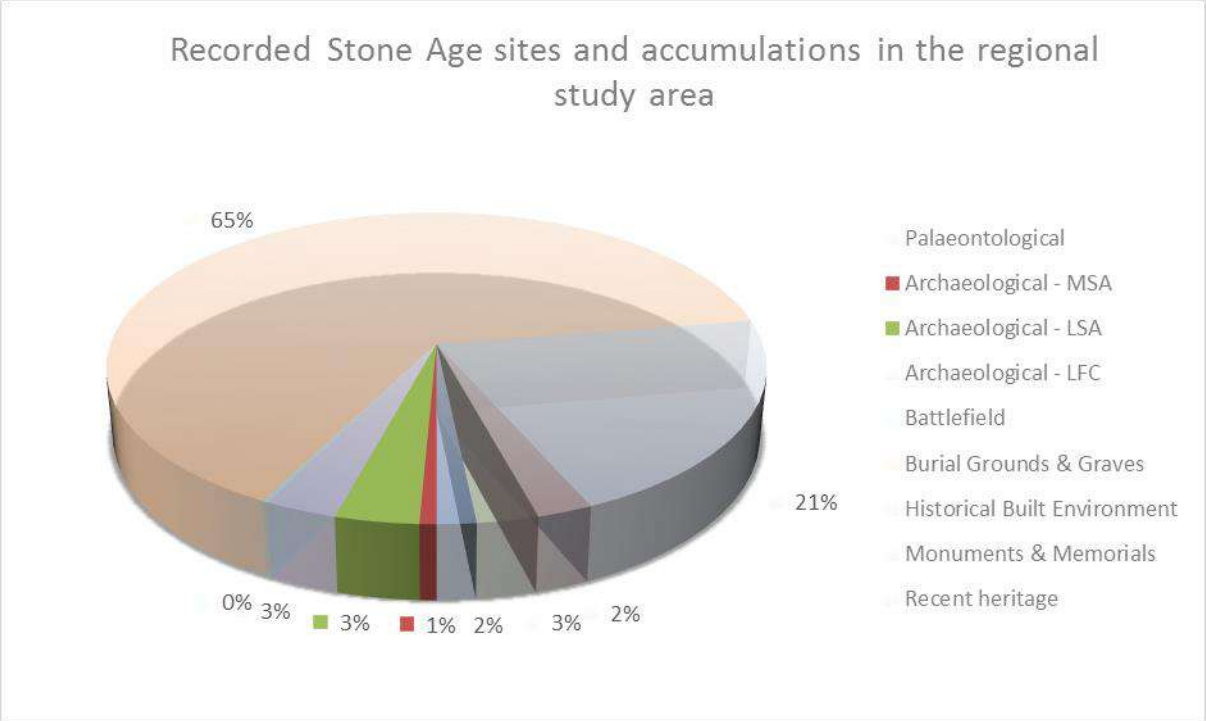


Figure 6-3: Percentage of identified Stone Age expressions in the regional study area relative to recorded heritage resources

Briefly, the MSA dates from approximately 300 000 years ago (kya) to 20 kya. Early MSA industries are characterised by high proportions of minimally modified blades, represented by the Levallois technique (Clark, 1982). In general however, the MSA is broadly defined by blades and points produced from good quality raw material, the use bone tools, ochre, beads and pendants (Deacon & Deacon, 1999).

Identified MSA accumulations within the regional study area are described as low-density surface scatters (WITS, 2010; du Piesanie & Nel, Heritage Impact Assessment for the Consbrey Colliery Project, 2629BB and 2629 BD, Mpumalanga Province, 2013).

The LSA dates from approximately 40 kya to the historical period. Lithics associated with the LSA are specialised: specific tools being created for specific purposes, and the inclusion of bone tools into the assemblages (Mitchell, 2002). LSA sites commonly contain diagnostic artefacts, such as microlithic scrapers and segments. In a southern African context, the LSA is closely associated with hunter-gatherer groups, such as the San. Regional hunter-gatherer occupation is well documented. Due to the nomadic nature of LSA people, open sites are difficult to identify and usually poorly preserved. Potgieter (1955) describes the San as occupying rock shelters throughout the landscape, and creating reed platforms in the Chrissiesmeer Lake District.

Identified expressions of the LSA within the regional study area include:

- Rock shelters with deposit and artefacts (WITS, 2010);
- Rock art (van Schalkwyk J. A., Archaeological Survey of a Section of the Secunda-Mozambique Gas Pipeline, Carolina District, Mpumalanga, 2003a; du Piesanie & Nel, Heritage Impact Assessment for the Consbrey Colliery Project, 2629BB and 2629 BD, Mpumalanga Province, 2013); and
- Low-density surface scatters of lithic accumulations (WITS, 2010).

6.1.3 Rock art

In addition to the production of LSA lithics, this period is characterised by evidence of ritual practises and complex societies (Deacon & Deacon, 1999). Within Mpumalanga, three rock art painting traditions occur and are widely dispersed. These are most notably recorded in the northern and eastern regions. Each of the traditions is associated with particular cultural groups:

- The first and oldest tradition is the fine line paintings associated with autochthonous LSA hunter-gatherer groups. Produced using fine brushes, quills or sticks predominantly done in red, white and black, and more rarely bichrome and polychrome. Realistic and proportionally correct animals such as various antelope species are often found. In addition, human figures and more symbolic beings are also represented (Eastwood, van Schalkwyk, & Smith, 2002);
- The second tradition is the finger paintings associated with the later arrival of pastoralists. Typified by predominantly finger-painted geometric images. Initially identified by Ben Smith and Sven Ouzman, the tradition extends in linear bands following the proposed migration routes of the pastoralists from southern Angola/western Zambia to the southern Cape (Smith & Zubieta, 2007). The geometric designs are composed entirely of circles, finger lines, finger dots, and handprints that are mostly painted in red pigment, sometimes in red and white, and occasionally only in white (Eastwood, van Schalkwyk, & Smith, 2002; Smith & Zubieta, 2007); and

- The last, third tradition is finger paintings associated with much later and possibly historic farming communities. No expressions are known to occur within the local study area. This tradition is not considered further at this stage.

A prominent rock art site within the region is the De Wittekrans Rock Art Complex. In a report completed by Ouzman (2009) the complex is described as consisting of four individual sites all with archaeological deposit, including stone tools and pottery. The rock art within the complex consist of fine-line, brush painted images made by hunter-gatherers and finger painted rock paintings associated with herder people. The co-occurrence of two or more of these traditions suggests that there were some cultural interactions between these groups. While the De Wittekrans Complex is located outside of the site-specific study area, there are sufficient similarities in the landscape that allow the author to infer that similar sites may occur in areas where rock shelters are present.

6.1.4 Farming community period

The farming community period correlates to Bantu-speaking agro-pastoralists movements into southern Africa. Literature review results demonstrated only heritage resources associated with Late Farming Communities (LFC) (1000 CE – 1840 CE) within the regional study area. This accounted for ~5% of all heritage resources identified (Refer to Figure 6-4). It is argued earlier regional occupation predominantly occurred at lower altitudes in the valleys close to rivers, covered by soil accumulated since its abandonment (Maggs, Early farming communities of the southern Highveld: a survey of Iron Age settlement, 1974; Delius, Maggs, & Schoeman, Forgotten World: The Stone-Walled Settlements of the Mpumalanga Escarpment, 2014). These sites, therefore, are often unidentified as surface markers are absent. For the purposes of this report, the LFC period will be the focus of the discussion.

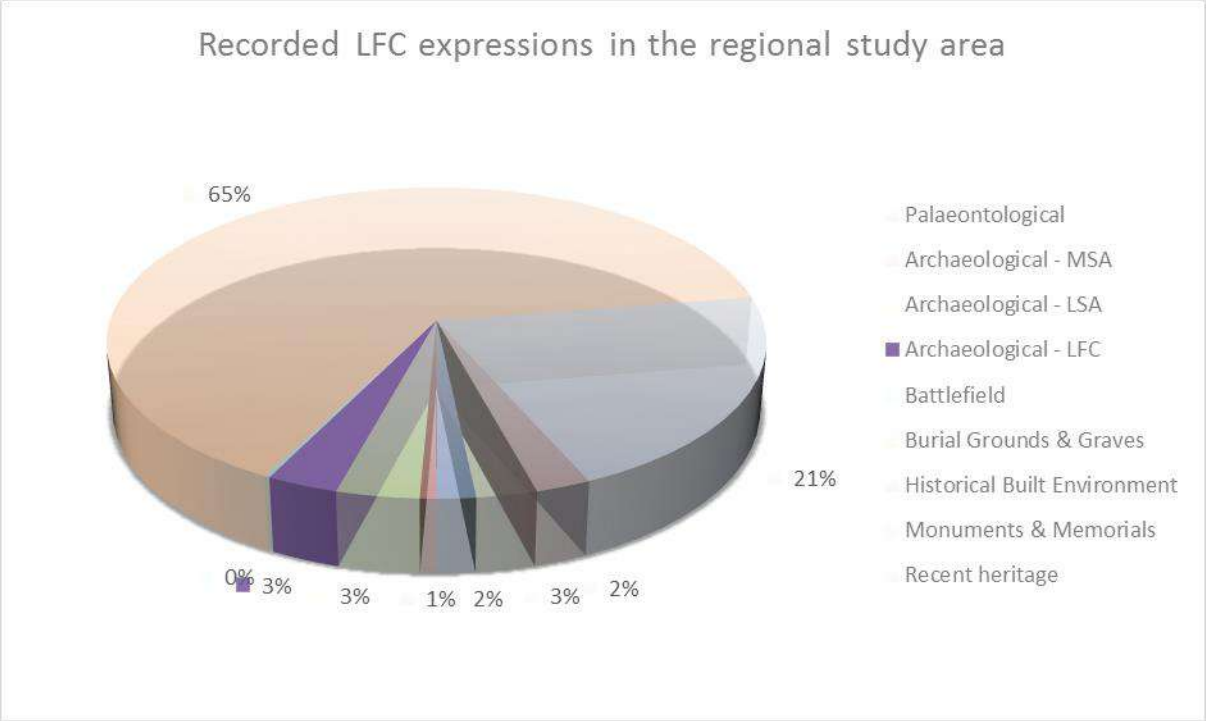


Figure 6-4: Percentage of identified LFC expressions in the regional study area relative to recorded heritage resources

The most visible indicator for LFC settlements is stonewalling. Stonewalls attest to complex processes of development and decline over several years (Delius, Maggs, & Schoeman, Forgotten World: The Stone-Walled Settlements of the Mpumalanga Escarpment, 2014). Several stonewalled settlement types are found in the regional study area. These are attributed to:

- Bokoni (also referred to as Badfontein) (16th Century);
- KwaMaza (1700 – 1840 CE); and
- Type V (19th Century).

Scholars consider Bokoni settlements to be rooted in the movement of Nguni speakers into the region, developed through processes of innovation, adaptation, and interactions. Distributed primarily along the escarpment between Ohrigstad and Carolina, these sites cluster along the rivers (Huffman, The archaeology of the Nguni past, 2004; Delius, Maggs, & Schoeman, Forgotten World: The Stone-Walled Settlements of the Mpumalanga Escarpment, 2014). Settlements consist of cattle trackways and large areas of terrace walls. Usually, the cattle lane leads into a central enclosure, an exit on the opposite side allowed access to kraals attached to the central wall (Maggs, Iron Age Communities of the Southern Highveld, 1976; Huffman, Handbook to the Iron Age: The Archaeology of Pre-Colonial Farming Societies in Southern Africa, 2007). This organisation may represent a left / right division. Huffman (2007, p. 41) refers to this type as Badfontein, however, the accepted

convention is Bokoni (Delius, Maggs, & Schoeman, Forgotten World: The Stone-Walled Settlements of the Mpumalanga Escarpment, 2014).

Huffman (2007, p. 33) described KwaMaza stonewalled settlements as a variant of Moor Park walling located within midlands of KwaZulu-Natal and Nguni origins. These settlements follow a layout with beehive huts at the back, the cattle kraals and central court built to look the same with two lobes for cattle and calves, and a side chamber for a small court. These sites commonly occur in the area around Stoffberg, outside of the defined study areas. These settlement types therefore are not considered further in this report.

Within the local study area, settlements comprise Type V expressions as the most common and widely distributed settlement pattern in the south-east of Mpumalanga around Bethal and Ermelo. To paraphrase Maggs (1976, p. 28), these consist of a number of primary enclosures grouped around a ring. The closures are either contiguous or linked by secondary walling to form a secondary enclosure. There may be additional free-standing structures around the periphery of the settlement unit, but there is no surrounding wall.

Secondary tangible surface indicators for LFC sites include ceramics[3] and evidence for domesticated animals in the form of dung deposits and faunal remains. Scattered throughout the regional landscape these resources provide motivation for settlement and possible trade networks (Delius, Maggs, & Schoeman, Forgotten World: The Stone-Walled Settlements of the Mpumalanga Escarpment, 2014). Huffman (2007) provides a reference for the possible distribution of ceramic facies within the regional study area. These are presented in Table 6-2:

Table 6-2: Common ceramic facies found in Mpumalanga

Facies	Period	Key Characteristics
Uitkomst	1650 CE – 1820 CE	Stamped arcades, appliqué and blocks of parallel incisions, stamping and chord impressions
Rooiberg	1650 CE – 1750 CE	Stamped rim band, mixture of stamped and incised bands, arcades and triangles in the neck
Icon	1300 CE – 1500 CE	Multiple incised bands separated by colour and lip decorations on bowls
Madikwe	1500 CE – 1700 CE	Multiple bands of cord impressions, incisions, stabs and punctates separated by colour
Letaba	1600 CE – 1840 CE	Hatched bands on shoulder, below black and red triangles
Klingbeil	1000 CE – 1200 CE	Triangles in neck bordered with slashes, punctates on shoulder

[3] Ceramic classification is used by archaeologists to establish relative cultural-historical temporal sequences. Refer to the glossary of terms for detailed explanations.

Identified LFC heritage resources within the regional study area include:

- Isolated undiagnostic ceramic findspots (du Piesanie & Nel, Heritage Impact Assessment for the Consbrey Colliery Project, 2629BB and 2629 BD, Mpumalanga Province, 2013; Karodia, Higgitt, du Piesanie, & Nel, 2013);
- Low density ceramic surface scatters (WITS, 2010; Karodia & Nel, Heritage Statement for the Basic Assessment undertaken for a Powerline Upgrade, Secunda, Mpumalanga, 2014a);
- Shelters and deposits (van Schalkwyk J. A., Archaeological Survey of a Section of the Secunda-Mozambique Gas Pipeline, Ermelo and Bethal Districts, Mpumalanga, 2003b; WITS, 2010);
- Sites of low – medium complexity (WITS, 2010; du Piesanie & Nel, Heritage Impact Assessment for the Consbrey Colliery Project, 2629BB and 2629 BD, Mpumalanga Province, 2013); and
- Structural remains and stone walling (van Schalkwyk J. A., Archaeological Survey of a Section of the Secunda-Mozambique Gas Pipeline, Ermelo and Bethal Districts, Mpumalanga, 2003b; WITS, 2010; du Piesanie & Nel, Heritage Impact Assessment for the Consbrey Colliery Project, 2629BB and 2629 BD, Mpumalanga Province, 2013; Karodia & Nel, Heritage Statement for the Basic Assessment undertaken for a Powerline Upgrade, Secunda, Mpumalanga, 2014a).

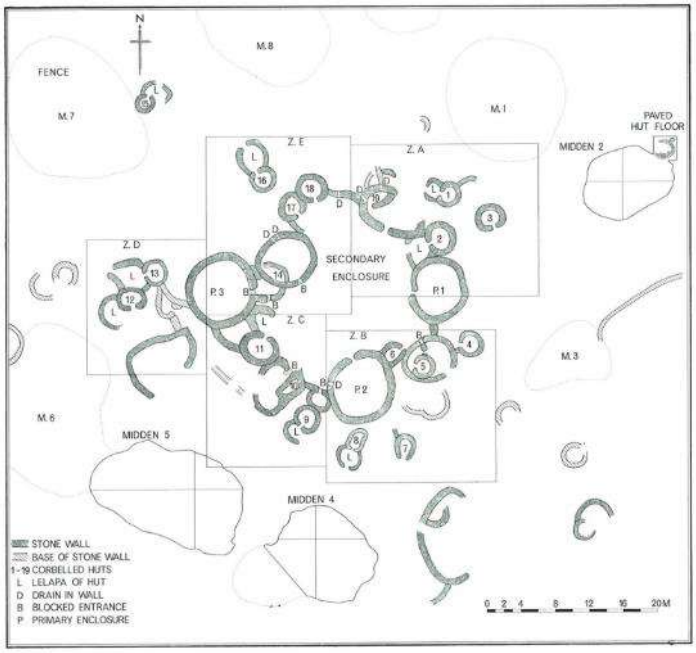


Figure 6-5: Example of Type V settlement layout (Maggs, Iron Age Communities of the Southern Highveld, 1976)

6.1.5 Historical period[4]

The historical period is commonly regarded as exclusively associated with contact between Europeans and Bantu-speaking African groups, and consequent *written* records. This period, however, overlaps with the Farming Community period and the division between the two is in many ways artificial.

The regional study area is predominantly associated with heritage resources dating to the historical period (Refer to Figure 6-6). These comprise:

- Battlefield remnants (1 record) (WITS, 2010);
- Monuments and memorials (10 records) (Genealogical Society of South Africa, 2011);
- Burial grounds and graves (292 records) (van Schalkwyk, 2003a; 2003b; 2003c; 2003d; Fourie & van der Walt, 2007; Pistorius, 2007; Genealogical Society of South Africa, 2011; van Schalkwyk, 2012; du Piesanie & Nel, 2013; Karodia, et al., 2013; Magoma, 2013; Pelser, 2013a; 2013b; Seliane, 2013; Karodia & Nel, 2014a; 2014b; du Piesanie & Nel, 2016);
- Historical built environment resources (101 records) (Fourie & van der Walt, 2007; Pistorius, 2007; Genealogical Society of South Africa, 2011; van Schalkwyk, 2012; du Piesanie & Nel, 2013; Karodia, et al., 2013; Pelser, 2013a; 2013b; Seliane, 2013; Karodia & Nel, 2014a; 2014b; du Piesanie & Nel, 2016); and
- Recent heritage (11 records) (WITS, 2010; van Schalkwyk, 2012; Magoma, 2013; Karodia & Nel, 2014b).

