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ENVIRONMENTAL

SAHRIS Case ID: 8826

Basic Assessment Report: Environmental Authorisation Application in support of the Section 102 Amendment for the Copper Sunset Sand Mining Operation, near Sasolburg, Free State

Heritage Basic Assessment Report

Project Number:

COP3706

Prepared for:

Copper Sunset Sand (Pty) Ltd

November 2015

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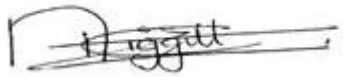
I, Natasha Higgitt as duly authorised representative of Digby Wells and Associates (South Africa) (Pty) Ltd., hereby confirm my independence (as well as that of Digby Wells and Associates (South Africa) (Pty) Ltd.) and declare that neither I nor Digby Wells and Associates (South Africa) (Pty) Ltd. have any interest, be it business, financial, personal or other, in any proposed activity, application or appeal in respect of Copper Sunset Sand (Pty) Ltd, other than fair remuneration for work performed, specifically in connection with the Heritage Resources Management (HRM) Process for the proposed Copper Sunset Expansion Project, Free State Province.



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EXECUTIVE SUMMARY

Copper Sunset Sand (Pty) Ltd has submitted an application for Environmental Authorisation for Listed Activities in terms of the Environmental Impact Assessment (EIA) Regulations, 2014, of the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA), as well an application to extend its Mining Right area in terms of Section 102 of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) (MPRDA). Copper Sunset Sand intends to incorporate three new farm areas. The farms Copper Sunset Sand intends to incorporate into its mining license are:

- The remaining extent of the Farm Zandfontein No. 259 (F01600000000025900000);
- The remaining extent of the Farm Bankfontein No. 9 (F01600000000000900000); and
- A portion of the Farm Rietfontein No. 152 (F01600000000015200000).

These farm portions are currently owned by New Vaal Colliery as part of Anglo American (Coal SA). The Mining Right application is for a total area of 19.1829 hectares (ha) for the mining of sand.

Digby Wells Environmental (Digby Wells) was appointed by Copper Sunset to submit an Environmental Authorisation (EA) application in support of a Section 102 Amendment to their Mining Right. This report constitutes a Heritage Basic Assessment Report (HBAR) to inform the overall Basic Assessment Report (BAR).

Copper Sunset Sands current mining operation involves the strip mining of general sand (90% plaster and 10% building sand); this is carried out in strips of 30 – 35 metres (m) in width and 2.5 – 3 m depth. The lengths of the strips are dependent on the area to be mined.

The following Scope of Work (SoW) has been completed:

- Brief literature review based on existing impact assessment reports in the surrounding area and available databases; and
- Historical layering to identify potential structures older than 60 years and to identify changes in the cultural landscape;
- Pre-disturbance survey of the proposed study area to record the current state of the cultural landscape;
- Statement of Significance;
- Impact Assessment and possible sources of risk; and
- Recommend mitigation measures.

Geologically, the site specific area is underlain by the Madzaringwe Formation of the Karoo Supergroup. The Madzaringwe Formation has the potential to hold fossils such as *Glossopterid* coal flora. No rocky outcrops or exposed bedrock was identified within the

project area. Based on the project activities, there will be no impact on the highly sensitive Madzaringwe Formation.

Based on the results of the desktop study and pre-disturbance survey, no heritage impacts are envisioned for the Copper Sunset Expansion Project. No significant heritage resources were identified within the site specific project area as a result of the desktop study. Heritage resources were identified at a local level including Stone Age surface occurrences, burial grounds and historical structures, though none were identified within the site specific project area. No heritage resources or surface indicators of sub-surface heritage resources were identified during the pre-disturbance survey

There will be no impacts to the very highly significant Madzaringwe Formation, as the loose sandy soil has been found to extend to 6 m deep. The proposed mining activities are planned to extend no deeper than 3 m, therefore the Madzaringwe Formation will not be impacted.

Based on the findings of this report, Digby Wells recommends the following mitigation and management plans:

- Exemption from further palaeontological assessments for the proposed infrastructure footprint due to the limited impact of the proposed project activities on the geological formations;
- Chance Finds Procedures (CFPs) inclusive of Fossil Finds Procedures (FFPs) must be developed and implemented as part of the Environmental Management Plan (EMP) that clearly describe the reporting process and appropriate management of the exposure of previously unidentified heritage resources; and
- The ECO/contractors must be trained to identify various types of heritage resources that are likely to be found within the project area.

LIST OF ACRONYMS, ABBREVIATIONS AND TERMS

Abbreviation	Meaning
ASAPA	Association of Southern African Professional Archaeologists
BA	Bachelor of Arts
Bsc	Bachelor of Science
DWE	Digby Wells Environmental
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
ESA	Early Stone Age
ESTA	Extension of Security of Tenure Act (Act No. 62 of 1997)
GIS	Geographical Information System
GPS	Global Positioning System
HBAR	Heritage Basic Assessment Report
HFS	Heritage Free State
HIA	Heritage Impact Assessment
Hons	Honours degree
HRA	Heritage Resources Authority
HRM	Heritage Resources Management
ICOMOS	International Council on Monuments and Sites
LSA	Late Stone Age
MA	Master of Arts
MPRDA	Minerals 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)
SAHRA	South African Heritage Resources Agency
SAHRIS	South African Heritage Resources Information System
SAMA	South African Museum Association
SoW	Scope of Work
Ste	Structure
UNESCO	United Nations Education, Scientific and Cultural Organisation
UP	University of Pretoria
Wits	University of the Witwatersrand

GLOSSARY

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.
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.
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 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.
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.
Formal protection	Places with qualities so exceptional that they are of special national significance as national heritage sites or that have special qualities as provincial heritage sites.
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.
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.
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 cryptocrystalines, quarts and chert. The LSA is also associated with archaeological rock art including both paintings and engravings.
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.
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. 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).
Palaeontological	Any fossilised remains or fossil trace of animals or plants which lived in the geological past, other than fossil fuels or fossiliferous rock intended for industrial use, and any site which contains such fossilised remains or trance.
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.
Public monuments / memorials	All monuments and memorials: erected on land belonging to any branch of central, provincial or local government; on land belonging to any organisation funded by or established in terms of the legislation of such a branch of government; which were paid for by public subscription, government funds, or a public-spirited or military organisation, and are on land belonging to any private individual.
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.