To this effect, this chapter provides a brief summary of the historical context of the region.

[4] The author acknowledges that in southern Africa, especially in Mpumalanga, the last 500 years represents a formative period that is marked by enormous internal economic invention and political experimentation that shaped the cultural contours and categories of modern identities outside of European contact. This period is currently not well documented and is being explored through the 500 year initiative (Swanepoel, et al., 2008).

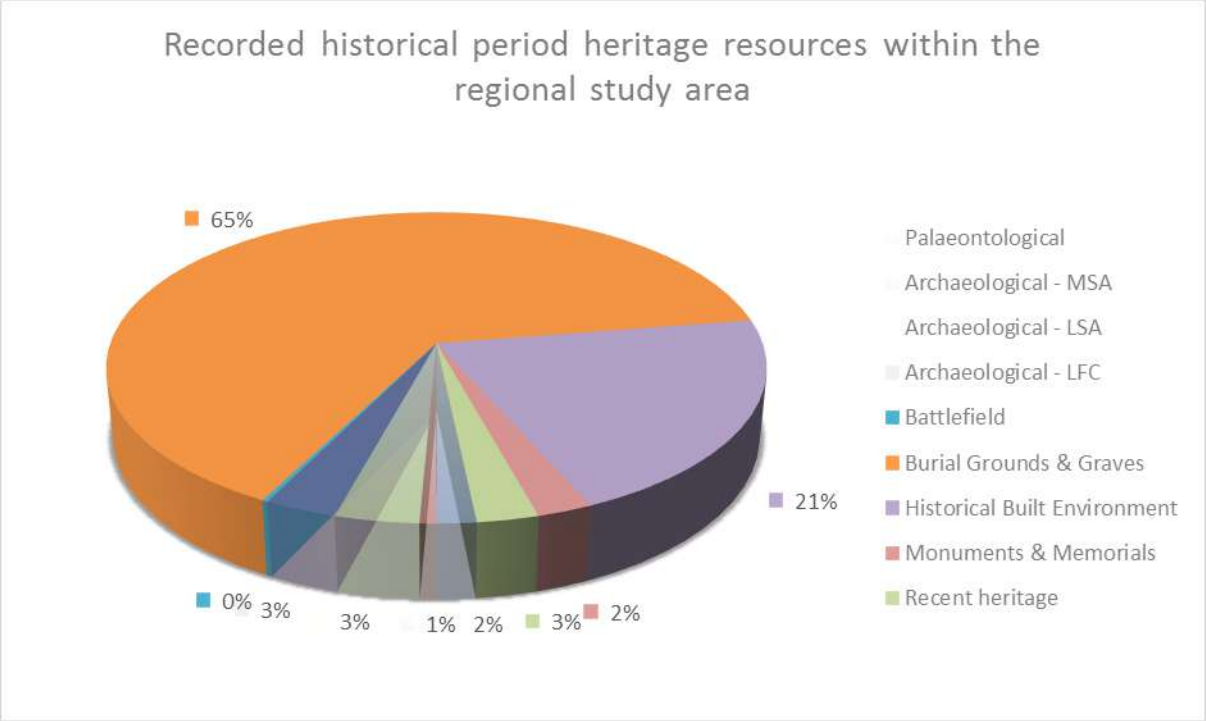


Figure 6-6: Percentage of identified historical period heritage resources in the regional study area relative to recorded heritage resources

Processes of migration, population growth, climatic variation and trade to the east significantly impacted the Pedi, Koni and other groups on the Mpumalanga Highveld. This period is characterised by the rise of power blocks with a range of political centralisation and waves of violent population displacements (Makhura, 2007). Within this region, the Pedi established a process of centralisation where subordinate communities retained their local independence under some tributary obligations. Marked by escalating the conflict and intensifying violence, this centralisation allowed the Pedi to emerge as the strongest power in the north-east (Delius, Maggs, & Schoeman, Forgotten World: The Stone-Walled Settlements of the Mpumalanga Escarpment, 2014).

A similar process played out in the Nguni area, resulting in large aggressive states emerging - the Ndwandwe, the Mthethwa, the Swazi and the Zulu Kingdom. The strife amongst the various groups culminated in the several battles, pillaging of settlements and movement of groups into the interior with tragic consequences for the Pedi and Koni alike. The Ndwandwe, the Ndebele led by Mzilikazi and Swazi considered as the dominant forces in this movement, smaller groups of raiders and invaders played a role in these events. The Ndwandwe, after their defeat in battle with the Zulus in 1819, moved north from the Nguni area. Their movement into the region dispersed smaller Sotho groups and resulted in battles with the Pedi Kingdom. By ~1923, the Ndwandwe overwhelmingly defeated the Pedi and removed the Maroteng royal house (Delius, Maggs, & Schoeman, Forgotten World: The Stone-Walled Settlements of the Mpumalanga Escarpment, 2014). In the wake of these

events, the Mpumalanga Highveld was left to intrusive groups such as the Swazi and *Voortrekkers*.

In reaction to increased British liberalism and the resultant abolishment of slavery and pass laws, groups of Afrikaaners initiated a move from the Cape into the interior around 1835 to establish an independent state. This migration of *Voortrekkers* is commonly called the Great Trek. The first *Voortrekkers* to move through the area were the Robert Schoon Party in 1836, with the first permanent settlement established as Ohrigstad in 1845. At this time the intruding *Voortrekkers* into the interior exacerbated the existing volatile landscape, frequently resulting in conflict with remnant groups of Pedi, Nduzundza Ndebele and Kopa (Delius & Cope, Hard-fought frontiers: 1845 - 1883, 2007; The Voortrekkers, 2014).

In 1852, representatives of the British and *Voortrekkers* signed into effect the Sand River Convention. This convention was an agreement acknowledging Boer independence and the official establishment of the *Zuid-Afrikaansche Republiek* (ZAR). ZAR independence facilitated the distributing land to its citizens through demarcating large farms and issuing title deeds. With a perceived right to the land under the ZAR, the Boers continued to engage in conflict with smaller groups. The conflict facilitated a Boer - Swazi alliance. As part of the alliance, the Swazi besieged and destroyed the Kopa, and launched assaults against the Ndzundza Ndebele. While unsuccessful at defeating the Ndzundza Ndebele, a compromise was reached between the Boers and Ndzundza chief where land would be leased by the Boers through a tribute system (Delius & Cope, Hard-fought frontiers: 1845 - 1883, 2007; The Voortrekkers, 2014).

These Boer farmers discovered and exploited Highveld Coalfield deposits within the region soon after settling. Initially extracted by farmers for domestic purposes, the discovery of gold on the Witwatersrand in 1886 increased the need for coal exponentially (Brodie, 2008; Pistorius, A Phase 1 Heritage Impact Assessment (HIA) Study for the Total Coal South Africa's (TCSA) Proposed New Expansion of the Dorsfontein Coal Mine (DCM) near Kriel on the Eastern Highveld in the Mpumalanga Province of South Africa, 2008a; Pistorius, A Phase 1 Heritage Impact Assessment (HIA) Study for Sasols proposed new shaft complex on Strybult 542 and for the North Block on the Eastern Highveld in the Mpumalanga Province of South Africa, 2008b). The increased demand for coal drove the commercial exploitation of the resource; this was, however, stunted with the onset of the South African War of 1899 - 1902.

The South African War (Second Anglo-Boer War) officially started on 9 October 1899 as a result of tensions and conflicting political agendas between the Boers and the British. Regionally, there were two notable battles associated with the South African War, namely the Battles of Lake Chrissie and Bakenlaagte on 6 February and 30 October 1901 respectively (Delius & Cope, Hard-fought frontiers: 1845 - 1883, 2007; von der Heyde, 2013).

Briefly, the Boer forces under Louis Botha launched a surprise attack on the British forces encamped around Lake Chrissie with the objective of thwarting their advancement into the Transvaal. The British, under Gen. H, L Smith-Doriens were taken by surprise, through the

use of “Boer-friendly” San scouts (referred to as *agterryers*) surveilling British movements in the area. During the battle, the British lost 75 men and over 300 horses. The Boers suffered a loss of 80 from their commando. This attack delayed the movement of British forces into the ZAR for the majority of 1901 (Delius & Cope, Hard-fought frontiers: 1845 - 1883, 2007).

The Battle of Bakenlaagte, occurring some 18 km north-west from the site-specific study area, is the culmination of a series of events (Refer to Section 6.2.4 below). Concisely, Lieutenant Colonel George Benson’s No. 3 Flying Column set out from the farm Syferfontein to march north-west to the Bakenlaagte farmstead. It was there they intended to set up camp. The advance guard reached the farmstead and set up camp, but by midday the rear-guard was still some distance away hampered by unfavourable weather. The divided column provided an advantage to the Boers. General Botha of the Boer commando and his 800 reinforcements planned to attack Benson's column. Outnumbered four to one, the Boers annihilated the rear-guard after a 20-minute gun battle. The result of this attack allowed the main column time to deploy and set up a defensive perimeter. This deployment prevented the attacking Boer forces from riding on and capturing the main Column as originally planned. The Boers left the field with whatever spoils they could carry and the British transported the 134 wounded to the entrenched camp during the night (Pakenham, 1979; Willsworth, 2006; von der Heyde, 2013).

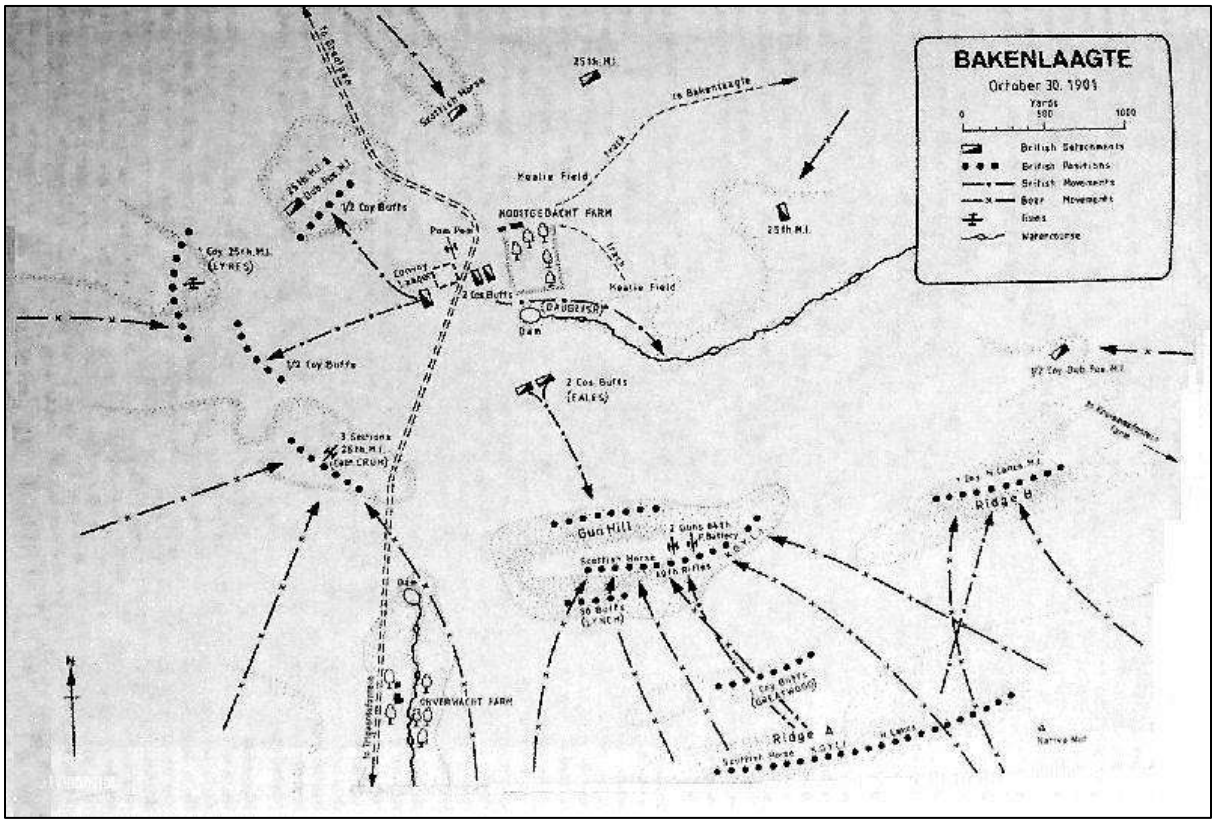


Figure 6-7: Plan of the Battle of Bakenlaagte (Price, 1992)

Prior to the end of the South African War, the regional study area inhabitants focussed on agricultural and with increased coal mining activities subsequently. During this period,

several small towns were proclaimed to service the local inhabitants and newly established coal mining industry. Towns in the regional study area include:

- Bethal;
- Belfast;
- Breyten;
- Carolina;
- Ermelo;
- Middleburg;
- Standerton; and
- Witbank (*eMalahleni*).

20th century South Africa is tainted with ethnic prejudices eventually formalised in a system of racial segregation under Apartheid in 1948. Within the regional study area, the so-called “Potato-Boycott” is a notable event associated with this time.

Gert Sibande, a member and eventual president of the African National Congress (ANC), investigated exploitative, "slave-like" practices on farms within the Bethal area during the 1940s and 1950s. The investigations revealed instances of coercion and beatings sometimes resulting in the death of labourers. The allegations sparked investigations by the then government, ultimately dismissed by H.F. Verwoerd. In protest, the ANC approved the Potato-Boycott that encouraged labourers and the public to boycott the purchasing and consumption of potatoes from the farmers in the Bethal district. The actions taken by the ANC here provided inspiration for a broader movement of resistance against the Apartheid government (Holden & Mathabatha, 2007). To commemorate his role in these events and contribution to the ANC, a monument dedicated to Gert Sibande was erected within Bethal town.

6.2 Site-specific and development footprint study area

This chapter describes the cultural landscape of the site-specific and development footprint study area. The area is underlain by lithologies with palaeontological sensitivity. Additionally, identified tangible heritage resources demonstrate that the study areas under consideration here comprise a cultural landscape affiliated with the LFC and historical period.

The current natural environment, the aforementioned various time periods and associated heritage resources are briefly discussed below.

6.2.1 Current natural environment

The site-specific study area lies within the grassland biome characterised by undulating landscapes with catchments areas of small streams / spruits. The grassland biome here, comprises Soweto and Eastern Highveld Grasslands, consisting of *Themeda triandra, Elionurus muticus, Eregrostis racemosa, Heteropogon contortus and Tristachya leucothrix*

grass species, and *Acacia caffra, Celtis Africana, Protea caffra* and other woody species (Mucina & Rutherford, 2006).

6.2.2 Geology and palaeontological sensitivity

As introduced in Section 6.1.1 above, the regional study area is predominantly underlain by lithologies associated with the Karoo Supergroup. The site-specific study area is associated with Karoo dolerites and the *Vryheid Formation* (Rubidge, 2008; Rubidge, 2013a; Rubidge, 2013b). These are briefly discussed separately below.

The Karoo dolerites are intrusive diatremes[5] classified as plutonic igneous rocks. This geological suite is void of any fossiliferous material and has no palaeo-sensitivity (SAHRA, 2013a; Rubidge, 2013a; Rubidge, 2013b). The Karoo dolerite suite is not considered further in this report.

The *Vryheid Formation* is the primary potential fossiliferous rock underlying the site-specific study area. It corresponds to the basal unit of the Ecca Group deposited in a deltic[6] environment at ~180 Ma. This formation is inherently associated with shales, sandstones, mudstones and coal (Bamford, 2016). Coal is formed by the compression and heat alteration of plant matter. Through this formation process, the coal is altered to the point that any potential plant fossil remains are unrecognisable. The shales found between the coal horizons and to a lesser degree the sandstone surface outcrops, however, have the potential to preserve good examples of plant fossils (Bamford, Best Practice for Palaeotnological Chance Finds: Proposed extension into adjacent Block 4 reserve of Syferfontein Mine (Sasol), Mpumalanga, 2014; Bamford, Environmental Authorisation for the Proposed Imvula Mine: Palaeontological Impact Assessment addendum to the Heritage Impact Assessment, 2016). Based on this, the *Vryheid Formation* is designated with very-high palaeo-sensitivity (SAHRA, 2013b).

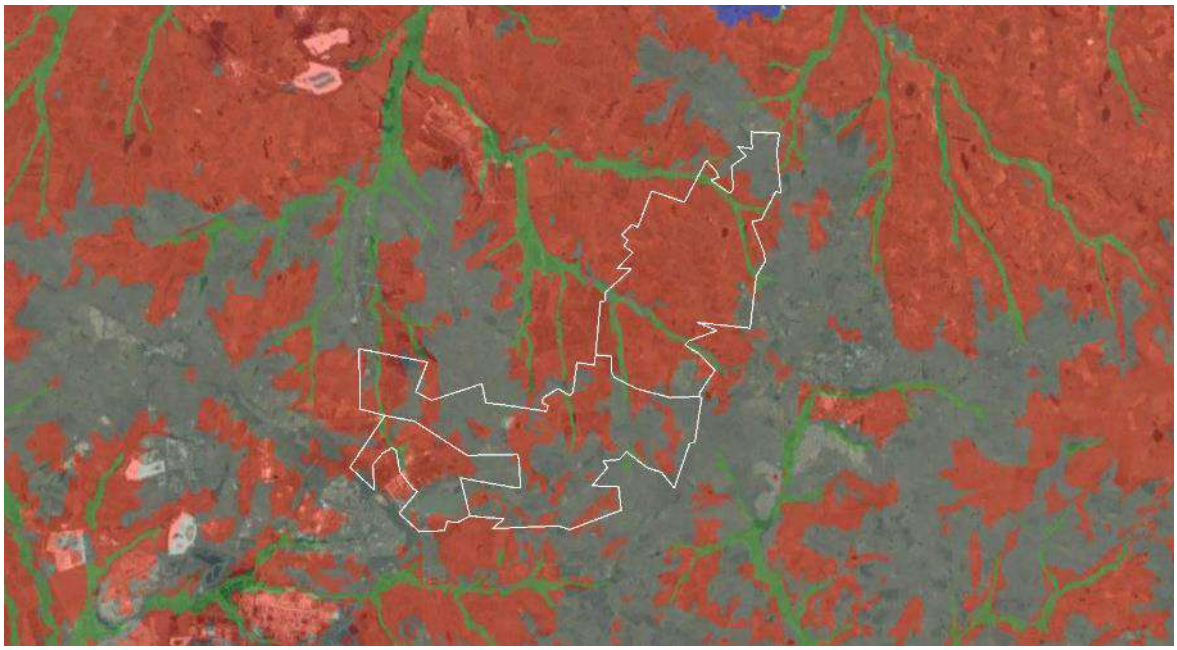
Fossil plants in general resemble modern plants – leaves of various shapes and sizes, twigs with leaf scars along the surface, chunks of wood, seeds, cones, ferns, etc. Common fossil plants that may be expected in the *Vryheid Formation* include:

- *Glossopteris* leaves, roots and inflorescences; and
- *Calamites* stems.