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1 Introduction

Copper Sunset Sand (Pty) Ltd (Copper Sunset) appointed Digby Wells Environmental (Digby Wells) to conduct a suite of specialist studies and compile a Basic Assessment Report in support of an application for Environmental Authorisation (EA). The EA was submitted for the proposed Copper Sunset Expansion Project (the Project). This Project will entail the incorporation of three farms located in the Metsimaholo Local Municipality (MLM), Free State Province, into Copper Sunset's existing mining right.

The farms Copper Sunset Sand intends to incorporate into its mining license are:

- The remaining extent of the Farm Zandfontein No. 259 (F01600000000025900000);
- The remaining extent of the Farm Bankfontein No. 9 (F01600000000000900000); and
- A portion of the Farm Rietfontein No. 152 (F01600000000015200000).

This document constitutes a Heritage Basic Assessment Report (HBAR) as one of the specialist studies conducted for the BAR.

1.1 Project Background

Copper Sunset intends to expand its Mining Right area to incorporate adjacent properties as discussed in section 1 above, to extend its Life of Mine. Digby Wells will be applying on behalf of Copper Sunset for the EA for Listed Activities in terms of the legal framework presented in section 3 below. A Basic Assessment (BA) process will be undertaken in support of the EA, in conjunction with the application to amend the mining right in terms of the legal framework.

These farm portions are currently owned by New Vaal Colliery as part of Anglo American (Coal SA). The Mining Right application is for a total area of 19.1829 hectares (ha) for the mining of sand. Digby Wells Environmental (Digby Wells) was appointed by Copper Sunset to submit an Environmental Authorisation (EA) application in support of a Section 102 Amendment to their Mining Right.

1.2 Scope of Work

The Terms of Reference (ToR) issued to Digby Wells required that a BA process be completed for the EA and application to amend Copper Sunset's existing mining right. This BA process needed to include a Heritage Resources Management (HRM) process. The HRM process comprised a Notification of Intent to Develop (NID) and a HBAR for submission to the South African Heritage Resources Agency (SAHRA) and Heritage Free State Heritage (HFS).

1.3 Purpose and contents of report

The purpose of this HRM process, including the NID and HBAR is to:

- Timeously furnish responsible heritage resources authorities (HRAs) with the project information;
- Provide HRAs with details regarding the location, nature and extent of the proposed activities;
- Identify the specific heritage sensitivities in the study area, including acceptable levels of change in relation to assigned cultural significance;
- Provide specialist recommendations for appropriate and feasible mitigation measures; and
- Ensure compliance with applicable legislation referred to in section 3 below.

This report is structured as follows:

- Chapter 2 describes the methodology undertaken during the HRM process and the compilation of this report;
- Chapter 3 provides a brief outline of the legal framework applicable to the HRM process;
- Chapter 4 summarises the project description and project activities;
- Chapter 5 provides a description of the cultural heritage baseline and affected environment;
- Chapter 6 presents the cultural significance of identified heritage sites and the discusses the impact assessment undertaken; and
- Recommendations and mitigation measures are discussed in Chapter 7.

2 Methodology

The following activities were completed during the HRM process:

- Study areas were defined;
- Data collection;
- Participation and consultation;
- Developing cultural significance and field ratings; and
- Heritage Impact Assessment.

2.1 Defining Study Areas

Three ‘concentric’ study areas were defined for the purposes of this study. These areas are defined below; each one encompasses its precursor and exceeds it in scale:

- The ***regional study area*** - this area was defined as the Fezile Dabi District Municipality (FDDM) district municipality. 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 as shown in Plan 4-1.
- The ***local study area*** – the area most likely to be influenced by any changes to heritage resources in the study area, or where project development could cause heritage impacts. This area was defined as the immediate surrounding properties / farms, as well as the affected MLM (See Plan 4-2).
- The ***site-specific study area*** – this is the area where heritage impacts are most probable due to development. This area is defined as the extent of the farm portions, of the proposed study area including any buffer areas around the study area that may be required. (See Plan 4-3).

The relevance of defining study area arises from the fact that heritage resources do not exist in isolation to the greater natural and social (including socio-cultural, -economic and -political) environment. There is also a legal requirement to provide suggested field ratings for identified heritage resources (see Section 2.2 below). These field ratings aim to assist responsible heritage resources authorities in grading resources into three categories in terms of national (Grade I), provincial (Grade II) and local (Grade III) 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.

2.1 Data Collection

Data collection is necessary to develop a cultural heritage baseline profile, discussed in Section 5. Gathered information assisted in the development of the cultural heritage baseline profile, determination of cultural significance, and assessment of impacts. Qualitative and quantitative data were collected for the HBAR.

2.1.1 Legal review

Relevant national and provincial legislation were reviewed. The purpose was to ensure that the Copper Sunset Expansion Project process adhered to all conditions contained in these documents.

2.1.2 Literature review and desktop data collection

Relevant information was sourced from amongst others available reports, publications, websites and cartographic sources, listed in 9. These sources were reviewed to collect both qualitative and quantitative data.

Table 2-1: Summary of reviewed information sources

Relevant Previous Heritage Studies		
Author	**Report Type**	**Area/development**
du Piesanie, 2014	NID	Bankfontein 9
Fourie, 2007	HIA	Bankfontein 9
Hollmann, 1999	Rock art report	Leeuwkuil engraving site
Pistorius, 2007	HIA	Vanderbijlpark
van der Walt, 2005	Heritage Scoping Report	New Vaal Colliery
Van Schalkwyk, 1998	HIA	Emfuleni Development Area
Van Vollenhoven, 2008	HIA	Midvaal Municipal Area

Historical layering was completed for the site specific area and aimed to identify historical heritage resources. 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 three fold as follows:

- Provides relative dates based on the presence/absence of visible features;
- To identify changes in the cultural landscape; and
- Identifies potential locations where heritage resources may exist within an area.

Cartographic sources referred to in this report are listed in Table 2-2 below.

Table 2-2: Relevant reviewed cartographic sources

<table>
<tr><th colspan="7">Historical maps</th></tr>
<tr><th colspan="2">Map series</th><th colspan="4">Name / number</th><th>Date</th></tr>
<tr><td colspan="2">Jeppes</td><td colspan="4">Transvaal</td><td>1899</td></tr>
<tr><th colspan="7">Aerial photographs</th></tr>
<tr><th>Job no.</th><th>Flight plan</th><th>Photo no.</th><th>Map ref.</th><th>Area</th><th>Date</th><th>Reference</th></tr>
<tr><td rowspan="3">256</td><td rowspan="2">017</td><td>00518</td><td rowspan="3">2627</td><td rowspan="3">Vereeniging</td><td rowspan="3">1948</td><td rowspan="3">1948/256</td></tr>
<tr><td>00519</td></tr>
<tr><td>019</td><td>01217</td></tr>
</table>

314	018	41222	2627 2628	Johannesburg/Vereeniging	1952	1952/314
698	004	01213	2627 2628 2727 2728	Vereeniging	1973	1973/698
498/258	005	00293	2627	Vereeniging	1989	1989/498/258

2.1.3 Pre-disturbance survey

The pre-disturbance survey was undertaken by Natasha Higgitt, a qualified and accredited archaeologist on 11 November 2015. The site specific project area was surveyed through pedestrian methods using an unstructured and unsystematic approach. Undisturbed areas located within the site specific area were surveyed, as no significant natural features were present in the area to focus the survey. The survey was recorded as a GPS track logs and the landscape was documented through photographic and written records.

2.1.4 Site naming

Site identified in previous relevant studies are prefixed by the SAHRIS case or map number and the original site name used by the author, i.e**. 2529DD/HH06**

2.2 Developing cultural significance and field ratings

2.2.1 Cultural significance

Determining the CS of heritage resources, and assign field ratings to these, are legal requirements as described in section 3 below.

CS was determined based on identified resources' importance or contribution to four broad value categories: aesthetic, historical, scientific and social values. The resources' importance or contributions to these values were considered in terms of associative (qualitative) and / or rarity (quantitative) attributes. These attributes were based on the data collected and collated into the cultural heritage baseline profile described in Section 5 below.

Qualitative data was used to identify any associative attributes such as notable people or groups, important events, or significant aspects that may be associated with the resource.

Quantitative data was used to determine the rarity of any attributes based on other similar examples that may exist elsewhere.

The integrity or condition of resources further influenced the CS. Integrity is largely determined based on resources' current, observed state of conservation, as well as notable changes made to it over the years.

A detailed methodology statement is provided in Appendix B.

2.2.2 Field Ratings

Field ratings assist the responsible heritage resources authority to grade heritage resources into national (Grade I), provincial (Grade II) or local (Grade III) categories. Each category requires specific minimum required mitigation measures and consequent management responsibilities. Field ratings are closely linked to the Importance rating, described in Section 6 below. The field rating process therefore aimed to facilitate the decision-making process. .

A detailed methodology statement is provided in Appendix B.

2.3 Impact assessment

Impacts to heritage resources can be broadly divided into three categories – direct, indirect and cumulative. The assessments of these impacts are done by assigning a numerical value to the significance of the identified impacts.

The assessment of impacts inherently considers the CS and field ratings. The consequence of the potential impact was weighted against the parameters intensity, spatial scale and duration. To identify the significance of the impact, the con sequence was measured against the probability of the impact occurring.

The magnitude of the potential impact was applied to both pre- and post-mitigation scenarios with the aim of removing all negative impacts on heritage resources, and enhancing positive ones.

A detailed methodology statement is provided in Appendix B.

2.4 Constraints and Limitations

Many tangible heritage resources, specifically archaeological resources, commonly occur below the surface, and may not be identified, documented and assessed without intrusive and destructive methods. Intrusive archaeological assessments require permits issued as per section 35 of the NHRA, however these are not issued as part of impact assessments. Therefore, the findings in the reviewed literature, and especially existing HIA reports, are in themselves limited to surface observations.

3 Legal and policy framework

This section outlines the general legal and policy framework within which the proposed Copper Sunset is being undertaken. This includes national and provincial legislation, local legislation and policy as well as international best practice standards.

3.1 Minerals and Petroleum Resources Development Act, Act No. 28 of 2002 (MPRDA)

The MPRDA is the overarching legislation that regulates all mining activities in the Republic of South Africa. 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 38 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.

3.2 National Environmental Management Act, Act No. 107 of 1998 (as amended) (NEMA)

This Act provides that sustainable development requires the integration of social, economic and environmental factors in the planning, implementation and evaluation of decisions so as to ensure that development serves present and future generations. The Act further sets out the process for public participation in terms of the 2014 NEMA Regulations

A BAR must be completed when a development triggers any activity in Listing Notice 1 of the EIA Regulations, 2014. Chapter 4 Section 19 states that where a basic assessment must be applied for, the BAR consider impacts and risks associated with the proposed project, it must include specialist reports (i.e. heritage and cultural aspects and impacts must be considered) and an Environmental Management Plan (EMP) Report.

3.3 National Heritage Resources Act, Act No. 25 of 1999 (NHRA)

The NHRA is the overarching legislation that protects and regulates the management of heritage resources in South Africa. This Act considers various heritage resources as forming part of the national estate, contemplated in Section 3. In addition, certain other categories are afforded automatic formal or general protection. Sections considered relevant to this project are outlined below:

- Formal protection:
  - National and provincial heritage sites, Section 27;
  - Certain types of protected areas, Section 28; and
  - Heritage areas, Section 32.
- General protection:

- Certain structures with demonstrable cultural significance or that are older than 60 years, Section 34;
- Archaeological and palaeontological resources, Section 35;
- Burial grounds and graves, Section 36; and
- All public monuments and memorials, Section 37.

Section 5 of the NHRA encapsulates general principles for HRM that this specialist heritage component of the Project aims to adhere to. Section 38 outlines the HRM process and minimum requirements that need to be complied with namely:

- Subsection (8) requires a HIA study to be conducted if an impact assessment is required in terms of any other Act such as the NEMA and MPRDA; and
- Subsection (3) outlines the minimum information that must be included in a HIA report.

This HBAR was completed to comply in part with sections 38 of the Act and will be submitted to the South African Heritage Resources Agency (SAHRA) and Heritage Free State (HFS) for statutory comment.