Fossil mammal-like reptiles and mammals are known to be associated with coal deposits. These are seldom, if ever, preserved with plant fossils (Bamford, Palaeontological Impact Assessment for Majuba Underground Coal Gasification Project, Mpumalanga, 2012; Bamford, Environmental Authorisation for the Proposed Imvula Mine: Palaeontological Impact Assessment addendum to the Heritage Impact Assessment, 2016).

[5] Igneous intrusions cause the formation of a diatreme, only in the specific setting where groundwater exists.

[6] River deposition of lithologies onto an alluvial plain.



Colour	Sensitivity	Required Action
	VERY HIGH	Field assessment and protocol for finds is required
	HIGH	Desktop study is required and based on the outcome of the desktop study, a field assessment is likely
	MODERATE	Desktop study is required
	LOW	No palaeontological studies are required however a protocol for finds is required
	INSIGNIFICANT	No palaeontological studies are required

Figure 6-8: The palaeontological sensitivity of the site-specific study area (adapted from SAHRIS, 2013)

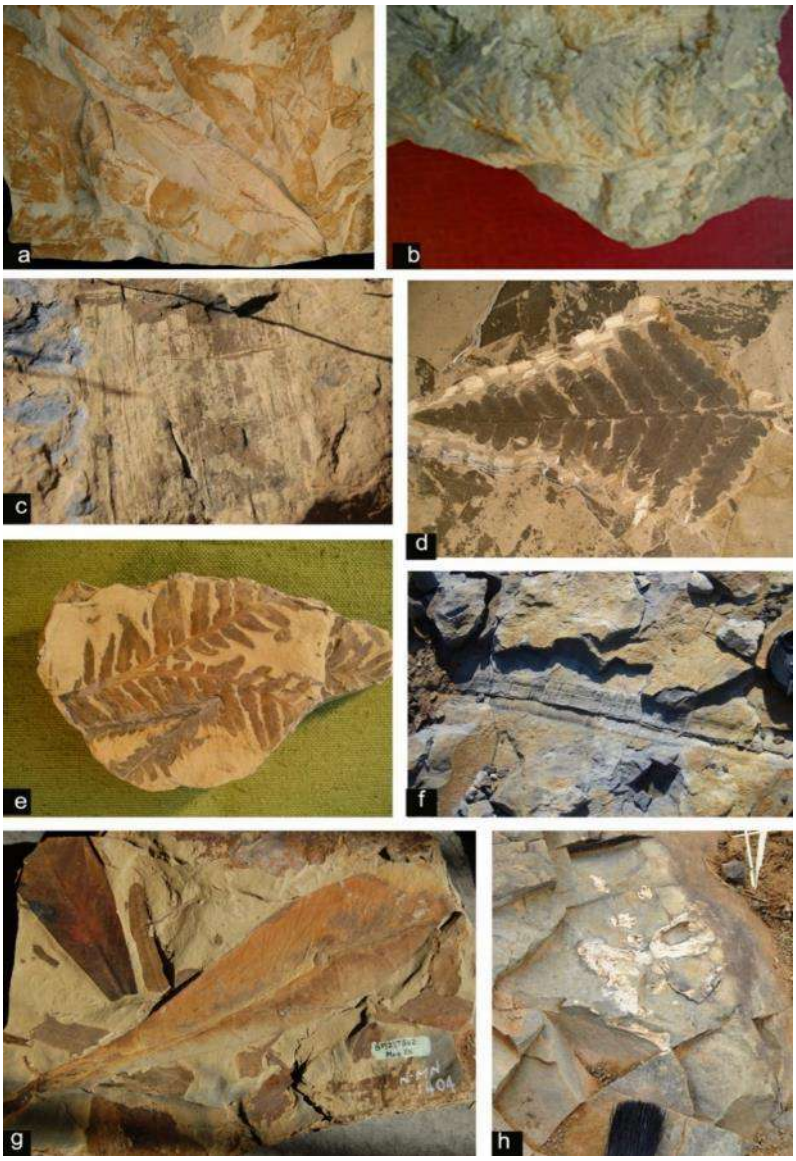


Figure 6-9: Composite of possible Karoo-aged fossil plants that may be identified within the site-specific study area (Bamford, Environmental Authorisation for the Proposed Imvula Mine: Palaeontological Impact Assessment addendum to the Heritage Impact Assessment, 2016)

6.2.3 LFC Period

LFC resources identified in previously completed assessments account for 24% (10 records) of the recorded heritage resources within the site-specific study area (van Schalkwyk J. A., Archaeological Survey of a Section of the Secunda-Mozambique Gas Pipeline, Ermelo and Bethal Districts, Mpumalanga, 2003b; Karodia & Nel, Heritage Statement for the Basic Assessment undertaken for a Powerline Upgrade, Secunda, Mpumalanga, 2014a). The assessors recorded these resources as follows:

- Low density surface scatters (1 record);

- Ash deposit (1 record);
- Structural remains (6 records); and
- Stone walled settlements (2 records).

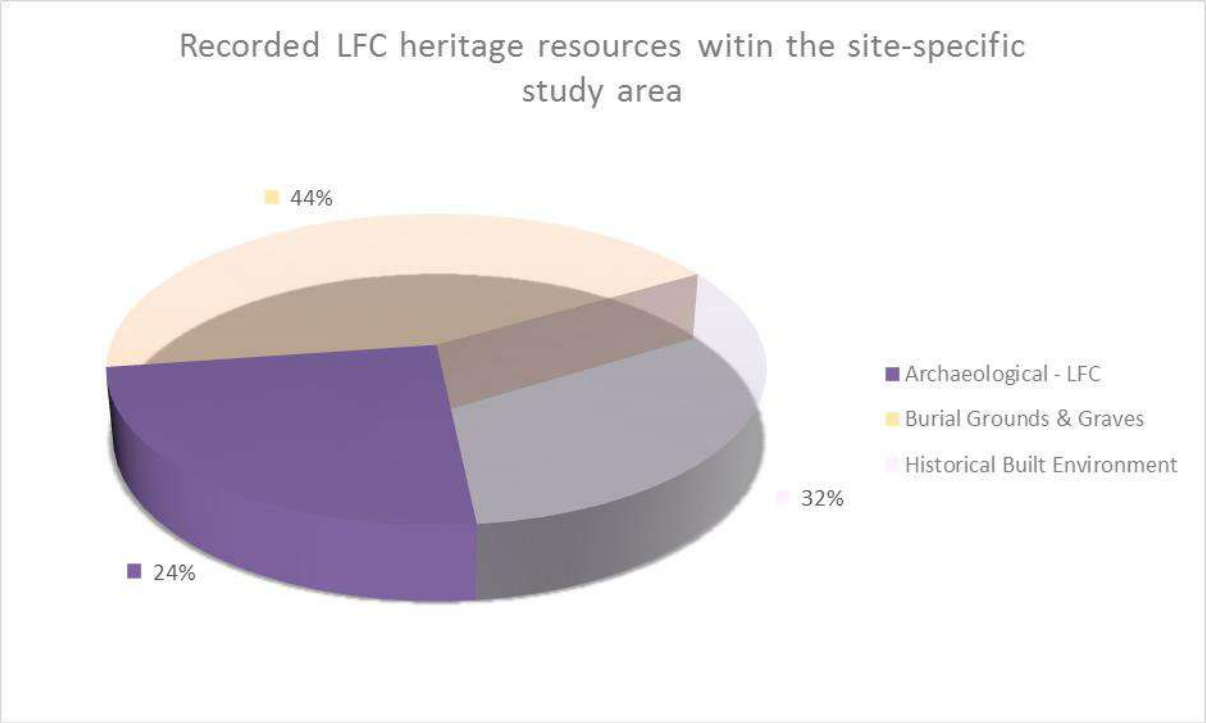


Figure 6-10: Recorded LFC heritage resources within the site-specific study area

Furthermore, a review of aerial imagery confirmed that previously unrecorded stone walled settlements occur within the site-specific study area. These appear to occur within proximity to water courses, and conform to “Type V” settlement patterns as described in Section 6.1.4 above (Figure 6-11).

Figure 6-11: Examples of identified stone walled settlements in the site-specific study area

6.2.4 Historical period

The historical period of the site-specific study area is dominated by burial grounds and graves, and historical built environment resources. These resources account for 44% and 32% respectively of the identified resources recorded in earlier assessments (Karodia & Nel, Heritage Statement for the Basic Assessment undertaken for a Powerline Upgrade, Secunda, Mpumalanga, 2014a) (Figure 6-12). This section considers the historical context of the site-specific study area based on the results of previous studies and informal consultation with Mr Quinlan-Fleet, the occupier of the farm Yzervarkfontein 140 IS.

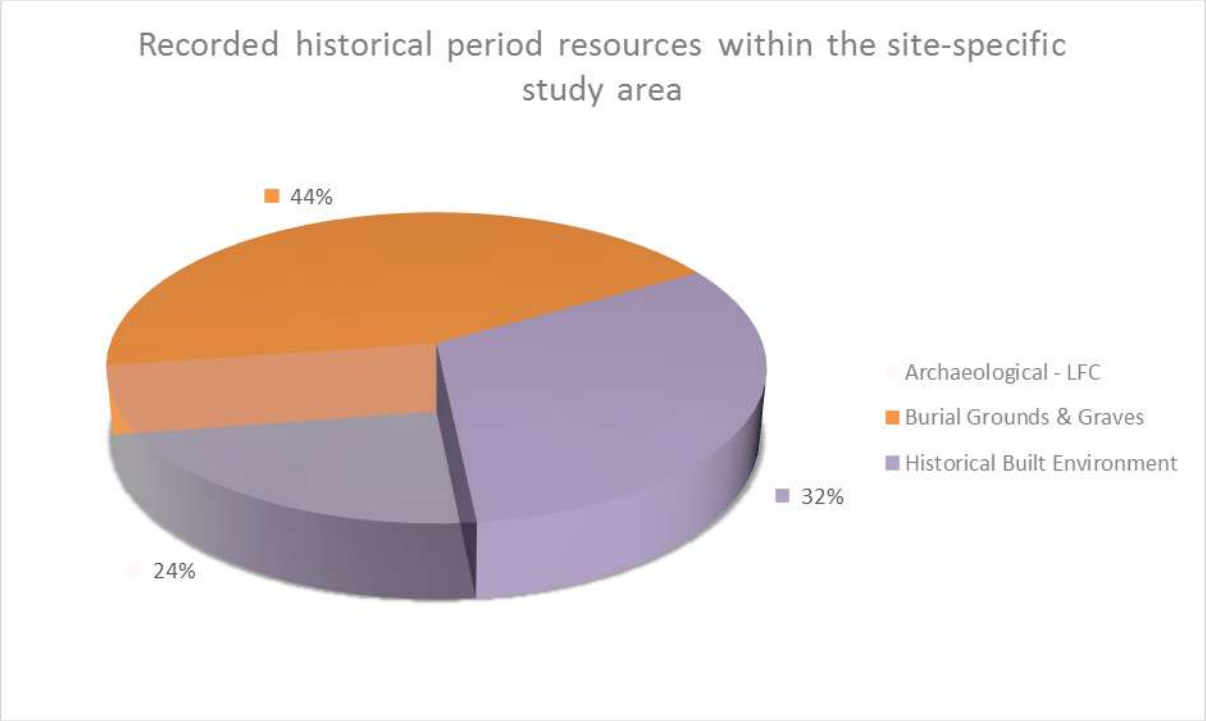


Figure 6-12: Recorded historical period resources within the site-specific study area

On 24 January 2017, during the pre-disturbance survey Mr Quinlan-Fleet commented that the original farmstead on Yzervarkfontein 140 IS played in a role in what is assumed to have been the 150th commemoration of the 1838-1841 Great Trek. Mr. Quinlan-Fleet maintains that a branch from a *Eucalyptus* tree that stood in the original werf was cut and used as a torch with which to light other 150th celebration torches nationwide. No reference to any event on the farm Yzervarkfontein 140 IS was noted in the reviewed sources *Federasie van Afrikaanse Kultuurvereniginge* (Federasie van Afrikaanse Kultuurveeniginge , 2017) and *Afrikanervolkswag* (Duvenage, 1994). The research did reveal however, the farm and Erasmus family had significant associations with the aforementioned Battle of Bakenlaagte (Refer to Section 6.1.5 above).

Daniel Jacobus Erasmus settled Yzervarkfontein 140 IS in 1872. His son, Lourens Johannes Erasmus died on 25 October 1901 in skirmishes with the British during the preceding events to the Battle of Bakenlaagte.

The series of events began with the march of Colonel Benson's column from Middelburg to Bethal on 20 October 1901. The column marched unfettered to Roodebloem and made camp on 22 October 1901 where they were spied by Commandant Grobler's scouts. The Boer Bethal Commando and other nearby commandos gathered and took up arms in an old kraal on top of a bare hill on the eastern border of Yzervarkfontein 140 IS on 25 October 1901. From this vantage point, the Boers noted that the column split in two, one moving towards the Mooifontein farm to their south, the second toward a hill with cannons. The Boers attacked the British to thwart their advancement. The rear guard of Benson's column made a final stand on the farm K-Stad 79 IS however, the concentrated fire from the Boers

finally drove them back to Rensburghoop. During this final stand, Lourens Erasmus was fatally wounded (Ackermann, 1969; Kitchener, 1901; Preller, 1942). His remains are buried with his father on the farm Yzervarkfontein 140 IS.

The wounded British soldiers were taken to the residence of Gielie Hamman, the father-in-law of Commandant Grobler, where the residence was set up as a field hospital. The facilities, unfortunately, were insufficient for the treatment and a message was sent to Benson to collect his wounded the following day. After collecting his wounded on 26 October 1901, Benson returned to camp on Roodebloem after which he broke camp and retreated on 28 October 1901. In his retreat, all the women, children and elderly left on the farms were captured and the buildings set alight. Benson and his column finally halted on the farm Syferfontein on 29 October 1901 where he reported he will be moving to Bakenlaagte towards Brugspruit the following day (*i.e. the day of the Battle of Bakenlaagte discussed in Section 6.1.5 above*) (Ackermann, 1969; Kitchener, 1901).

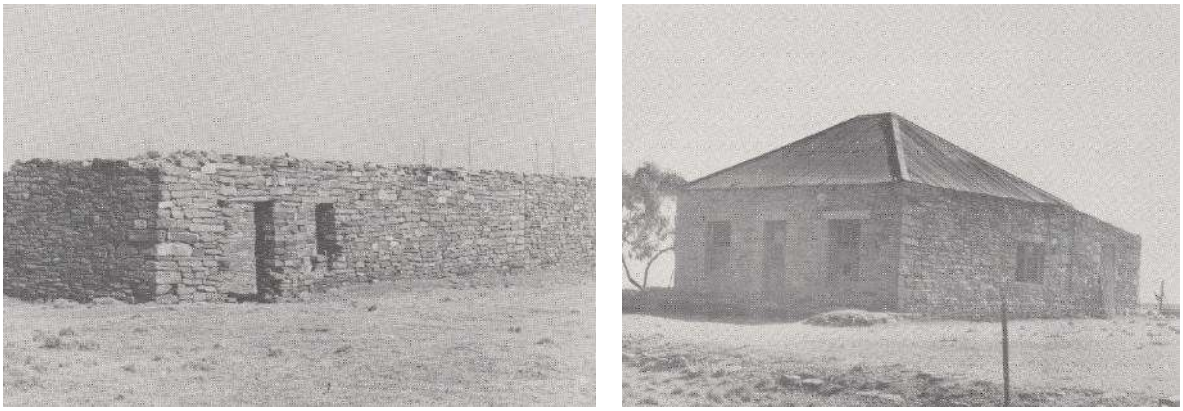


Figure 6-13: Ruins of D. Erasmus house burnt during the war and new dwelling built after the war on the farm Yzervarkfontein 140 IS (Anonymous, 1980)

Figure 6-14: Ruins of D. Erasmus house presently. Recorded as Ste-001 and Ste-002

More broadly, the towns considered in this section include Trichardt and Secunda. Trichardt originated as a small Dutch Reform Church settlement on the farm Trigaardtsfontein sometime after the Boers settled in the area. The settlement, and presumably the farm, were

named after the son of *Voortrekker* Louis Trichardt, Carolus Johannes Trichardt. On the 1899 Jeppes Map of the Transvaal, a postal agent and the meeting point between an established postal route and the main road to Bethal are on the farm Trigaardtsfontein. By 1902, several additional routes through the settlement are recorded, as well as the Peel and Laings Store (Figure 6-15). Trichardt was officially proclaimed a town in 1906 (Raper, 1987; Pistorius, A Phase 1 Heritage Impact Assessment (HIA) Study for Sasols proposed new shaft complex on Strybult 542 and for the North Block on the Eastern Highveld in the Mpumalanga Province of South Africa, 2008b).

Secunda town, established in the 1970s, is intrinsically linked with the history of Sasol. Derived from the Latin *secundus* meaning 'second', Sasol established Secunda to service their second extraction refinery after Sasol 1 at Sasolburg. The company was formed as a parastatal entity in the 1950s and recognised as the world's first “oil from coal” company. Absent oil reserves in South Africa and mounting international sanctions due to Apartheid initiated the government to produce oil from coal to reduce the country's reliance on oil imports and ward off a looming oil crisis (Schirmer, 2007).