3.4 SAHRA Guidelines

SAHRA published prerequisites for mining and prospecting projects with regards to heritage resources in 2006 (SAHRA APMHOB Permit Committee, 2009). All superficial mining projects are likely to impact in one way or another on archaeological sites. Impact assessments are required before any disturbance of the landscape. In order to do this, a specialist report is required to allow the relevant authority to assess whether this approval can be granted. As such, no mining, prospecting or development can take place without prior heritage assessment and approval.

4 Project description

4.1 Project description and activities

Copper Sunset Sand's current mining operation involves strip mining of general sand (90% plaster and 10% building sand), mined in 30 to 35 m strips, 2.5 to 3 m deep. The strip distances depend on the area to be mined. The mining method to be applied includes:

- Stripping and stockpiling of topsoil;
- Construction of a temporary access road alongside the strip to be mined;
- Mining of the sand resources; and
- Backfilling of the mined excavations with overburden and the stockpiled topsoil.

The mined sand is supplied to the Free State and Gauteng construction industries. A washing plant on site is utilised to produce finer sand sold to industrial clients.

The Project will trigger EIA Regulations, 2014 Listed Activities listed in Table 4-1 below.

Table 4-1: Listed activities

Activity No.	Activity	GN R Activity	NHRA Trigger
Establishment and Operational Phase			
1	Clearance of vegetation in excess of 1 ha but less than 20 ha	GN R983 Listing Notice 1 Activity 27	Section 38 (8)

Based on the project activities, only Activity 27 of Listing Notice 1 is triggered, however the above project activities will be considered during the impact assessment.

4.2 Project location

The site specific project area is located 4.2 km from the Vaal River and 7.5 km from Vereeniging. Location details for the Copper Sunset Expansion Project area summarised in Table 4-2 below.

Table 4-2: Location of the proposed expansion area

Province	Free State Province
Magisterial District / Local Authority	Sasolburg Magisterial District
District Municipality	Fezile Dabi District Municipality
Local Municipality	Metsimaholo Local Municipality
Nearest Town	Vereeniging / Vanderbijlpark / Sharpeville
Property Name and Number	Remaining Extent of the Farm Rietfontein No. 152 Remaining Extent of the Farm Zandfontein No. 259 Remaining Extent of the Farm Bankfontein No. 9
1: 50 000 Map Sheet	2627DB Vereeniging
GPS Co-ordinates (relative centre point of study area)	-26.744956
	27.933139

Plan 1

Copper Sunset Sand

Extension Application Regional Setting

Legend

- Project Area
- City
- Major Town
- National Roads
- River
- Dam
- District Municipality

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Plan 1

Copper Sunset Sand

Extension Application
Local Setting

Legend

- Project Area
- Other Town
- Arterial / National Route
- Main Road
- Minor Road
- Track
- Railway Line
- Perennial Stream
- Non-Perennial Stream
- Dam Wall
- Dam / Lake
- Non-Perennial Pan / Stream
- Perennial Pan
- Wetland
- Local Municipality

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0 0.5 1 2 3

Kilometres

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Plan 3

Copper Sunset Sand

Extension Application
Site Specific Setting

Legend

Project Area

2627DB Vereeniging
2627DD Sasolburg

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4.2.1 Consultant and Specialists[1]

Natasha Higgitt compiled the overall DHBAR. She obtained her Bachelor of Arts (BA) Honours degree in Archaeology in 2010 from the University of Pretoria. She currently holds the position of Assistant Heritage Consultant: Archaeology Specialist at Digby Wells. She has more than 5 years' experience in archaeological survey and gained further generalist heritage experience since her appointment at Digby Wells in South Africa and Liberia.

Natasha is a professional member of the Association of Southern African Archaeologists (ASAPA) (*Member No. 335*).

Justin du Piesanie undertook the first technical review of this DHBAR. 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. He currently holds the position of Heritage Management Consultant: Archaeologist at Digby Wells. He has over 9 years combined experience in HRM in South Africa, including heritage assessments, archaeological mitigation and grave relocation. 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 International Finance Corporation (IFC) requirements such as Performance Standard 8: Cultural Heritage.

Justin is a professional member of ASAPA (*Member No. 270*) and the International Council on Monuments and Sites (ICOMOS) South Africa (*Member No. 14274*).

Johan Nel undertook the second technical review of this DHBAR. He has more than 13 years of combined experience in the field of HRM including archaeological and heritage assessments, grave relocation, social consultation and mitigation of archaeological sites. He has gained experience both within urban settings and remote rural landscapes. Since 2010 he has been actively involved in environmental management that has allowed Johan to investigate and implement the integration of heritage resources management into EIA's. Many of the projects since have required compliance with IFC requirements such as Performance Standard 8: Cultural Heritage. This exposure has allowed Johan to develop and implement a HRM approach that is founded on international best practice, leading international conservation bodies such as the United Nations Educational, Scientific and Cultural Organisation (UNESCO) and ICOMOS and aligned to the South African legislation. Johan has worked in most South African Provinces, as well as Swaziland, the Democratic Republic of the Congo, Liberia and Sierra Leone.

Johan is a professional member of ASAPA (*Member No. 095*), accredited CRM practitioner, and a member of ICOMOS South Africa (*Member No. 13839*).

[1] Detailed curricula vitae of the specialists are attached as Appendix A

5 Cultural Heritage Baseline Description

The cultural baseline is based on information sources such as previous HIAs conducted in the area and databases described in section 2.1.2 above. The baseline considered all study areas as discussed in section 2.1 above. The natural environment, geology, paleontological potential, Stone Age, and historical periods were investigated and are discussed below.

The cultural landscape of the regional and local study area can be categorised by the occurrence of Early Stone Age (ESA), Middle (MSA) and Late Stone Age (LSA) accumulations, and historical settlements including the town of Vereeniging and surrounding farming communities.

5.1 Regional and Local Study Area

5.1.1 Natural Environment

The local study area is situated within the Grassland Biome with a relatively flat topography (Mucina & Rutherford, 2006). The natural veld that would mainly consists of *Cymbopogon plurinodis* and *Cynodon dactylon* is greatly altered through old ploughed areas, plantations, illegal dumping, and coal mining. The closest watercourse to the site specific project area is the Vaal River. Climatically, the site specific study area falls within the Northern Free State climatic zone typified by warm summer and cool dry winters with temperatures ranging from 28˚C in the summer to below zero in the winter (Digby Wells Environmental, 2007).

According to a soils study completed for the previous expansion on the adjacent property, the soils were found to extend further than 1.2 m deep (Jackson, 2014). Groundwater studies completed for the New Vaal Colliery approximately 1 km south from the site specific study area found that the alluvium of fine sand extends 6 m deep (Golder Associates, 2012)

5.1.2 Geology and Palaeontological Sensitivity

Geologically, the project area is underlain by the Madzaringwe Formation of the Karoo Supergroup. The formation consists of fluvial sandstones, siltstones, shales and coals. The study area is generally flat and the soils are derived from Aeolian sand moved in over local colluvium derived from Ecca Sandstone.

The base of the Karoo sequence in the study area consists of rocks of the Dwyka Group. The Group consist of a complex mixture of sandstones, feldspathic sandstones, mudstones, conglomerates and both in-situ and reworked tillites. Overlying the Dwyka Group is the Ecca Group. (Johnson, et al., 2006).

Additionally, the potential fossil flora found within the Madzaringwe formation (*Glossopteris*) is of global importance as they are rare and have contributed to a great deal of debate within the research community (Adendorff, et al., 2002; Prevec, 2012).

Table 5-1: Lithographic units and fossil sensitivity (adapted from Johnson et al 2006 and SAHRIS[2])

Ma	Eon	Era	Lithostratigraphic units		Lithology	Sensitivity	Fossils
250	Phanerozoic	Mesozoic	Karoo Supergroup	Ecca Group	Madzaringwe Formation	Very High	Glossopterid coal flora

5.1.1 Stone Age and Rock Art

Archaeologically, sites associated with the Stone Age have been identified in the local study area. Pistorius (2007) notes the numerous Stone Age sites discovered along the ancient banks of the Vaal and Klip Rivers at localities such as Klipplaatdrift, the Klip River Quarry site and the Duncanville Archaeological Reserve. Van Schalkwyk (1998) makes reference to the Vaal River basin and its association with the ESA. Here it is noted that the Vaal River gravels remain an important source of information on the ESA which is associated with the Oldowan and Acheulian industries. These resources are significant as they are contributing to the understanding of early hominid cognitive evolution through the examination of stone tool production techniques (Leader IV, 2009).

These industries are typified by large core tools such as choppers, bi-facial handaxes and cleavers (Deacon & Deacon, 1999). Van Vollenhoven (2008) notes the presence of MSA artefacts within the local study area. These stone tools commonly date to between 300 000 years ago (kya) and 20 kya consisting primarily of blade technologies.

In Fourie (2007) open scatters associated with the LSA (Fourie – 2007/MHC001) were identified 3.5 km from the project area. The LSA is typically associated with the transition from the MSA some 20 kya in which a series of technological innovations in the form of microliths were introduced. These tools were often shaped through secondary retouch into a variety of formal tools suited to hafting. These finds made by Fourie (2007) occurred in secondary contexts and were deemed to have negligible to low heritage value.

Approximately 4.4 km directly northwest of current sand mining operations, the rock engraving site of Leeuwkuil is located. Hollmann (1999) described the sites as being located on a small island in the Vaal River where engravings are concentrated on the south-eastern part of the peninsula. Eland and other antelope dominated the images depicted, which appeared to be in the San hunter-gatherer engraving tradition (Hollmann, 1999).

[2] http://www.sahra.org.za/sahris/fossil-heritage-layer-browser accessed 23/04/2015

Plan 4

Copper Sunset Sand

Extension Application Geology

27°50'0"E 27°55'0"E 28°0'0"E

26°40'0"S 26°45'0"S 26°50'0"S

Malmani Sbgrp, Chuniespoort Grp

Silverton Fm, Pretoria Grp

Pretoria Grp, Transvaal Spgrp

Madzaringwe Fm, Karoo Spgrp

Karoo Dolerite Sui

Klipriviersberg Grp, Ventersdorp Spgrp

Vereeniging

Sharpeville

Vanderbijlpark

Viljoensdrif

Vaalpark

Sasolburg

Coalbrook

Zamdela

R553 R28 M61 Brockett St Klip Gen.Hertzog Rd Vaal Suikerbosrant R54 Delfos Blvd McCollm Blvd Barrage Rd R42 Piet Retief Blvd Ascot on Vaal Rd Hendrik van Eck Blvd Ravel St R59 R57 R82 R716 Taaibosspruit Eric Louw Rd Golden

Legend

- Project Area
- Major Town
- Other Town
- Settlement
- Main Road
- River

Geology

- Fault Observed
- Karoo Dolerite Sui
- Klipriviersberg Grp, Ventersdorp Spgrp
- Madzaringwe Fm, Karoo Spgrp
- Malmani Sbgrp, Chuniespoort Grp
- Pretoria Grp, Transvaal Spgrp
- Silverton Fm, Pretoria Grp

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5.1.1 Farming Communities

No sites associated with the southern African Farming Communities have been identified in the local study area in any of the reports reviewed for this project. This can be attributed to the reasonably unfavourable natural environment as described in Section 5.1.1 above. Much of the Farming Community settlements on the Highveld have been precluded by these factors in which settlement was unfavourable.

Taking this into consideration, it is a fair assumption that any significant Farming Community sites would not have occurred in the local study area, and if any heritage resources associated with the Farming Communities were to have existed in the local study area, the surface indicators of sub-surface remains would have been destroyed by the various activities that have taken place over time.

5.1.2 Historical period

The affected environment has been heavily altered through time as is evident in recent aerial imagery. To the west of the local study area, the landscape is dominated by urban development associated with Vanderbijlpark and Sharpville. To the north of the proposed project, the landscape is utilised for industrial purposes. This has resulted in a high disturbance which ultimately resulted in the transformation of the landscape from its natural state.

Historically, the town of Vereeniging, just north of Viljoensdrift, was established in 1882 and proclaimed in 1889. It is significant as it played host to several prominent figures and events. Prior to the Anglo-Boer War, President Kruger of the Zuid Afrikaanse Republiek (ZAR) and President Reitz of the Orange Free State met for the official opening of the first railway crossing of the Vaal River in 1892. This is seen in the Jeppes 1899 Map of the Transvaal in which the station at Viljoensdrift and railway is clearly depicted in Figure 5-2 below. The station at Viljoensdrift was named after the drift that was located at the Vaal River that was used by ox wagons to cross the river before the bridge was built in 1892.