Sasol 1 and Sasol 2 both being important in supplying fuel to South Africa made the refineries specific targets to destabilise the Apartheid government. *Umkhonto we Sizwe* (MK) member Patrick Chamusso was falsely accused of plotting to sabotage the Sasol 2 plant in the 1980s. Tortured by the government and eventually released, he spent several months in Angola receiving military training. Upon his return, he successfully planted two explosives within the Sasol 2 Plant, one within the water storage facility which detonated, and the second in the main reactor petrol pump that was found and disarmed. He was captured in October 1981 and sentenced to 24 years on Robben Island. After his release from prison in 1991 with all other political prisoners, his life and struggle were depicted in the biographical film "Catch a Fire" (Laurier, 2006; Holden & Mathabatha, 2007).

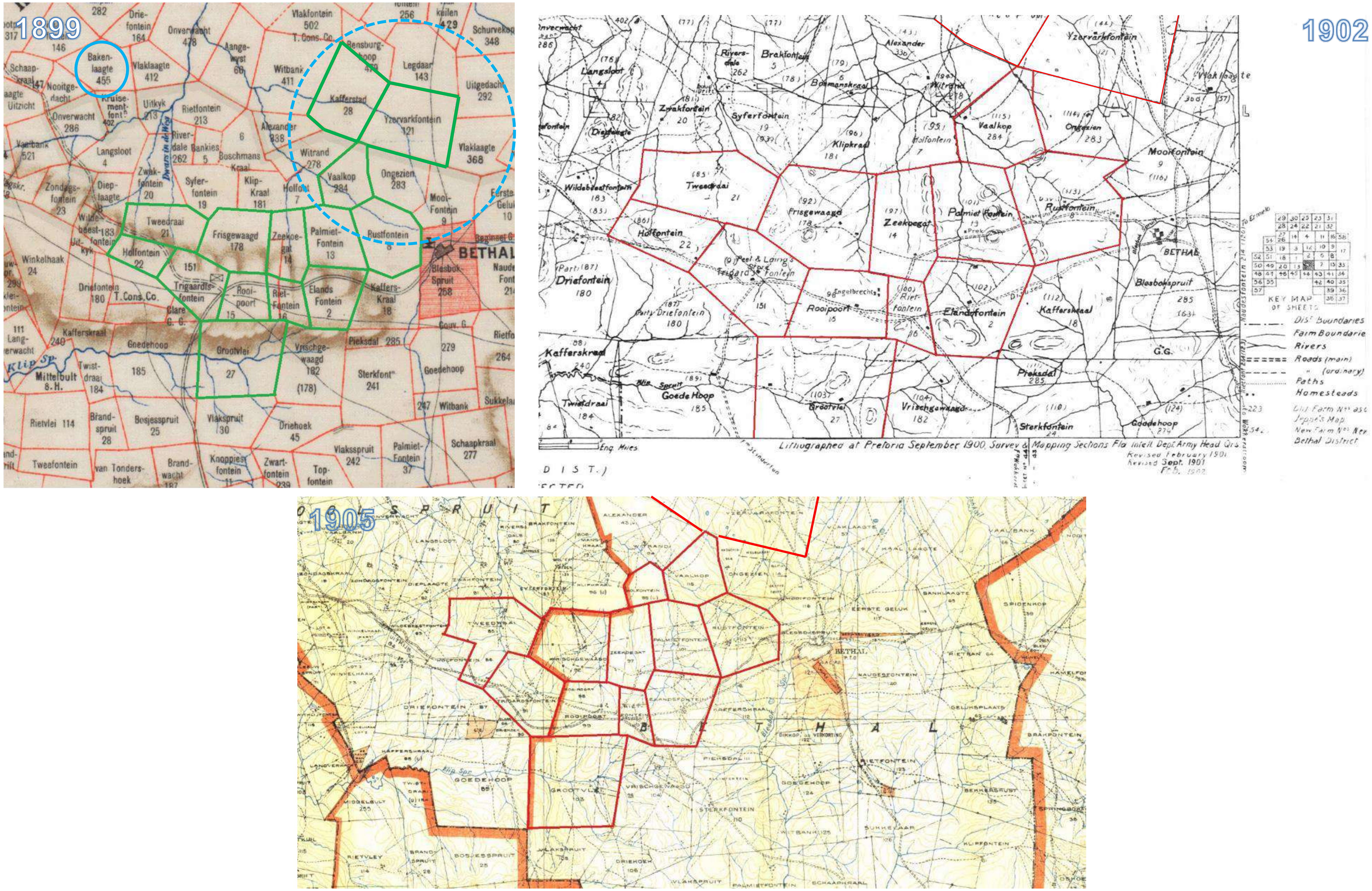


Figure 6-15: Site-specific study area on historical maps dating to 1899, 1902 and 1905 respectively. Areas associated with the skirmishes and Battle of Bakenlaagte indicated in blue on the 1899 map

6.2.5 Results of the field survey

Site Name	Latitude	Longitude	Description
12164/BGG-001	-26.352745	29.424597	Historic farmstead cemetery on the farm Yzervarkfontein associated with the Erasmus family. The cemetery comprises four graves with granite surface dressing. The identifiable inscriptions include: - Lourens J Erasmus 11-06-1864 25-10-1901 - (*Illegible*)obus Erasmus 5-4-1830 30-4-1913 - Daniel Jacobus Erasmus 1-7-1876 4-12-1969 - Zacharia Gertruida Erasmus 11-2-1886 7-8-1971
12164/BGG-002	-26.346692	29.415093	Historic burial ground comprising of a single grave on the farm Yzervarkfontein associated with the Erasmus family. The grave has granite surface dressing. Identifiable inscriptions on the tombstone include: - Rasmus Elardus Erasmus 20-02-1866 23-07-1923
12164/BGG-003	-26.347572	29.413972	Historic burial ground of farm labourers. Comprises at least 32 graves all with stone dressing. Two graves identified with concrete tombstones. Discernible dates recorded are 1954 and 1970. No family names were recorded on any of the identified graves.
12164/BGG-004	-26.344666	29.410225	Historic burial ground of farm labourers. Comprises at least 20 graves all with stone dressing. No tombstones or identifying features were noted to determine age or Next-of-Kin.
12164/BGG-005	-26.374613	29.380643	Historic burial ground comprising of a single grave associated with the Meyer family. The grave has granite tombstone. Identifiable inscriptions on the tombstone include: - Carolus Johannus Meyer 1-1-1915 13-12-1937
12164/BGG-006	-26.405619	29.365389	Historic farmstead cemetery associated with the Steynberg family. The cemetery comprises three graves with granite surface dressing. The identifiable inscriptions include: - Johannes L Steynberg 17-2-1876 22-6-1953 - Magdalena S Steynberg (geb. Hammann) 14-10-1973 22 - Deborah Getruida 13-11-1907 31-12-1925
12164/BGG-007	-26.41108	29.364116	Historic burial ground of farm labourers. Comprises at least 17 graves all with stone dressing. No tombstones or identifying features were noted to determine age or Next-of-Kin.
12164/BGG-008	-26.427597	29.382056	Historic farmstead cemetery associated with the Zwennis family. The cemetery comprises two graves with granite surface dressing. The identifiable inscriptions include: - Johan Peter Wilhelm Zwennis (Hammann) 26-11-1888 18-6-1949 - MFF Zwennis 14-1-1904 1-9-1936
12164/Ft-001	-26.338225	29.393733	Remnants of partial stone walling. The walls were collapsed, and possibly pillaged through time. No diagnostic stonewalling patterns could be determined to classify or associate with known farming community period groups.
12164/Ft-002	-26.40107	29.353424	Large square stonewalling at the base of a hill. Presumed to be historic in nature associated with farming activities.

Site Name	Latitude	Longitude	Description
12164/Ste-001	-26.354007	29.424759	Historic structure associated with the Erasmus family. Recorded as the original dwelling of Danie Erasmus burnt by the British during the Second Anglo-Boer War, presumed during skirmishes associated with the Battle of Bakenlaagte. Structure is abandoned and currently in a state of decay. Only outer perimeter walls of the structure remain. Structure constructed from sandstone.
12164/Ste-002	-26.353354	29.42394	Historic structure associated with the Erasmus family. Recorded as the second dwelling of Danie Erasmus established after the Second Anglo-Boer War. Structure is abandoned and currently in a state of decay. Outer and interior walls remain, with tin roof still intact. No doors or windows remain. Structure constructed from sandstone.
12164/Ste-003	-26.419025	29.372624	Historic farmhouse currently occupied by farm labourers.
12164/Ste-004	-26.42931	29.384048	Historic structure associated with farmstead. Comprises of a single structure built of sandstone. Outer perimeter walling remains, and has no roof. The structure is currently in disuse and state of decay.
12164/Wf-001	-26.415314	29.417591	Historic werf with ruins of original built structures. Comprises three structures, one large abandoned shed / workshop and another outbuilding. A single structure presumed to be the original outhouse / outside toilet for the farmstead is situated adjacent to the current farmhouse. The historic structures are currently in disuse and in state of decay. No significant architectural features identified to age the structures.
12164/Wf-002	-26.404374	29.36436	Historic werf ruin. Comprises several structures including farmhouse and outbuildings. The historic structures are currently in disuse and in state of decay. No significant architectural features identified to age the structures.

7 Impact Assessment

7.1 Cultural significance of the identified landscape

Heritage resources are intrinsic to the history and beliefs of communities. They characterise community identity and cultures, are finite, non-renewable and irreplaceable. Considering the innate value of heritage resources, HRM acknowledges that these have lasting worth as evidence of the origins of life, humanity and society. Notwithstanding the inherent value ascribed to heritage, it is incumbent of the assessor to determine resources significance to allow implementation of appropriate management. This is achieved through assessing heritage resources value relative to certain prescribed criteria encapsulated in policies and legal frameworks.

This section presents a statement of cultural significance as relevant to the newly identified heritage resources and greater cultural landscape of the site-specific study area. The statement of significance considers the identified heritage resources and landscape importance or contribution to four broad value categories: aesthetic, historical, scientific and social values, to summarise the CS and other values described in Section 3(3) of the NHRA.

Three categories of heritage resources were recorded during the field survey of the Vaalkop site-specific study area. These comprised:

- Archaeological – LFC (1 record);
- Burial grounds and graves (8 records); and
- Historical built environment (8 records).

The assessment of the CS and Field Ratings demonstrated that the identified have a CS designation ranging from negligible to very-high. A summary of this is presented in Table 7-1:

Figure 7-1: Examples of identified heritage resources

Table 7-1: CS and Field Ratings of newly identified heritage resources within the Vaalkop site-specific study area

Resource ID	Type	Description	Aesthetic	Historic	Scientific	Social	INTEGRITY	VALUE	Designation	Recommended Field Rating	Field Rating Description	Recommended Mitigation
BGG-001 BGG-002 BGG-003 BGG-004 BGG-005 BGG-006 BGG-007 BGG-008	Burial / grave	Burial Grounds & Graves	- Burial grounds and graves were not assessed against aesthetic criteria as defined in Section 3(3) of the NHRA	- Burial grounds and graves were not assessed against historic criteria as defined in Section 3(3) of the NHRA	- Burial grounds and graves were not assessed against scientific criteria as defined in Section 3(3) of the NHRA	5 Burial grounds and graves have specific connections to communities or groups for spiritual reasons. The significance is universally accepted.	4 The integrity of burial grounds is considered to be excellent with both tangible and intangible fabric preserved	20	Very High	Grade I[7]	Heritage resources with qualities so exceptional that they are of special national significance	Project design must change to avoid all change to resource; Conserved in entirety, CMP
Ste-001 Ste-002	Structure	Historical Built Environment	3 The structures were considered to display aesthetic attributes that are increasingly rare, primarily affiliated with the construction of sandstone dwellings dating to the late 19th and early 20th century.	4 The structures represent tangible remnants associated individuals and events surrounding the Battle of Bakenlaagte during the South African War of 1899 -1902 (Refer to Sections 6.1.5 and 6.2.4). These events contributed to the history of South Africa and are considered relevant at a national level.	4 The structures represent tangible remnants associated individuals and events surrounding the Battle of Bakenlaagte during the South African War of 1899 -1902 (Refer to Sections 6.1.5 and 6.2.4). These events contributed to the history of South Africa and are considered relevant at a national level.	4 The structures represent tangible remnants associated individuals and events surrounding the Battle of Bakenlaagte during the South African War of 1899 -1902 (Refer to Sections 6.1.5 and 6.2.4). These events contributed to the history of South Africa and are considered relevant at a national level.	3 The fabric of these resources are considered to be well preserved, where good quality information may be obtained, and the meaning is evident.	11	Medium	General Protection IV A	Resources under general protection in terms of NHRA sections 34 to 37 with Medium to Medium-High significance	Mitigation of resource to include detailed recording and mapping, and limited sampling, e.g. STPs.

[7] Field ratings considered the assigned CS and the level of official management required or the local competency of heritage authorities. Currently the MPHRA is only competent to manage and issue permits on NHRA Section 34 heritage resources, and no local (i.e. local government) competency exists within the province. All decisions relating burial grounds and graves therefore fall under the ambit of SAHRA.

Resource ID	Type	Description	Aesthetic	Historic	Scientific	Social	INTEGRITY	VALUE	Designation	Recommended Field Rating	Field Rating Description	Recommended Mitigation
Ft-001	Farming community site	Archaeological - LFC	0 Aspects may be considered in a particular dimension, but the overall aesthetics are poorly represented that it does not contribute to the resources overall value.	0 Aspects may be considered in a particular dimension, but the historic connections are poorly represented that it does not contribute to the resources overall value.	1 The resource was determined as common and well represented in diverse landscapes. Superior examples that could contribute to the scientific value of the resource exist in the local and regional study area.	1 The resource was determined as common and well represented in diverse landscapes. Superior examples that could contribute to the social value of the resource exist in the local and regional study area.	1 Based on the current state of preservation, the fabric was considered as poorly preserved with limited information potential.	1	Negligible	General Protection IV C	Resources under general protection in terms of NHRA sections 34 to 37 with Negligible significance	Sufficiently recorded, no mitigation required
Ft-002	Structure	Historical Built Environment	0 Aspects may be considered in a particular dimension, but the overall aesthetics are poorly represented that it does not contribute to the resources overall value.	0 Aspects may be considered in a particular dimension, but the historic connections are poorly represented that it does not contribute to the resources overall value.	0 Aspects may be considered in a particular dimension, but the scientific potential is negligible to the point that it does not contribute to the resources overall value.	0 Aspects may be considered in a particular dimension, no social attributes were identified that could contribute to the resources overall value.	1 The remnant stone walling holds no meaningful information potential and the fabric and original setting has been lost	0				
Ste-003			1 These structures and architectural styles were considered common and well represented throughout diverse cultural landscapes.	0 Aspects may be considered in a particular dimension, but the historic connections are poorly represented that it does not contribute to the resources overall value.	- The structures were not assessed against scientific criteria as defined in Section 3(3) of the NHRA	3 The structures were considered to have importance to specific communities.	2 Structures maintained some of the original fabric and the meaning was evident, but changes through time have encroach on the original structures and setting.	3				
Ste-004												
Wf-001	Werf		1 These structures and architectural styles were considered common and well represented throughout diverse cultural landscapes.	0 Aspects may be considered in a particular dimension, but the historic connections are poorly represented that it does not contribute to the resources overall value.	- The werfs were not assessed against scientific criteria as defined in Section 3(3) of the NHRA	3 The werfs were considered to have importance to specific communities.	2 Werfs maintained some of the original fabric and the meaning was evident, but level of preservation and decay has limited the information potential and/or quality.	3				
Wf-002												

Through an understanding of various heritage resources distribution within the site-specific study area, the statement of CS as presented in Table 7-2 demonstrates an average medium significance rating for the defined cultural landscape.

Table 7-2: CS for the cultural landscape

Resource ID	Description	INTEGRITY	CS Value	Cultural Significance
Vryheid Formation	Geological strata with palaeontological sensitivity	4	20	Very High
LFC Sites	LFC sites with good integrity	4	13	Medium High
LFC Sites	LFC sites with poor integrity	1	3	Negligible
Historical Built Environment	Historical structures associated with living groups with good integrity	4	12	Medium
Historical Built Environment	Historical structures associated with living groups with poor integrity	1	3	Negligible
Historical Built Environment	Historical structures not associated with living groups with good integrity	4	12	Medium
Historical Built Environment	Historical structures not associated with living groups with poor integrity	1	3	Negligible
Burial grounds and graves	Burials / graves	4	20	Very High

7.2 Heritage Impact Assessment

The assessment of potential impacts to heritage resources considers the aforementioned activities associated with the Project, specifically:

- The construction of two ventilation shafts within their TCTS and Trichardtsfontein Mining Right areas respectively; and
- Inclusion of high-extraction mining methodologies in addition to the approved bord and pillar mining method.

Based on the distribution of known heritage resources, none occur within or in proximity to the development of the proposed ventilation shafts on TCTS and Trichardtsfontein respectively. Therefore no direct impacts to heritage resources from the construction and operation of the ventilations shafts is envisaged.

The proposed mining methodologies will all occur at sub-surface levels, with no mining occurring on the surface. These methodologies avoid potential direct impacts commonly associated with open pit mining operations. . The inclusion of high-extraction mining

however, does increase the risk of subsidence during operation and decommissioning phases. This risk is intrinsically coupled with the depth to coal. In this instance, high extraction in areas with a depth to coal of between 30 – 50 m were considered to result in subsidence. No identified heritage resources occur within these areas, including a 15 m buffer.

The risk of subsidence, both high and low, are considered under Section 7.4 below.

7.3 Cumulative impacts on the cultural landscape

Cumulative impacts occur from in-combination effects of various impacts on heritage resources acting within a host of processes that result in an incremental effect. The importance of identifying and assessing cumulative impacts is that the whole is often greater than the sum of its parts. This implies that the total effect of multiple stressors or change processes acting simultaneously on a system may be greater than the sum of their effects when acting in isolation.

This Project in conjunction with other mining operations and planned developments in line with the strategic development plans for Mpumalanga requires consideration to identify the possible in-combination effects of various impacts to known heritage resources.

The following possible cumulative impacts of the Project have been identified:

Table 7-3: Summary of potential cumulative impacts

Type	Cumulative Impact	Direction of Change	Extent of Impact
Synergistic Space crowding	Continued contribution to the enhancement of an industrial / mining landscape through establishing new ventilation shafts. Contributing to the alteration of the sense-of-place of the cultural landscape from a historic, agrarian cultural landscape.	Negative	Regional
Additive	The continued effects operational activities, i.e. underground mining activities, on the integrity of the various known heritage resources within the site-specific study area.	Negative	Site-specific
Additive Synergistic	Increased significance of remaining *in situ* archaeological sites and accumulations and historic built structures regardless of integrity within the greater local study area.	Negative	Local

7.4 Risks and unplanned events

This section considers the potential risks to protected heritage resources, and potential heritage risks that could arise *for* Sasol in terms of implementation of the Project. These two aspects are discussed separately.