The town also hosted Boer Generals Botha, Hertzog, Smuts, de la Rey and Lord Milner and General Kitchener in May 1902 to negotiate the Peace Treaty with Great Britain after the Anglo-Boer War (Fourie, 2007). The site is indicated today by a sawn-off tree trunk near the Vereeniging Refactories' Recreation Hall. Subsequent to this, the regional study area has been dominated by mining activities which has left the landscape heavily disturbed.

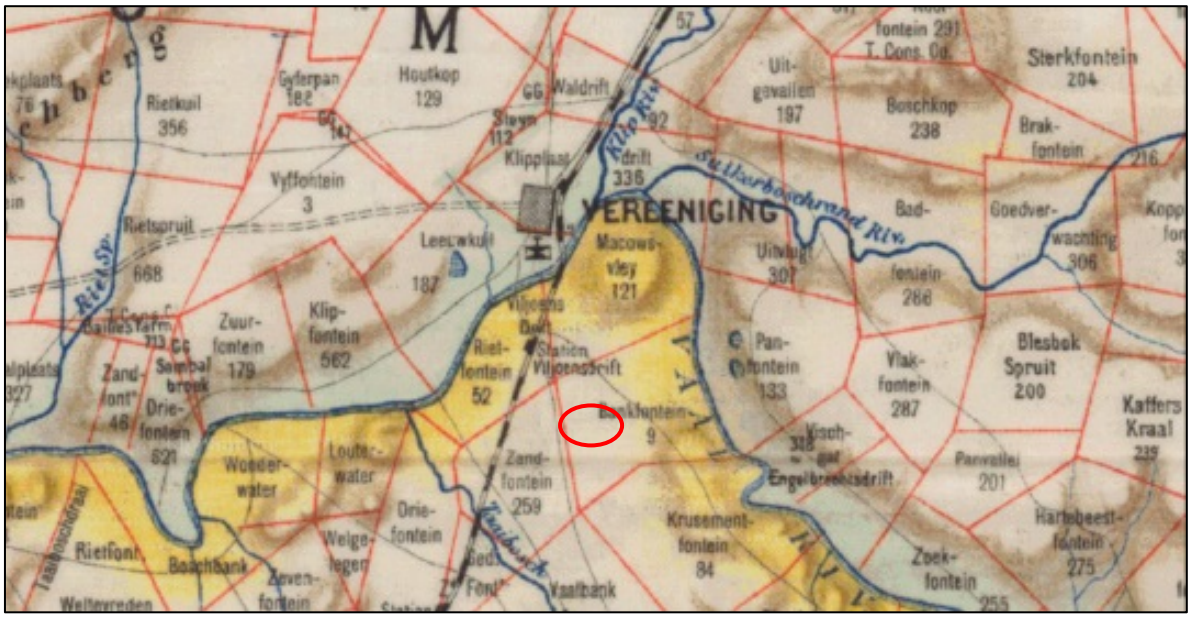


Figure 5-2: Extract from Jeppes 1899 Map of the Transvaal showing the project area

Coal was discovered in the region study area as early as 1879 by George William Stow (Pistorius, 2007). In 1903, a report compiled by Dr Hatch identified a coal formation that extended almost 40 000 ha. In reaction to this two collieries were opened, the Cornelia Colliery situated on the Free State side of the Vaal River, and the Camp Colliery situated on the then 'Transvaal' side of the Vaal River (Fourie, 2007).

These collieries were left with large quantities of waste coal from their production, which Senator Sammy Marks believed could be exploited to generate electricity for the gold mines of the Witwatersrand. The Vereeniging Power Station was completed in 1912 and extended four times between 1923 and 1933. Power demands from the Witwatersrand resulted in the establishment of the Klip Power Station in the early 1930s and the Vaal Power Station commencing operations in 1945 (Fourie, 2007).

Fourie (2007) noted the remains of built structures that could possibly have been associated with the Vaal Power Station, which was decommissioned in 1989 and demolished by 1998. One stone structure (Fourie – 2007/MHC002) with low heritage significance was recorded in the report. Van der Walt (2005) also notes that large areas where historic structures once stood have been demolished and rubble litters the area.

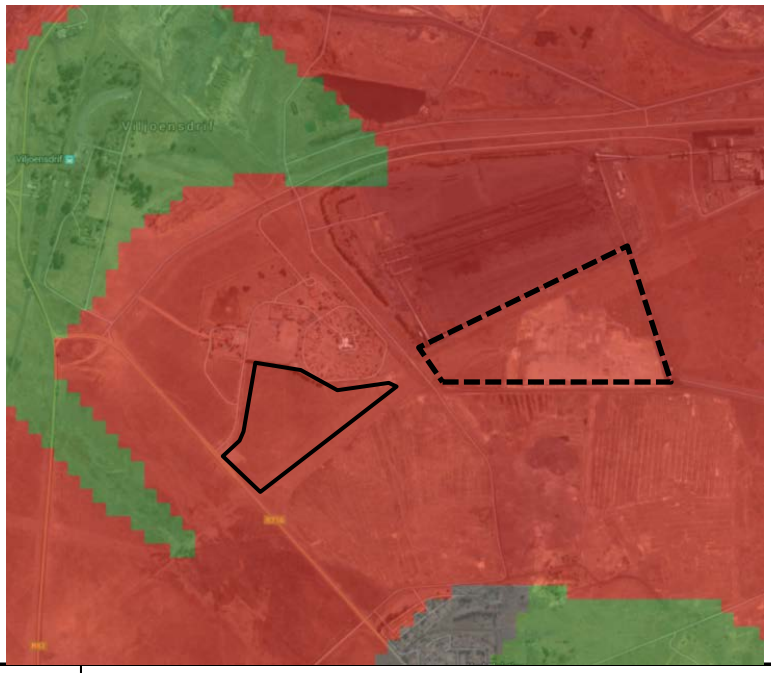
5.2 Site Specific Study Area

The literature review did not identify any Stone Age or Farming Community heritage resources within the site specific area and these heritage resources are not discussed further in this section.