Considering the specified mining activities discussed under Sections 1.4 and 7.2 above, high-extraction methodologies increase the risk of subsidence in areas where the depth to coal is below 100 m. In these areas, subsidence may impact on protected heritage

resources (*Refer to Table 7-5 for list of relevant identified protected heritage resources*). Where an impact on heritage resources manifests, this may have social repercussions or result in litigation where no proactive management measures were undertaken.

A summary of the potential risk to protected heritage resources is presented in Table 7-4.

Table 7-4: Potential risk to identified protected heritage resources

Phase	Activity	Risk	Potential Impact
Operational	High extraction mining method where depth to coal is below 100 m.	High extraction mining method may result in subsidence Considering the distribution, identified heritage resources at the greatest risk of subsidence include: - Ste-001; - BGG-005; and - 4919/1998-SAHRA-0029/2629AD7	Damage or destruction of NHRA Section 34 resources, i.e. structures and built environment resources older than 60 years.
			Destruction of or disturbance to NHRA Section 35 resources, i.e. archaeological and/or palaeontological resources.
			Damage or destruction of, and loss of access to, NRHA Section 36 resources, i.e. burial grounds and graves.
Decommissioning	Closure	Underground mining voids may result in subsidence	Destruction or alteration of NHRA Section 34 resources, i.e. structures and built environment resources older than 60 years.
			Destruction of or disturbance to NHRA Section 35 resources, i.e. archaeological and/or palaeontological resources.
			Damage or destruction of, and loss of access to, NRHA Section 36 resources, i.e. burial grounds and graves.

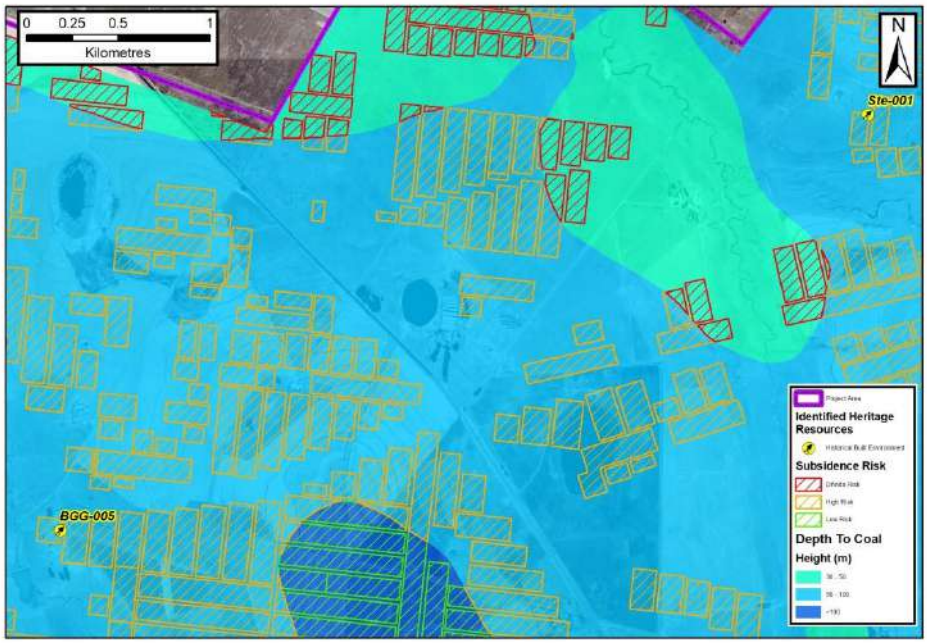


Figure 7-2: Location of Ste-001 and BGG-005 in relation to proposed undermining

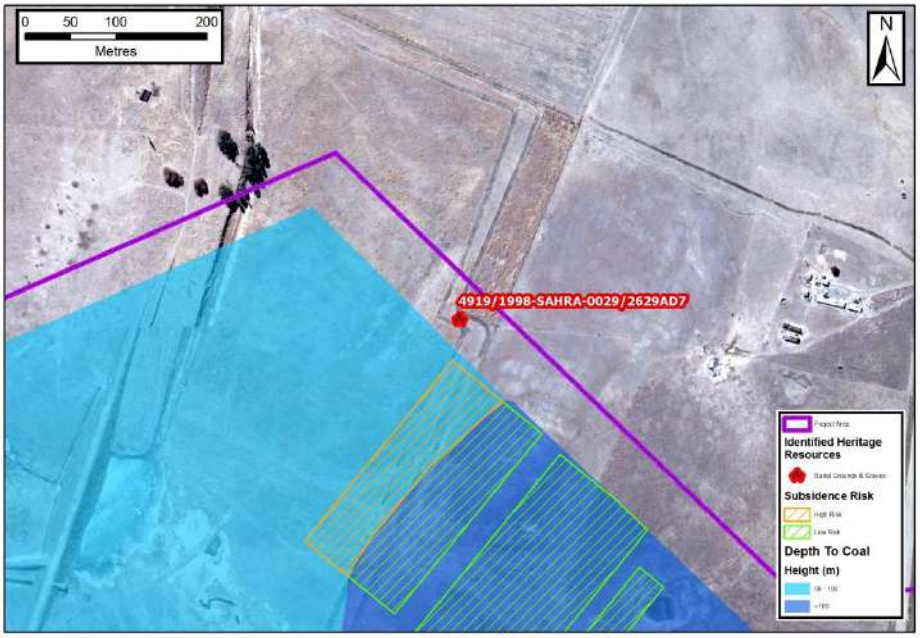


Figure 7-3: Location of 4919/1998-SAHRA-0029/2629AD7 in relation to proposed undermining

Table 7-5: Identified heritage resources at risk of possible subsidence

LoM Year	Heritage Category	Site ID	Description
Undefined	Burial Grounds & Graves	4919/1998-SAHRA-0029/2629AD42	Informal cemetery with approximately 5 graves, one of which has a headstone.
		4919/Van Schalkwyk-2007/17	An informal cemetery with about five graves, one of which has a headstone.
	Historical Built Environment	4919/1998-SAHRA-0029/2629AD43	Old farmstead with outbuildings. Currently occupied by farm labourers. It seems to be older than 60 years and is therefore protected.
		4919/Van Schalkwyk-2007/18	An old farmstead with outbuildings. Currently occupied by farm labourers. It seems to be older than 60 years and is therefore protected.
		Ste-002	Remnant foundation of historic structure. No other features identified.
2017	Archaeological - LFC	4919/1998-SAHRA-0029/2629AD41	Circular structures of stone affiliated with the LIA.
	Burial Grounds & Graves	4919/1998-SAHRA-0029/2629AD9	Four graves marked with cairns.
		4919/Van Schalkwyk-2007/2	Four graves marked with cairns. Just east of that, there are a number of circular stone structures that might be the foundations of old houses. These probably date to the early art of the century and can be related to the graves.
2018	Archaeological - LFC	4919/1998-SAHRA-0029/2629AD13	Circular structures of stone typical of the LIA.
		4919/Van Schalkwyk-2007/27	Circular structures of stone, typical of Late Iron Age structures. The Late Iron Age walling probably dates to the last 200 years and can possibly be related to the Sotho/Tswana speaking people.
		4919/Van Schalkwyk-2007/6	Circular structures of stone, typical of Late Iron Age structures. The Late Iron Age walling probably dates to the last 200 years and can possibly be related to the Sotho/Tswana speaking people.
	Historical Built Environment	4919/1998-SAHRA-0029/2629AD15	Old homestead, with a number of other structures, possibly labourer houses, in the vicinity. Not much information would be gained from this structure.
		4919/Van Schalkwyk-2007/8	An old homestead, with a number of other structures, possibly labourer houses, in the vicinity. Not much information would be gained from this structure.
2019	Burial Grounds & Graves	4919/1998-SAHRA-0029/2629AD11	Informal cemetery containing approximately 50 graves, five of which have headstones.
		4919/Van	An informal cemetery containing about 50 graves, of

LoM Year	Heritage Category	Site ID	Description
		Schalkwyk-2007/4	which five have headstones.
2021	Archaeological - LFC	4919/Van Schalkwyk-2007/26	Circular structures of stone, typical of Late Iron Age structures. The Late Iron Age walling probably dates to the last 200 years and can possibly be related to the Sotho/Tswana speaking people.
2022	Burial Grounds & Graves	4919/1998-SAHRA-0029/2629AD36	Informal cemetery containing approximately 5 graves, one with a headstone dating to 1980.
		4919/Van Schalkwyk-2007/11	An informal cemetery with about five graves. One of these have a headstone dating to 1980.
2024	Historical Built Environment	4919/1998-SAHRA-0029/2629AD40	Remains of houses occupied by farm labourers.
		4919/Van Schalkwyk-2007/15	Remains of houses occupied by farm labourers.
2025	Burial Grounds & Graves	4919/1998-SAHRA-0029/2629AC3	Informal cemetery containing approximately 10 graves, three of which have headstones.
		4919/Van Schalkwyk-2007/21	An informal cemetery containing about ten graves, of which three have headstones. Inscriptions are basically illegible.
	Historical Built Environment	4919/1998-SAHRA-0029/2629AD38	Remains of houses occupied by farm labourers.
		4919/Van Schalkwyk-2007/13	Remains of houses occupied by farm labourers.
2028	Burial Grounds and Graves	4919/1998-SAHRA-0029/2629AD7	Formal cemetery containing approximately 100 graves, some with headstones. Majority have been relocated during Sasol Mining developments.
2034	Archaeological - LFC	672/2629AD105	A number of ash middens, probably the remains of old cattle kraals.
	Historical Built Environment	4919/2003-SAHRA-0075/2629AD105	A number of ash middens, probably remains of old cattle kraals. Short sections of stone walling occur among the middens.
2035	Burial Grounds & Graves	4919/1998-SAHRA-0029/2629AC19	Informal cemetery with approximately 80 graves, 8 of which have headstones.
		4919/Van Schalkwyk-2007/25	An informal cemetery with about 80 graves. Most are marked with cairns and eight have headstones.
2036	Historical Built Environment	4919/Van Schalkwyk-2007/30	An old farmhouse. Stylistically it dates to the 1920s, but can even be older.

LoM Year	Heritage Category	Site ID	Description
2042	Burial Grounds & Graves	BGG-006	Historic farmstead cemetery associated with the Steynberg family. The cemetery comprises three graves with granite surface dressing. The identifiable inscriptions include: - Johannes L Steynberg 17-2-1876 22-6-1953 - Magdalena S Steynberg (geb. Hamman)
2043	Burial Grounds & Graves	BGG-001	Historic farmstead cemetery on the farm Yzervarkfontein associated with the Erasmus family. The cemetery comprises four graves with granite surface dressing. The identifiable inscriptions include: - Lourens J Erasmus 11-06-1864 25-10-1901 - (Illegible)
2045	Burial Grounds & Graves	BGG-005	Historic burial ground comprising of a single grave associated with the Meyer family. The grave has granite tombstone. Identifiable inscriptions on the tombstone include: - Carolus Johannus Meyer 1-1-1915 13-12-1937
2048	Historical Built Environment	Ft-002	Large square stonewalling at the base of a hill. Presumed to be historic in nature associated with farming activities.
2052	Historical Built Environment	Ste-001	Historic structure associated with the Erasmus family. Recorded as the original dwelling of Danie Erasmus burnt by the British during the Second Anglo-Boer War, presumed during skirmishes associated with the Battle of Bakenlaagte. Structure is abandoned.

Heritage related risks may also arise for Sasol through implementation of the Project. Identified heritage related risks are summarised in Table 7-6.

Table 7-6: Identified heritage risks that may arise for Sasol

Description	Primary Risk
Heritage resources with a high CS rating are inherently sensitive to any development in so far that the continued survival of the resource could be threatened. In addition to this, certain heritage resources are formally protected thereby restricting various development activities. Within the site-specific study area, these include LFC sites protected by Section 35 of the NHRA, historical built environment resources protected by Section 34 of the NHRA, and burial grounds and graves protected by Section 36 of the NHRA.	Negative Record of Decision (RoD) and/or development restrictions issued by SAHRA and/or MPRHA in terms of Section 38(8).
Impacting on heritage resources formally and generally protected by the NHRA without following	Fines

Description	Primary Risk
due process. Due process may include social consultations and/or permit application processes to SAHRA and/or MPRHA.	Penalties Seizure of Equipment Compulsory Repair / Cease Work Orders Imprisonment

8 Identified heritage impacts versus socio-economic benefit

Information presented in this section is an abbreviated summary of information contained within the Gert Sibande District Municipality Integrated Development Plan and Spatial Development Framework (Gert Sibande District Municipality, 2014; 2016)**, the Goven Mbeki Local Municipality Integrated Development Plan** (Goven Mbeki Local Municipality, 2016) **and Statistics South Africa** (Statistics SA, 2011)

The site-specific study area is located in the GMLM of the GSDM in Mpumalanga. The primary economic sectors include:

1. Agriculture and forestry;
2. Mining and energy;
3. Tourism and cultural industries;
4. Green economy; and
5. Manufacturing and beneficiation.

The strategic objective of the GSDM is to foster economic growth and job creation in the aforementioned economic sectors. Broadly, it is proposed to achieve this objective *inter alia*:

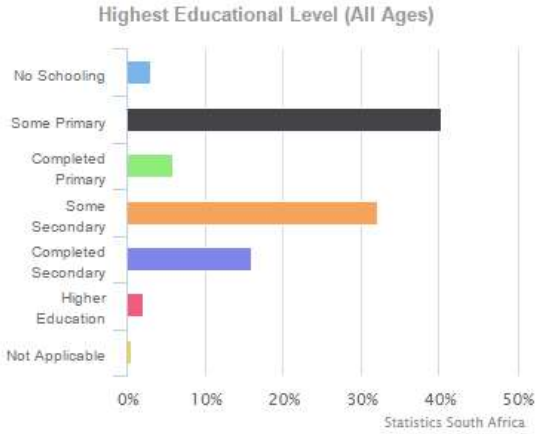
- Infrastructure and skills development;
- Balanced consideration of competition between agriculture and mining industries; and
- Diversification of primary nature-based tourism offerings.

Statistically, the GMLM comprises a population of 294 538. Most the population have completed some primary or secondary education, but with only 16% completing secondary education. Inferences from these statistics suggest that the population has a relatively low skill base that contributes to the economic profile of the GMLM. Here, of the total population 69% (i.e. 204 475) are of working age with only 99 138 individuals employed. Economically, 44% of earners receive an annual salary of between R 9 601 – R 76 400. The education levels, employment status and average income of the working age group is presented in Figure 8-1.

To facilitate the achievement of the strategic objectives of the GSDM and GMLM, mining developments and operations can serve as positive contributors to skills development to the affected local population, a stimulator for economic growth, a vehicle for Local Economic

Development (LED) initiatives, and sustainable employment. Therefore, the potential socio-economic benefits that may be derived from the Project are greater than the identified risks to the known heritage resources. This statement is supported by the following:

- Identified heritage resources can be maintained *in situ* and managed through the proposed recommendations;
- No heritage resources have been identified within the development footprint of surface infrastructure;
- The Project will contribute to the economic development of the local study area; and
- The Project can contribute to LED initiatives.



Employment Status	Number
Employed	99138
Unemployed	35249
Discouraged Work Seeker	6787
Not Economically Active	63301

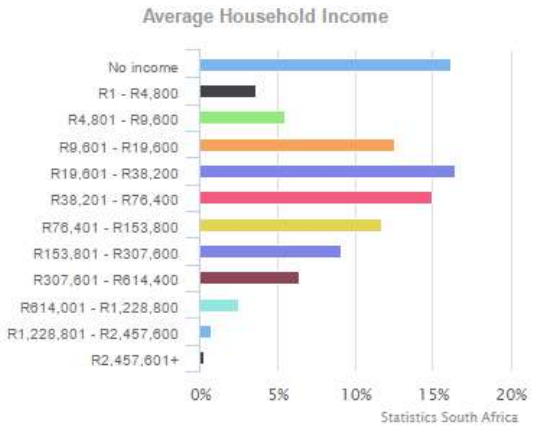


Figure 8-1: Statistics of GMLM population (Statistics SA, 2011)

9 Consultation

The consultation process affords Interested and Affected Parties (I&APs) opportunities to engage in the EIA process. The objectives of the Stakeholder Engagement Process (SEP) include the following:

- To ensure that I&APs are informed about the project;
- To provide I&APs with an opportunity to engage and provide comment on the project;
- To draw on local knowledge by identifying environmental and social concerns associated with the project;
- To involve I&APs in identifying methods in which concerns can be addressed;
- To verify that stakeholder comments have been accurately recorded; and
- To comply with the legal requirements.

Informal, heritage specific consultation was undertaken with Mr. John Patrick Quinlan-Fleet on 24 January 2017. Mr. Quinlan-Fleet held the view that the original *Yzervarkfontein* homestead (Recorded as Ste-001 and Ste-002), played a role in what is assumed to be the 150th commemoration of the 1838-1841 Great Trek that took place in 1988. He maintains that a branch from a *Eucalyptus* tree that stood at in the original *werf* was cut and used as a torch in various celebratory proceedings nationwide. These claims were investigated, but no supporting documentation in the available archives could be identified.

At the time of compiling this report the required regulatory SEP had not commenced. All comments received through the public review of this report and the draft EIA / EMPr will be collated into a Comments and Response Report (CRR) to respond to and address any comments raised.

The final EIA / EMPr, CRR and HIA will be submitted to SAHRA and MPRHA for adjudication as required in terms of Section 38(8) of the NHRA.

10 Recommendations

Portions of the site-specific study area are underlain by the *Vryheid Formation* with a high palaeontological sensitivity and very high CS. The fossiliferous material commonly occurs in the shale lenses between coal seams at sub-surface levels. Digby Wells acknowledges the significance of the *Vryheid Formation* but is of the opinion that a detailed palaeontological assessment at this stage will not add value. On a similar project completed for Digby Wells, Bamford (2016) notes that field assessments would not reveal any additional information until excavation of the coal seams themselves take place.

Digby Wells therefore requests exemption from further palaeontological assessment on the basis of the aforementioned motivation and on condition that a Fossil Chance Find Procedure is included in the final EMPr. The recommended procedure developed by Bamford (2016) comprises the following.

Table 10-1: Recommended fossil finds procedure

Phase	Procedure
Construction	Surface excavations should be monitored by the geologist and any fossil material disturbed should be put aside and the palaeontologist called to inspect the material within a reasonable timeframe to minimise delays to the project. The geologist should also review visual references and descriptions of palaeontological material presented in Section 6.2.2 above. A schedule of monitoring must be set up between the mine and palaeontologist and the agreement letter submitted to SAHRA. If it is not feasible for the palaeontologist to visit the mine timeously then digital photographs of good quality and resolution should be sent to the palaeontologist to assess and make recommendations. From visits or photographs supplied the palaeontologist must make the following recommendations: • Material is of no value so development can proceed, or • Fossil material is of some interest so a representative sample should be carefully collected and put aside for further study and incorporated into a recognised repository (e.g. Ditsong Museum, Council for Geosciences, Pretoria; Evolutionary Studies Institute, University of the Witwatersrand, Johannesburg) and a permit obtained from SAHRA for the removal of the fossils, then development may proceed, or • Fossils are scientifically important and the palaeontologist must obtain a SAHRA permit to excavate the fossils and put them into a recognised repository, then development may proceed.
Operational	Once the mine is operational and the coals and shales are exposed the palaeontologist should visit the mine to see if fossils are present. Then the above procedure, can be followed. • At each stage a report should be sent to SAHRA by the palaeontologist detailing the fossil finds and where they are being kept.
Decommissioning	A palaeontologist should search through the dumps and exposed shales and seams, rescue any fossil material of scientific interest, store it in a recognised repository so it is available for future research, and then the land must be rehabilitated.

Based on the nature of the Project and the distribution of heritage resources, no direct impacts from the construction and operation of the ventilations shafts is envisaged. Furthermore, the proposed mining methodologies will all occur at sub-surface levels, with no mining occurring on the surface. These methodologies avoid potential direct impacts to identified heritage resources occurring within or in proximity to the underground operations. The inclusion of high-extraction mining however, does increase the risk of subsidence during operation and decommissioning phases.

To mitigate against the identified potential risk of subsidence to known heritage resources, Digby Wells recommends the development and implementation of a Conservation Management Plan (CMP) as a condition of authorisation that includes *inter alia*:

- Site definitions;
- Descriptions and defines CS of the known heritage resources;

- Ownership structures;
- Management structures;
- Responsibility matrices;
- Objectives, targets and strategies;
- Monitoring procedures
- Define regulated permitting activities as encapsulated in GN R 548 that may be applicable in the event of impact manifestation; and
- Reporting requirements.

Further to the proposed recommendations, Sasol must complete a detailed surface survey of the proposed undermining areas prior to the operation phase to:

- Accurately delineate the extent of the potential subsidence area;
- Confirm the presence to identified heritage resources that may be impacted upon;
- Record any additional previously unidentified heritage resources that must be included in the developed CMP.

11 Conclusion

The aim of the HRM process was to comply with regulatory requirements contained within Section 38 of the NHRA through the following:

- Defining the cultural landscape within which the Project is situated;
- Identify, as far as is feasible, heritage resources that may be impacted upon by the project as well as define the CS;
- Assess the possible impacts to the identified heritage resources;
- Consider the socio-economic benefits of the Project; and
- Provide feasible mitigation and management measures to avoid, remove or reduce perceived impacts and risks.

No alternatives to the Project were considered in this assessment. The only alternative would be the “no-go” option, in which case the current status quo would remain intact. This option will promote the continued degradation of the known heritage resources as well as decreased CS through time.

Based on Digby Wells’ understanding of the Project (Refer to Section 1.2) while considering the defined cultural landscape and known heritage resources (Refer to Section 6), no impacts are envisaged by the construction and operation of the proposed TCTS and Trichardtsfontein ventilations shafts, or the inclusion of high-extraction mining methodologies. This notwithstanding, the following recommendations have been made:

- An RfE from further palaeontological assessment based on the motivations and conditions presented in Section 10; and
- The development and implementation of a CMP for the consolidated site-specific study area to proactively manage the identified risk of subsidence.

Where these recommendations are adopted, Digby Wells does not object to the implementation of the Project.

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Appendix A: Specialist CV

DIGBY WELLS
ENVIRONMENTAL

Mr. Justin du Piesanie

Manager: Heritage Resources Management

Social and Heritage Services Department

Digby Wells Environmental

1 Education

Date	Degree(s) or Diploma(s) obtained	Institution
2015	Continued Professional Development, Intermediate Project Management Course	PM.Ideas: A division of the Mindset Group
2013	Continued Professional Development Programme, Architectural and Urban Conservation: Researching and Assessing Local Environments	University of Cape Town
2008	MSc	University of the Witwatersrand
2005	BA (Honours) (Archaeology)	University of the Witwatersrand
2004	BA	University of the Witwatersrand
2001	Matric	Norkem Park High School

2 Language Skills

Language	Written	Spoken
English	Excellent	Excellent
Afrikaans	Proficient	Good

3 Employment

Period	Company	Title/position
2016 to present	Digby Wells Environmental	Unit Manager: Heritage Resources Management
2011-2016	Digby Wells Environmental	Heritage Management Consultant: Archaeologist
2009-2011	University of the Witwatersrand	Archaeology Collections Manager
2009-2011	Independent	Archaeologist
2006-2007	Maropeng & Sterkfontein Caves UNESCO World Heritage Site	Tour guide

4 Experience

I joined the company in August 2011 as an archaeologist and was subsequently made unit manager in the Social and Heritage Services Department in 2016. I obtained my Master of Science (MSc) degree in Archaeology from the University of the Witwatersrand in 2008, specialising in the Southern African Iron Age. I further attended courses in architectural and urban conservation through the University of Cape Town's Faculty of Engineering and the Built Environment Continuing Professional Development Programme in 2013. I am a professional member of the Association of Southern African Professional Archaeologists (ASAPA), and accredited by the association's Cultural Resources Management (CRM) section. I am also a member of the International Council on Monuments and Sites (ICOMOS), an advisory body to the UNESCO World Heritage Convention. I have over 10 years combined experience in HRM in South Africa, including heritage assessments, archaeological mitigation, grave relocation, and NHRA Section 34 application processes. I gained further generalist experience since my appointment at Digby Wells in Botswana, Burkina Faso, the Democratic Republic of Congo, Liberia and Mali on projects that have required compliance with IFC requirements such as Performance Standard 8: Cultural Heritage. Furthermore, I have acted as a technical expert reviewer of HRM projects undertaken in Cameroon and Senegal. My current focus at Digby Wells is to develop the HRM process as an integrated discipline following international HRM principles and standards. This approach aims to provide clients with comprehensive, project-specific solutions that promote ethical heritage management and assist in achieving strategic objectives.

5 Project Experience

Please see the following table for relevant project experience:

Project Title	Project Location	Date:		Description of the Project	Name of Client
Klipriviersberg Archaeological Survey	Meyersdal, Gauteng, South Africa	2005	2006	Archaeological surveys	ARM
Sun City Archaeological Site Mapping	Sun City, Pilanesberg, North West Province, South Africa	2006	2006	Phase 2 Mapping	Sun International
Witbank Dam Archaeological Impact Assessment	Witbank, Mpumalanga, South Africa	2007	2007	Archaeological survey	ARM
Archaeological Assessment of Modderfontein AH Holdings	Johannesburg, Gauteng, South Africa	2008	2008	Heritage Basic Assessment	ARM
Heritage Assessment of Rhino Mines	Thabazimbi, Limpopo Province, South Africa	2008	2008	Heritage Impact Assessment	Rhino Mines
Cronimet Project	Thabazimbi, Limpopo Province, South Africa	2008	2008	Archaeological surveys	Cronimet
Eskom Thohoyandou SEA Project	Limpopo Province, South Africa	2008	2008	Heritage Statement	Eskom
Wenzelrust Excavations	Shoshanguve, Gauteng, South Africa	2009	2009	Phase 2 Excavations	Heritage Contracts Unit
University of the Witwatersrand Parys LIA Shelter Project	Parys, Free State, South Africa	2009	2009	Phase 2 Mapping	University of the Witwatersrand
Transnet NMPP Line	Kwa-Zulu Natal, South Africa	2010	2010	Heritage survey	Umlando Consultants
Archaeological Impact Assessment – Witpoortjie Project	Johannesburg, Gauteng, South Africa	2010	2010	Archaeological Impact Assessment	ARM
Der Brochen Archaeological Excavations	Steelpoort, Mpumalanga, South Africa	2010	2010	Phase 2 Excavations	Heritage Contracts Unit
De Brochen and Booysendal Archaeology Project	Steelpoort, Mpumalanga, South Africa	2010	2010	Phase 2 Mapping	Heritage Contracts Unit
Eskom Thohoyandou Electricity Master Network	Limpopo Province, South Africa	2010	2010	Heritage Statement	Strategic Environmental Focus
Batlhako Mine Expansion	North-West Province, South Africa	2010	2010	Phase 2 Mapping	Heritage Contracts Unit
Kibali Gold Project Grave Relocation Plan	Orientale Province, Democratic Republic of Congo	2011	2013	Grave Relocation	Randgold Resources Limited

Project Title	Project Location	Date:		Description of the Project	Name of Client
Kibali Gold Hydro-Power Project	Orientale Province, Democratic Republic of Congo	2012	2014	Heritage Impact Assessment	Randgold Resources Limited
Everest North Mining Project	Steelpoort, Mpumalanga, South Africa	2012	2012	Heritage Impact Assessment	Aquarius Resources
Environmental Authorisation for the Gold One Geluksdal TSF and Pipeline	Gauteng, South Africa	2012	2012	Heritage Impact Assessment	Gold One International
Platreef Burial Grounds and Graves Survey	Mokopane, Limpopo Province, South Africa	2012	2012	Burial Grounds and Graves Survey	Platreef Resources
Resgen Boikarabelo Coal Mine	Limpopo Province, South Africa	2012	2012	Phase 2 Excavations	Resources Generation
Bokoni Platinum Road Watching Brief	Burgersfort, Limpopo Province, South Africa	2012	2012	Watching Brief	Bokoni Platinum Mine
SEGA Gold Mining Project	Burkina Faso	2012	2013	Socio Economic and Asset Survey	Cluff Gold PLC
Everest North Mining Project	Steelpoort, Mpumalanga, South Africa	2012	2015	Heritage Impact Assessment	Aquarius Resources
SEGA Gold Mining Project	Burkina Faso	2013	2013	Technical Reviewer	Cluff Gold PLC
Consbrey and Harwar Collieries Project	Breyton, Mpumalanga, South Africa	2013	2013	Heritage Impact Assessment	Msobo
New Liberty Gold Project	Liberia	2013	2014	Grave Relocation	Aureus Mining
Falea Uranium Mine Environmental Assessment	Falea, Mali	2013	2013	Heritage Scoping	Rockgate Capital
Putu Iron Ore Mine Project	Petroken, Liberia	2013	2014	Heritage Impact Assessment	Atkins Limited
Sasol Twistdraai Project	Secunda, Mpumalanga, South Africa	2013	2014	Notification of Intent to Develop	ERM Southern Africa
Daleside Acetylene Gas Production Facility	Gauteng, South Africa	2013	2013	Heritage Impact Assessment	ERM Southern Africa
Exxaro Belfast GRP	Belfast, Mpumalanga, South Africa	2013	-	Grave Relocation	Exxaro Coal Mpumalanga (Pty) Ltd
Nzoro 2 Hydro Power Project	Orientale Province, Democratic Republic of Congo	2014	2014	Social consultation	Randgold Resources Limited
Eastern Basin AMD Project	Springs, Gauteng, South Africa	2014	2014	Heritage Impact Assessment	AECOM
Soweto Cluster Reclamation Project	Soweto, Gauteng, South Africa	2014	2014	Heritage Impact Assessment	Ergo (Pty) Ltd

Project Title	Project Location	Date:		Description of the Project	Name of Client
Klipspruit South Project	Ogies, Mpumalanga, South Africa	2014	2014	Heritage Impact Assessment	BHP Billiton
Klipspruit Extension: Weltevreden Project	Ogies, Mpumalanga, South Africa	2014	2014	Heritage Impact Assessment	BHP Billiton
Ergo Rondebult Pipeline Basic Assessment	Johannesburg, South Africa	2014	2014	Heritage Basic Assessment	Ergo (Pty) Ltd
Kibali ESIA Update Project	Orientale Province, Democratic Republic of Congo	2014	2014	Heritage Impact Assessment	Randgold Resources Limited
GoldOne EMP Consolidation	Westonaria, Gauteng, South Africa	2014	2014	Gap analysis	Gold One International
Yzermite PIA	Wakkerstroom, Mpumalanga, South Africa	2014	2014	Palaeontological Assessment	EcoPartners
Sasol Mooikraal Basic Assessment	Sasolburg, Free State, South Africa	2014	2014	Heritage Basic Assessment	Sasol Mining
Oakleaf ESIA Project	Bronkhorstspruit, Gauteng, South Africa	2014	2015	Heritage Impact Assessment	Oakleaf Investment Holdings
Rea Vaya Phase II C Project	Johannesburg, Gauteng, South Africa	2014	2014	Heritage Impact Assessment	ILISO Consulting
Imvula Project	Kriel, Mpumalanga, South Africa	2014	2015	Heritage Impact Assessment	Ixia Coal
Sibanye WRTRP	Gauteng, South Africa	2014	2016	Heritage Impact Assessment	Sibanye
VMIC Vanadium EIA Project	Mokopane, Limpopo, South Africa	2014	2015	Heritage Impact Assessment	VM Investment Company
NLGM Constructed Wetlands Project	Liberia	2015	2015	Heritage Impact Assessment	Aureus Mining
ERPM Section 34 Destruction Permits Applications	Johannesburg, Gauteng, South Africa	2015	2015	Section 34 Destruction Permit Applications	Ergo (Pty) Ltd
JMEP II EIA	Botswana	2015	2015	Heritage Impact Assessment	Jindal
Gino's Building Section 34 Destruction Permit Application	Johannesburg, Gauteng, South Africa	2015	2016	Heritage Impact Assessment and Section 34 Destruction Permit Application	Bigen Africa Services (Pty) Ltd
EDC Block Refurbishment Project	Johannesburg, Gauteng, South Africa	2015	2016	Heritage Impact Assessment and Section 34 Permit Application	Bigen Africa Services (Pty) Ltd
Namane IPP and Transmission Line EIA	Steenbokpan, Limpopo Province, South Africa	2015	2016	Heritage Impact Assessment	Namane Resources (Pty) Ltd
Temo Coal Road Diversion and Rail Loop EIA	Steenbokpan, Limpopo Province, South Africa	2015	2016	Heritage Impact Assessment	Namane Resources (Pty) Ltd
Groningen and Inhambane PRA	Limpopo Province, South Africa	2016	2016	Heritage Basic Assessment	Rustenburg Platinum Mines Limited

Project Title	Project Location	Date:		Description of the Project	Name of Client
NTEM Iron Ore Mine and Pipeline Project	Cameroon	2014	2016	Technical Review	IMIC plc
Palmietkuilen MRA	Springs, Gauteng, South Africa	2016	2016	Heritage Impact Assessment	Canyon Resources (Pty) Ltd
Copper Sunset Sand Mining S.102	Free State, South Africa	2016	2016	Heritage Basic Assessment	Copper Sunset Sand (Pty) Ltd
Grootvlei MRA	Springs, Gauteng, South Africa	2016	2016	Notification of Intent to Develop	Ergo (Pty) Ltd
Lambda EMP	Mpumalanga, South Africa	2016	2016	Palaeontological Impact Assessment	Eskom Holdings SOC Limited
Kilbarchan Basic Assessment and EMP	Newcastle, KwaZulu-Natal, South Africa	2016	2016	Heritage Basic Assessment	Eskom Holdings SOC Limited
Grootegeluk Amendment	Lephalale, Limpopo Province, South Africa	2016	2016	Notification of Intent to Develop	Exxaro
Garsfontein Township Development	Pretoria, Gauteng, South Africa	2016	2016	Notification of Intent to Develop	Leungo Construction Enterprises
Massawa EIA	Senegal	2016	2017	Technical Reviewer Heritage Impact Assessment	Randgold Resources Limited
Louis Botha Phase 2	Johannesburg, Gauteng, South Africa	2016	2016	Phase 2 Excavations	Royal Haskoning DHV
Beatrix EIA and EMP	Welkom, Free State, South Africa	2016	2017	Heritage Impact Assessment	Sibanye Gold Ltd
Sun City Heritage Mapping	Pilanesberg, North-West Province, South Africa	2016	2016	Phase 2 Mapping	Sun International
Sun City Chair Lift	Pilanesberg, North-West Province, South Africa	2016	2017	Notification of Intent to Develop and Heritage Basic Assessment	Sun International
Hendrina Underground Coal Mine EIA	Hendrina, Mpumalanga, South Africa	2016	2017	Heritage Impact Assessment	Umcebo Mining (Pty) Ltd
Elandsfontein EMP Update	Clewer, Mpumalanga, South Africa	2016	2017	Heritage Impact Assessment	Anker Coal
Eskom Northern KZN Strengthening	KwaZulu-Natal, South Africa	2016	-	Heritage Impact Assessment	ILISO Consulting
Thabametsi GRP	Lephalale, Limpopo Province, South Africa	2017	-	Grave Relocation	Exxaro Resources Ltd
Grootegeluk Watching Brief	Lephalale, Limpopo Province, South Africa	2017	2017	Watching Brief	Exxaro Resources Ltd
Matla HSMP	Kriel, Mpumalanga Province, South Africa	2017	2017	Heritage Site Management Plan	Exxaro Coal Mpumalanga (Pty) Ltd
Ledjadja Coal Borrow Pits	Lephalale, Limpopo Province, South Africa	2017	2017	Heritage Basic Assessment	Ledjadja Coal (Pty) Ltd
Exxaro Belfast Implementation Project PIA	Belfast, Mpumalanga, South Africa	2017	2017	Palaeontological Impact Assessment	Exxaro Coal Mpumalanga (Pty) Ltd