5.2.1 Geology and Palaeontological Potential of the Study Area

According to the SAHRIS PalaeoSensitivity Map, the site specific area is located in an area of very high palaeontological sensitivity as depicted in Figure 5-3 below (SAHRIS, 2014). As stated above in section 5.1.2, the Madzaringwe Formation is highly significant due to the potential for *Glossopterid* coal flora fossils within the formation.

As stated in section 5.1.1 above, the soils of the site specific project extend between 1.2 m and 6 m deep. Taking this into consideration, the Madzaringwe Formation is assumed to be deeper than the proposed 3 m depth of the mining activities and will not be impacted on.



Sensitivity	Required action
Very High	Field assessment and chance finds protocol required
High	Desktop study to determine necessity of field assessment
Moderate	Desktop study
Low	No palaeontological studies necessary, but chance finds protocols are required
Insignificant/zero	No palaeontological studies necessary or chance finds protocols are required
Unknown	At minimum, a desktop study

Figure 5-3: Palaeontological sensitivity of the site specific study area

5.2.2 Historical period

Historical aerial imagery shows how the area surrounding the project has been altered since the 1940's. In 1948, the site specific project area and the surrounding areas are undeveloped areas of veld. The rail siding of Viloensdrift is visible in the north-western corner of Figure 5-4 and the old Vaal Power Station referred to in section 5.1.2 is visible in the south-eastern corner. In 1952, the Vaal Power Station complex had been expanded, along with the residential development around it as shown in Figure 5-5. By 1973, the Vaal Power Station development has expanded northwards, however the proposed site specific

project area is still unaffected directly as seen in Figure 5-6. Eventually, by 1989 development has occurred in close proximity to the proposed site specific project area. The current Anglo American Training Centre was built between 1973 and 1989, and a large amount of mining activity has taken place in the surrounding areas (See Figure 5-7). Additionally, between 1989 and 2005, the Vaal Power Station was decommissioned and demolished as shown in Figure 5-8.