Project Title	Project Location	Date:		Description of the Project	Name of Client
Lanxess Chrome Mine Archaeological Mitigation	Rustenburg, North West Province, South Africa	2017	2017	Phase 2 Excavations	Lanxess Chrome Mine (Pty) Ltd
Goulamina EIA Project	Goulamina, Sikasso Region, Mali	2017	2017	Heritage Impact Assessment	Birimian Limited
Zuurfontein Residential Establishment Project	Ekurhuleni, Gauteng, South Africa	2017	2017	Notification of Intent to Develop	Shuma Africa Projects
Kibali Grave Relocation Training and Implementation	Orientale Province, Democratic Republic of Congo	2017	-	Grave Relocation	Randgold Resources Limited
Exxaro Matla HRM	Kriel, Mpumalanga	2017	-	Heritage Impact Assessment	Exxaro Coal Mpumalanga (Pty) Ltd

6 Professional Registrations

Position	Professional Body	Registration Number
Member	Association for Southern African Professional Archaeologists (ASAPA); ASAPA Cultural Resources Management (CRM) section	270
Member	International Council on Monuments and Sites (ICOMOS)	14274
Member	Society for Africanist Archaeologists (SAfA)	N/A
Member	International Association of Impact Assessors (IAIA) South Africa	5494

7 Publications

Huffman, T.N. & du Piesanie, J.J. 2011. Khami and the Venda in the Mapungubwe Landscape. Journal of African Archaeology 9(2): 189-206

du Piesanie, J.J., 2017. Book Review: African Cultural Heritage Conservation and Management. South African Archaeological Bulletin 72(205)

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Email/E-pos: admin@es.org.za
Web: www.es.org.za

BTW nommer : 4280258700

CURRICULUM VITA

1 PERSONAL DETAILS

Full names	Johan Nel
Nationality	South African citizen
Date of birth	7 January 1980
South African identity number	80 01 07 50 11 080
Driver's licence type	South Africa code B
Home language	Afrikaans and English
Highest qualification obtained	BA Honours (Archaeology) (UP), 2002
Current employer	The Heritage Foundation
Current position	Manager: Conservation Services
Health	Excellent
Criminal record	None

2 EDUCATION

Date	Degree(s) or Diploma(s) obtained	Institution
2014	Integrated Heritage Resources Management Certificate, NQF Level 6	Rhodes University
2002	BA (Honours) (Archaeology)	University of Pretoria

2001	BA	University of Pretoria
1997	Matric with exemption	Brandwag Hoërskool

3 LANGUAGE

Language	Speaking	Writing	Reading
English	Excellent	Excellent	Excellent
Afrikaans	Excellent	Excellent	Excellent

4 EMPLOYMENT

Period	Company	Title/position
11/2016 –	The Heritage Foundation	Manager: Conservation Services
09/2011 to 10/2016	Digby Wells Environmental	Manager: Heritage Resources Management unit
05/2010-2011	Digby Wells Environmental	Archaeologist
10/2005-05/2010	Archaic Heritage Project Management	Manager and co-owner
2003-2007		Freelance archaeologist
(2004-2005)	Rock Art Mapping Project	Resident archaeologist
2002-2003	Department of Anatomy, University of Pretoria	Special assistant: Anthropology
2001-2002	Department of Anatomy, University of Pretoria	Technical assistant
1999-2001	National Cultural History Museum & Department of Anthropology and Archaeology, UP	Assistant: Mapungubwe Project,

5 BIOGRAPHY

My involvement in Cultural Heritage Resources Management spans a period of 17 years. This includes *inter alia* research projects, archaeological and heritage assessments, grave relocation, social consultation and mitigation of archaeological sites. I have worked in both urban settings and remote rural landscapes throughout South Africa, as well as Botswana, the Democratic Republic of the Congo, Liberia Sierra Leone and Swaziland. In addition, I have also acted as a specialist reviewer of heritage studies undertaken by local specialists in countries such as Cameroon, Malawi, Mali and Tanzania.

Since 2010 I have been fortunate to complement my experience in the heritage arena with Integrated Environmental Management. This exposure has enabled me to investigate and implement the integration of Cultural Heritage Resources Management into Environmental Management processes. Many of the projects have required compliance with International Finance Corporation requirements and other World Bank standards. This knowledge has allowed me to develop and implement a Cultural Heritage Resources Management approach that is founded on international best practice and leading international conservation bodies such as UNESCO and ICOMOS.

I have been appointed by the Heritage Foundation, a Section 21 not-for-profit company in November 2016 as Manager: Conservation Services. My duties here include among other things review, drafting and implementing Integrated Management Plans and Conservation Management Plans for various heritage sites in South Africa, identifying funding opportunities and drafting funding proposals, heritage focussed research and liaison with various government and NGO bodies. In addition, I still maintain a level of general Heritage Resources Management consulting services through the Heritage Foundation.

I am fluent in English and Afrikaans, with excellent writing and research skills. My fully computer literacy includes proficiency in all Microsoft programmes. I am fortunate to be able to work very well under pressure, especially when projects demand grasping complex, interconnected processes.

6 PROFESSIONAL REGISTRATION

Position	Professional Body	Registration Number
Professional member (Council member) (2013-2015)	Association for Southern African Professional Archaeologists (ASAPA); ASAPA Cultural Resources Management (CRM) section	095
Member	International Council on Monuments and Sites (ICOMOS)	13839

Professional member	International Association of Impact Assessors – South Africa (IAIAsa)	NA
Institutional member	South African Museums Association (SAMA)	NA

7 PUBLICATIONS AND CONFERENCE PAPERS

Author/s & date	Title	Published in/presented at
Nel, J. (2001)	Cycles of Initiation in Traditional South African Cultures.	South African Encyclopaedia (MWEB).
Nel, J. 2001.	Social Consultation: Networking Human Remains and a Social Consultation Case Study	Research poster presentations at the. Bi-annual Conference (SA3) Association of Southern African Professional Archaeologists the National Museum, Cape Town
Nel, J. 2002.	Collections policy for the WG de Haas Anatomy museum and associated Collections.	Unpublished. Department of Anatomy, School of Medicine: University of Pretoria.
Nel, J. 2004.	Research and design of exhibition for Eloff Belting and Equipment CC	Institute of Quarrying 35th Conference and Exhibition on 24 – 27 March 2004
Nel, J. 2004.	Ritual and Symbolism in Archaeology, Does it exist?	Research paper presented at the Bi-annual Conference (SA3) Association of Southern African Professional Archaeologists: Kimberley
Nel, J & Tiley, S. 2004.	The Archaeology of Mapungubwe: a World Heritage Site in the Central Limpopo Valley, Republic of South Africa.	Archaeology World Report, (1) United Kingdom p.14-22.
Nel, J. 2007.	The Railway Code: Gautrain, NZASM and Heritage.	Public lecture for the South African Archaeological Society, Transvaal Branch: Roedean School, Parktown.

Nel, J. 2009.	Un-archaeologically speaking: the use, abuse and misuse of archaeology in popular culture.	The Digging Stick. April 2009. 26(1): 11-13: Johannesburg: The South African Archaeological Society.
Nel, J. 2011.	'Gods, Graves and Scholars' returning Mapungubwe human remains to their resting place.' In: Mapungubwe Remembered.	University of Pretoria commemorative publication: Johannesburg: Chris van Rensburg Publishers.
Nel, J. 2012	HIAs for EAPs.	. Paper presented at IAIA annual conference: Somerset West.
Nel, J. 2013.	The Matrix: A proposed method to evaluate significance of, and change to, heritage resources.	Paper presented at the 2013 ASAPA Biennial conference: Gaborone, Botswana.
Nel, J. 2013	HRM and EMS: Uncomfortable fit or separate process.	Paper presented at the 2013 ASAPA Biennial conference: Gaborone, Botswana.

8 PROJECT EXPERIENCE

Archaeological and Heritage Impact Assessments	80+
Burial grounds and graves consultation and relocation processes	20
Heritage mitigation projects	10+
Research reports and reviews	10+
Management plans	2

9 REFEREES

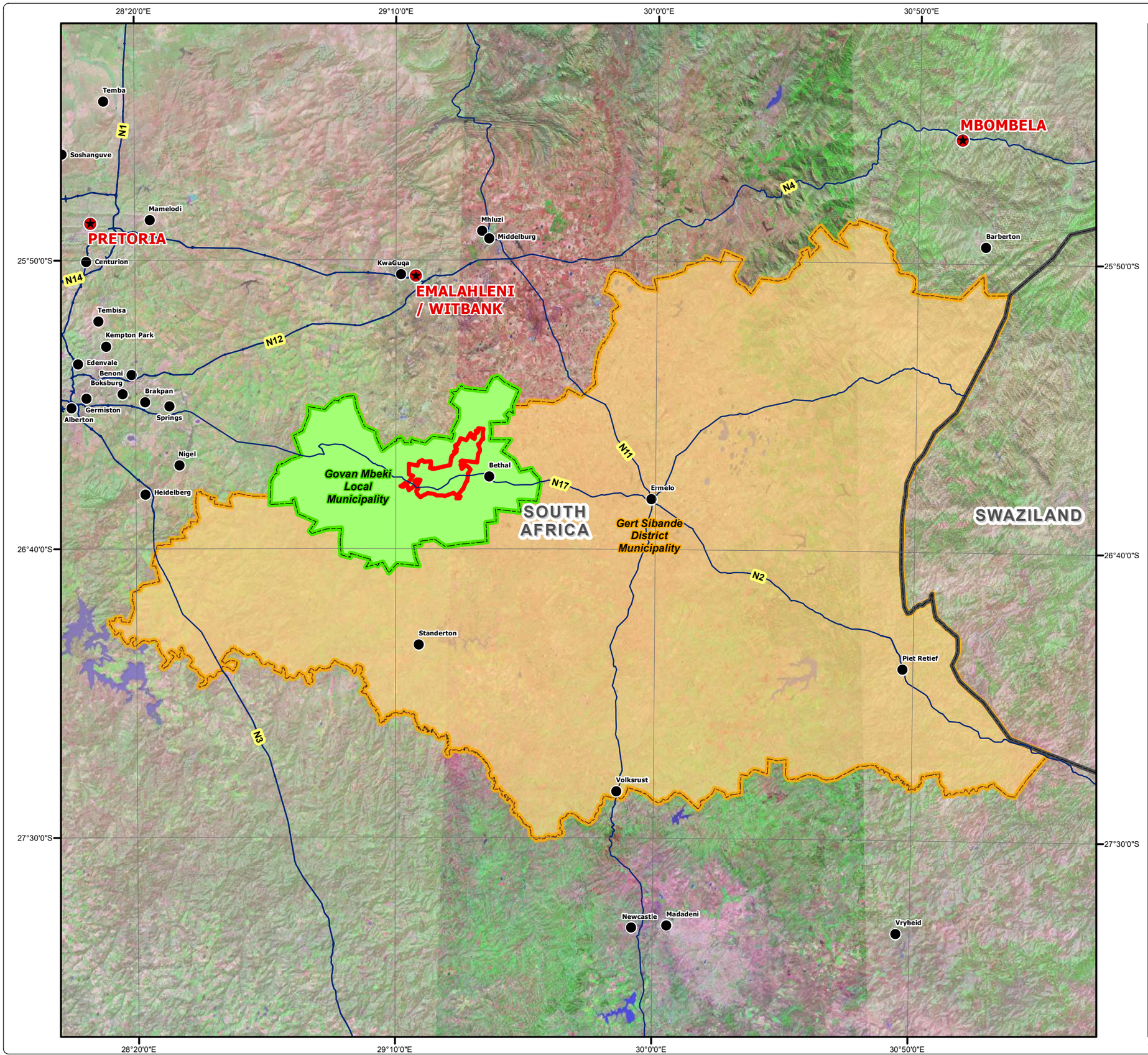
A list of referees can be provided on request.

Appendix B: Plans

Plan 1

Thubelisha Consolidated EMPR

Regional Study Area



Legend

- Project Area
- Local Study Area
- Regional Study Area
- City
- Major Town
- National Road
- International Boundary
- District Municipal Boundary
- Local Municipal Boundary

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Projection: Transverse Mercator	Ref #: kwt.SAS3869.201611.012
Datum: WGS 1984	Revision Number: 1
Central Meridian: 29°E	Date: 01/11/2016

N

0 10 20 40 60

Kilometres

1:1 220 000

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Plan 2

Thubelisha Consolidated EMPR

Site-Specific Study Area

29°12'0"E 29°18'0"E 29°24'0"E

26°18'0"S 26°24'0"S 26°30'0"S

R580 R545 R547 N17 R38

DWA RIVIER/DIEWEGSPRUIT

RIETFONTEIN DAM

East Vent

South Shaft

Trichardt

Secunda

TRICHARDSPRUIT

TRICHARDTSFONTEIN DAM

BIESBOKSPRUIT

KLIPSPRUIT

Legend

- Project Area
- Vaalkop Mining Right
- Trichardtsfontein Mining Right
- Thubelisha Mining Right
- Shaft Location
- Secondary Town
- Other Town
- Power Line
- National / Arterial Route
- Main Road
- Minor Route
- Railway Line
- Non-Perennial Stream
- Perennial Stream
- Dam Wall
- Dam / Lake
- Non-Perennial Pan
- Perennial Pan

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Datum: WGS 1984
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Ref #: kwt.SAS3869.201611.012
Revision Number: 1
Date: 01/11/2016

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Kilometres

1:110 000

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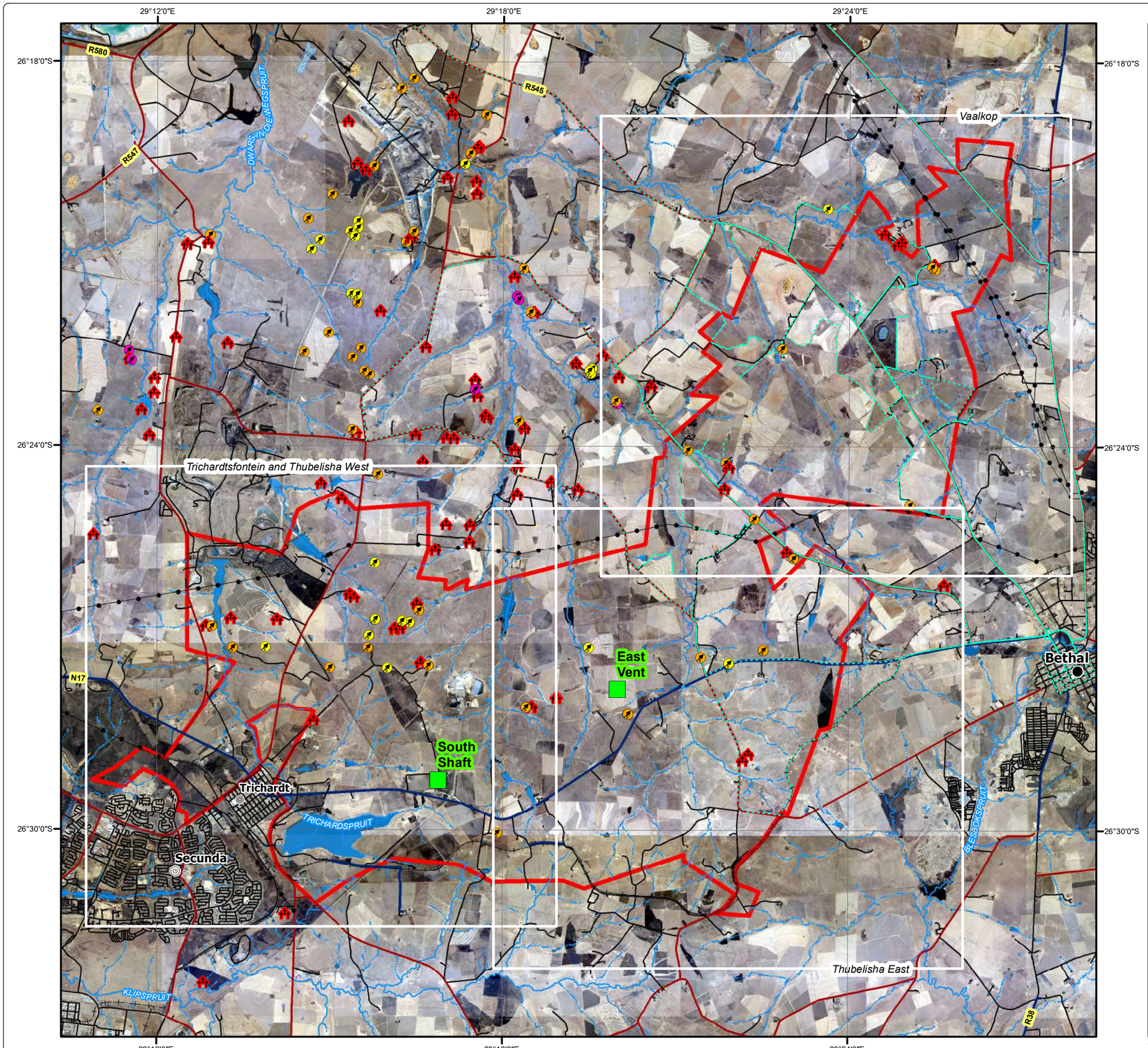
Plan 3

Thubelisha Consolidated EMPR

Identified Heritage Resources



Legend

- Project Area
- Shaft Location

Identified Heritage Resources

- Archaeological
- Burial Grounds & Graves
- Historical Built Environment
- Recent Heritage
- Major Town
- Secondary Town
- Other Town
- Heritage Fieldwork Tracks
- Power Line
- National / Arterial Route
- Main Road
- Minor Route
- Railway Line
- Non-Perennial Stream
- Perennial Stream
- Dam Wall
- Dam / Lake
- Non-Perennial Pan
- Perennial Pan

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Projection: Transverse Mercator	Ref #: kwt.SAS3869.201708.004
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Kilometres

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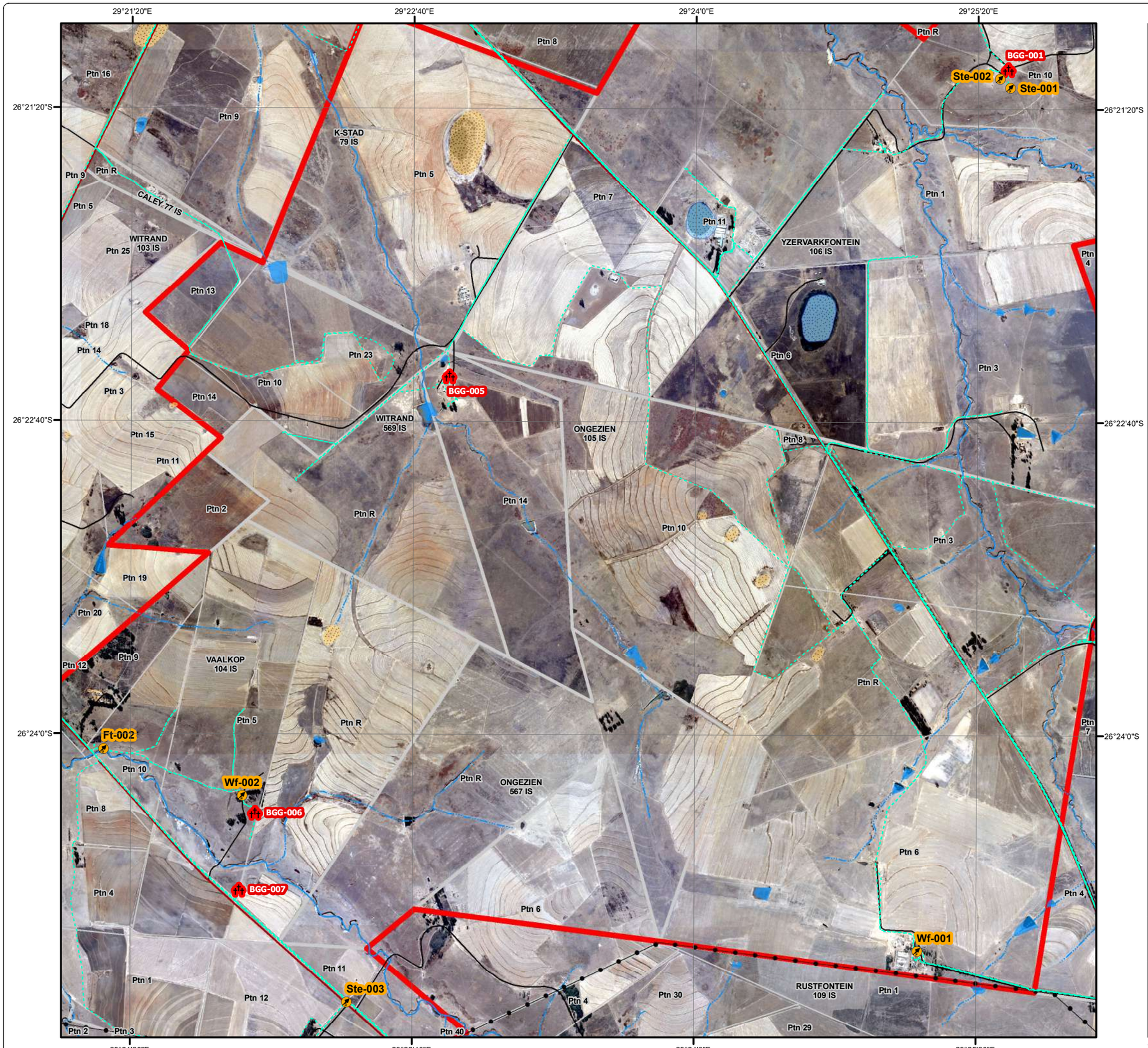
Plan 3a

Thubelisha Consolidated EMPR

Identified Heritage Resource - Vaalkop Zoom



Legend

- Project Area

Identified Heritage Resource

- Burial Grounds & Graves
- Historical Built Environment
- Heritage Fieldwork Tracks
- Power Line
- Main Road
- Minor Route
- Non-Perennial Stream
- Perennial Stream
- Dam / Lake
- Non-Perennial Pan
- Perennial Pan
- Farm Boundary
- Farm Portion

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Projection: Transverse Mercator	Ref #: kwt.SAS3869.201708.004
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Central Meridian: 29°E	Date: 02/08/2017

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Kilometres

1:30 000

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Plan 3b

Identified Heritage Resource - Trichardtsfontein and Thubelisha West Zoom

29°13'30"E | 29°15'0"E | 29°16'30"E

26°25'30"S | 26°27'0"S | 26°28'30"S

SYFERFONTEIN 115 IS
KLIPKRAAL 114 IS
FRISCHGEWAAGD 142 IS
TWEEDRAAI 139 IS
TRICHARDTSFONTEIN 140 IS
HOLFONTEIN 138 IS
ROOIPOORT 143 IS

4919/Van Schalkwyk-2007/25
4919/1998-SAHRA-0029/2629AD19
4919/1998-SAHRA-0029/2629AD18
4919/1998-SAHRA-0029/2629AD17
4919/1998-SAHRA-0029/2629AD11
4919/Van Schalkwyk-2007/4
4919/1998-SAHRA-0029/2629AD12
4919/Van Schalkwyk-2007/5
4919/1998-SAHRA-0029/2629AC17
4919/Van Schalkwyk-2007/23
4919/Van Schalkwyk-2007/21
4919/Van Schalkwyk-2007/22
4919/1998-SAHRA-0029/2629AC4
4919/1998-SAHRA-0029/2629AC3
4919/Van Schalkwyk-2007/9
4919/1998-SAHRA-0029/2629AD16
4919/1998-SAHRA-0029/2629AD10
4919/1998-SAHRA-0029/2629AD13
4919/Van Schalkwyk-2007/3
4919/Van Schalkwyk-2007/27
4919/1998-SAHRA-0029/2629AD9
4919/1998-SAHRA-0029/2629AD14
4919/Van Schalkwyk-2007/7
4919/1998-SAHRA-0029/2629AD15
4919/Van Schalkwyk-2007/8
4919/Van Schalkwyk-2007/24
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4919/Van Schalkwyk-2007/26
4919/Van Schalkwyk-2007/17
4919/1998-SAHRA-0029/2629AD42
4919/Van Schalkwyk-2007/18
4919/1998-SAHRA-0029/2629AD43
4919/Van Schalkwyk-2007/16
4919/1998-SAHRA-0029/2629AD41
4919/Van Schalkwyk-2007/10
4919/1998-SAHRA-0029/2629AD35
4919/1998-SAHRA-0029/2629AD11
4919/Van Schalkwyk-2007/4
4919/Van Schalkwyk-2007/5
4919/1998-SAHRA-0029/2629AD12
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4919/1998-SAHRA-0029/2629AD13
4919/1998-SAHRA-0029/2629AD10
4919/Van Schalkwyk-2007/3
4919/Van Schalkwyk-2007/2
4919/1998-SAHRA-0029/2629AD8
4919/Van Schalkwyk-2007/27
4919/1998-SAHRA-0029/2629AD9
South Shaft

Legend

- Project Area
- Shaft Location

Identified Heritage Resource

- Archaeological
- Burial Grounds & Graves
- Historical Built Environment
- Power Line
- National / Arterial Route
- Main Road
- Minor Route
- Railway Line
- Non-Perennial Stream
- Perennial Stream
- Dam / Lake
- Perennial Pan
- Farm Boundary
- Farm Portion

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Projection: Transverse Mercator	Ref #: kwt.SAS3869.201708.004
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Central Meridian: 29°E	Date: 02/08/2017

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Kilometres

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Plan 3c

Thubelisha Consolidated EMPR

Identified Heritage Resource - Thubelisha East Zoom

29°18'0"E 29°19'10"E 29°20'20"E 29°21'30"E 29°22'40"E

26°27'20"S 26°28'30"S 26°29'40"S 26°30'50"S

FRISCHGEWAAGD 142 IS
ZEEKOEGAT 145 IS
PALMIETFONTEIN 110 IS
ELANDSFONTEIN 147 IS
ROOIPOORT 143 IS
ROOIPOORT 144 IS
RIETFONTEIN 146 IS
GROOTVLEI 293 IS
FRISCHGEWAAGD 294 IS

4919/1998-SAHRA-0029/2629AD37
4919/2003-SAHRA-0075/2629AD105
672/2629AD105
4919/Van Schalkwyk-2007/30
672/2629AD104
East Vent
4919/Van Schalkwyk-2007/13
4919/Van Schalkwyk-2007/14
4919/Van Schalkwyk-2007/28
4919/Van Schalkwyk-2007/29
4919/Van Schalkwyk-2007/31
4919/Van Schalkwyk-2007/11
4919/1998-SAHRA-0029/2629AD36
4919/Van Schalkwyk-2007/15
4919/1998-SAHRA-0029/2629AD39
4919/Van Schalkwyk-2007/14

N17

Legend

- Project Area
- Shaft Location

Identified Heritage Resource

- Archaeological
- Burial Grounds & Graves
- Historical Built Environment
- Heritage Fieldwork Tracks
- National / Arterial Route
- Main Road
- Minor Route
- Railway Line
- Non-Perennial Stream
- Perennial Stream
- Dam / Lake
- Perennial Pan
- Farm Boundary
- Farm Portion

DIGBY WELLS ENVIRONMENTAL

• Sustainability • Service • Positive Change • Professionalism • Future Focused • Integrity

Projection: Transverse Mercator
Datum: WGS 1984
Central Meridian: 29°E

Ref #: kwt.SAS3869.201708.003
Revision Number: 1
Date: 01/08/2017

N

0 0.25 0.5 1 1.5

Kilometres
1:33 000

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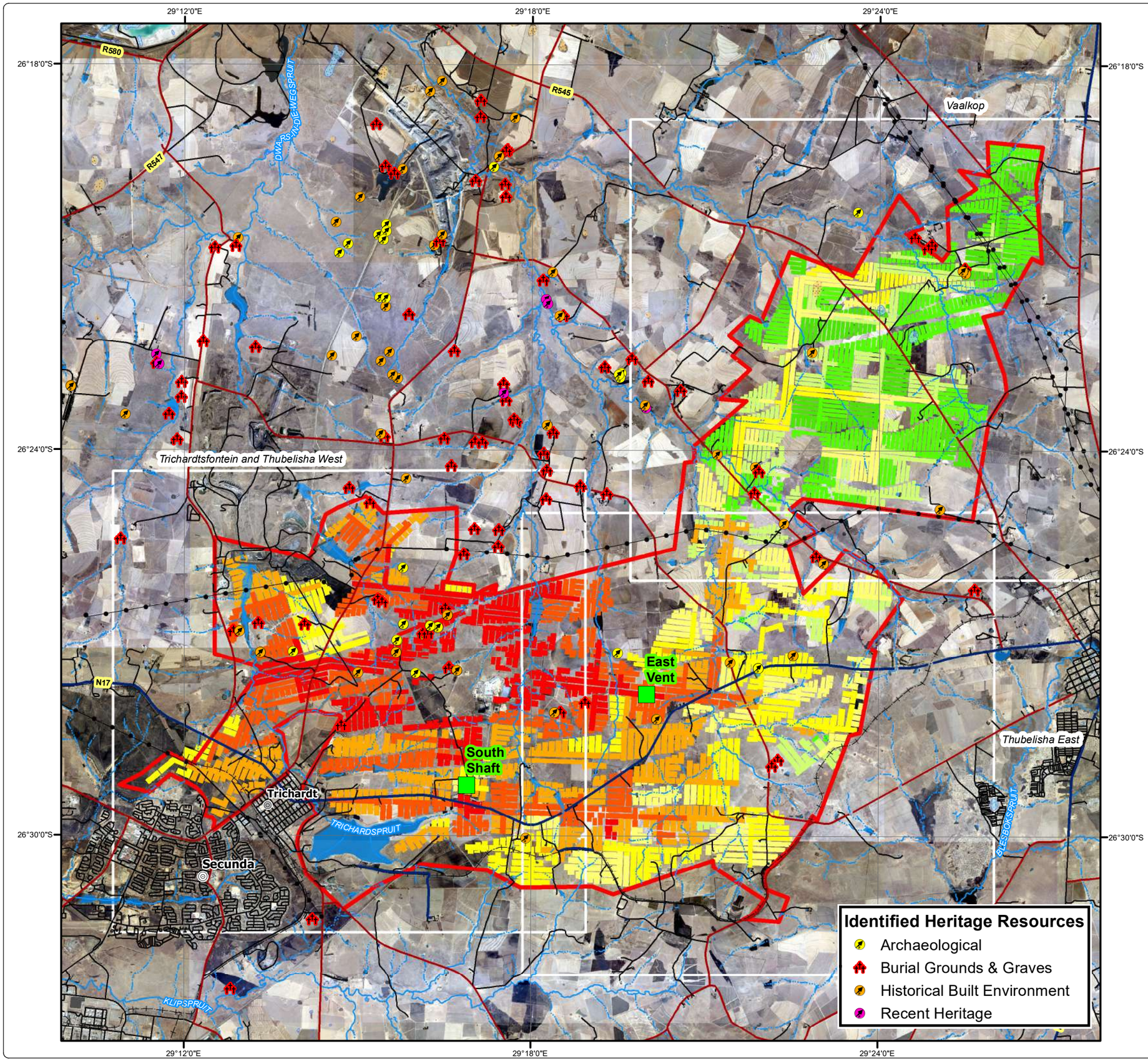
Plan 4

Thubelisha Consolidated EMPR

Life of Mine



Legend

- Project Area
- Shaft Location
- Secondary Town
- Other Town
- Power Line
- National / Arterial Route
- Main Road
- Minor Route
- Railway Line
- Non-Perennial Stream
- Perennial Stream
- Dam Wall
- Dam / Lake
- Non-Perennial Pan
- Perennial Pan

Life Of Mine

Year

- 2016 - 2020
- 2021 - 2025
- 2026 - 2030
- 2031 - 2035
- 2036 - 2040
- 2041 - 2045
- 2046 - 2050
- 2051 - 2054

DIGBY WELLS ENVIRONMENTAL

• Sustainability • Service • Positive Change • Professionalism • Future Focused • Integrity

Projection: Transverse Mercator	Ref #: kwt.SAS3869.201708.003
Datum: WGS 1984	Revision Number: 1
Central Meridian: 29°E	Date: 01/08/2017

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0 1 2 4

Kilometres

1:110 000

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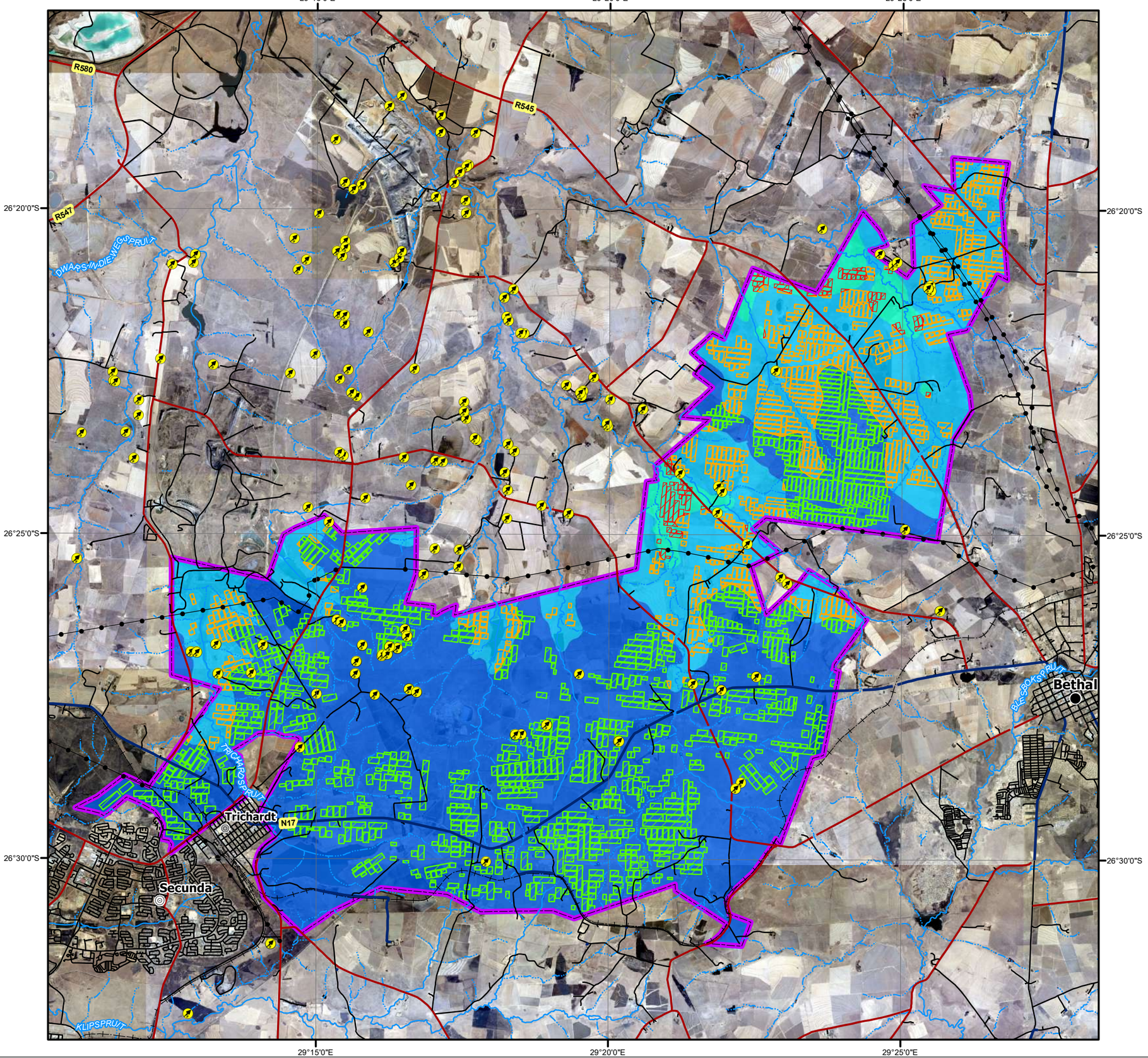
Plan 5

Thubelisha Consolidated EMPR

Subsidence Risk



Legend

- Project Area
- Identified Heritage Resource
- Major Town
- Secondary Town
- Other Town
- Power Line
- National / Arterial Route
- Main Road
- Minor Route
- Railway Line
- Non-Perennial Stream
- Perennial Stream

Subsidence Risk

- Definite Risk
- High Risk
- Low Risk

Depth To Coal

Height (m)

- 30 - 50
- 50 - 100
- >100

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Projection: Transverse Mercator
Datum: WGS 1984
Central Meridian: 29°E

Ref #: kwt.SAS3869.201712.034
Revision Number: 1
Date: 08/12/2017

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Kilometres

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