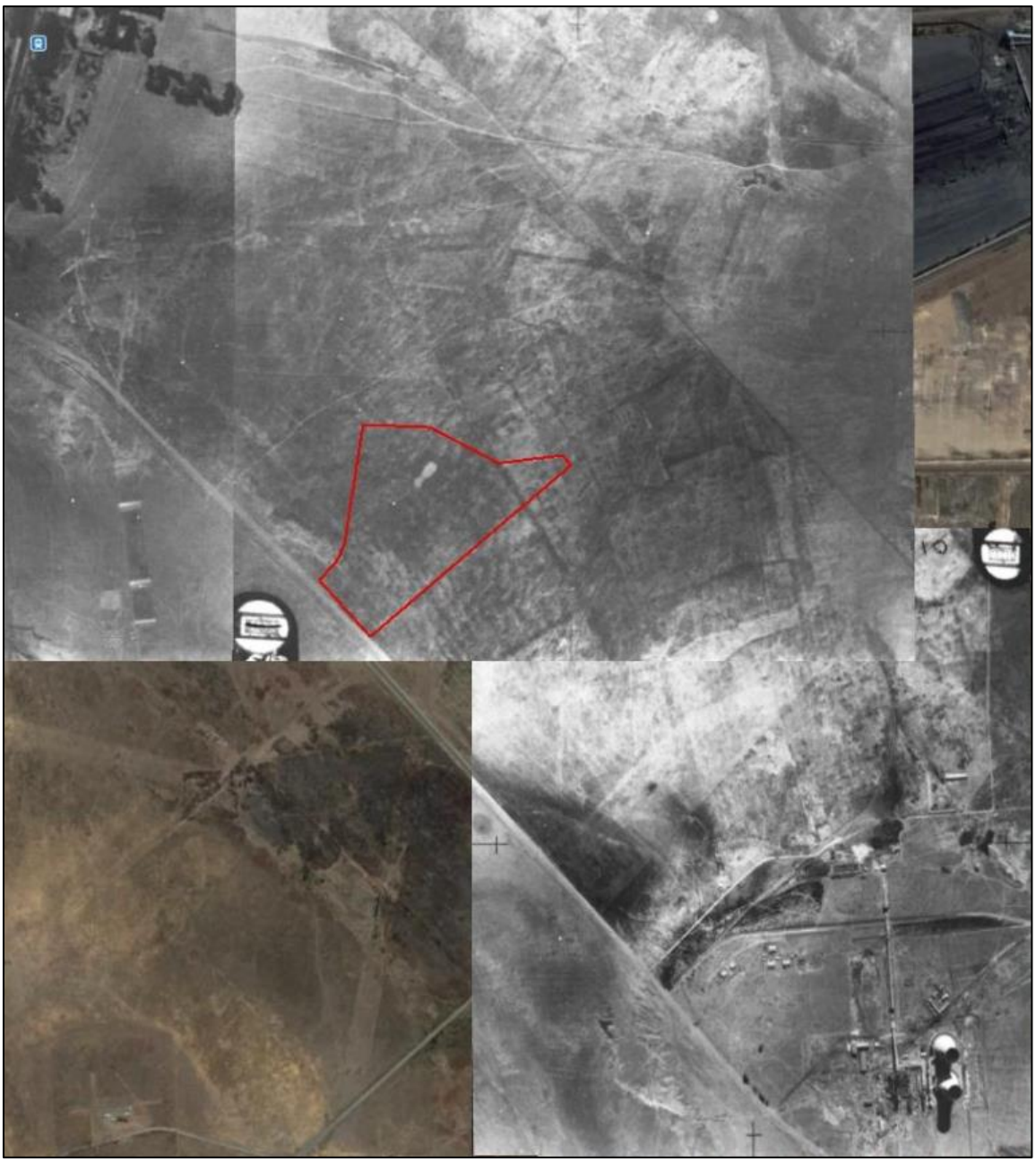


Figure 5-4: 1948 aerial image of the proposed project area

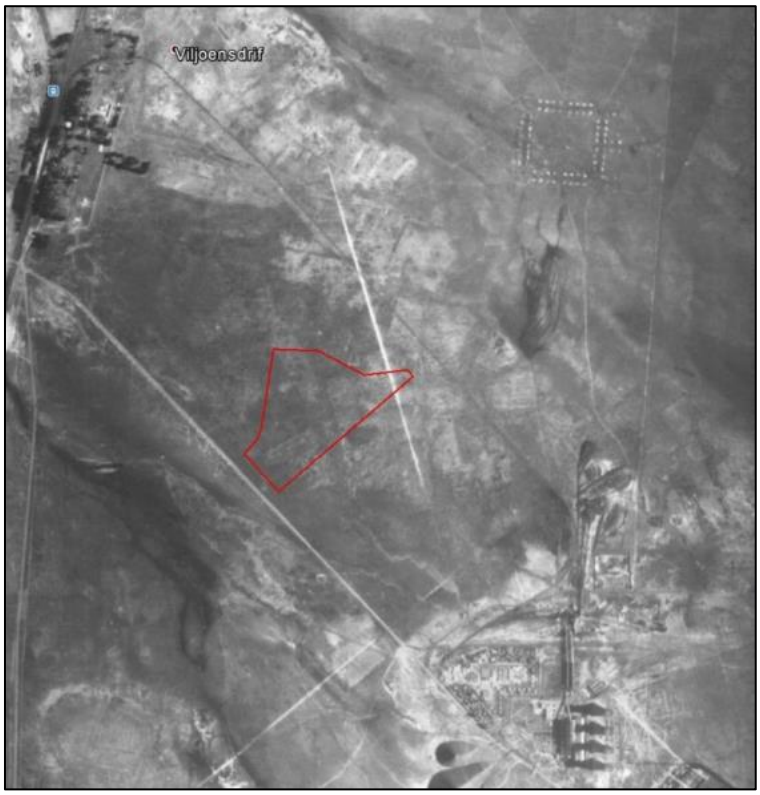


Figure 5-5: 1952 aerial image of the proposed project area

Figure 5-6: 1973 aerial image of the proposed project area

Figure 5-7: 1989 aerial image of the proposed project area

Figure 5-8: 2005 aerial image of the project area

5.2.3 Results of reconnaissance and identified heritage resources

A pre-disturbance survey of the site specific study area was undertaken on 11 November as mentioned in Section 2.1.3 above.

The study area is characterised by flat topography with no significant topographical features such as hills or ridges, or water courses. The soils are predominantly deep sandy E-horizon soils with some areas of disturbance such as ploughing (See Figure 5-9 below). The Land type has been defined as Upland Duplex and/or Margalithic soils (Ca1) (Jackson, 2014).

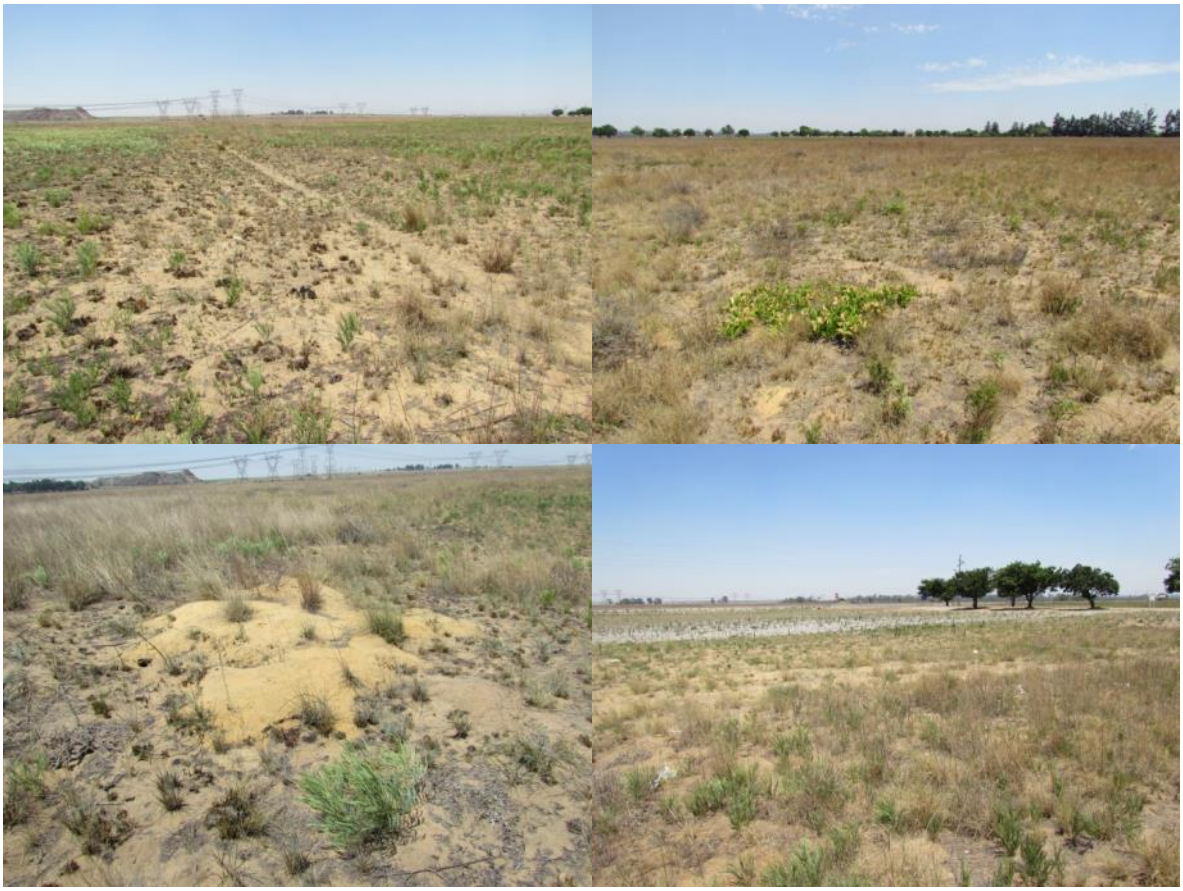


Figure 5-9: General view of the current state of the environment (top row), example of orange brown sand and ploughing within the project area (bottom row)

No visible surface evidence of heritage resources was observed within study area. The soil type (Kroonstad) was instrumental in this. Kroonstad soils drain poorly, have a low nutrient status and are highly erosive (Jackson, 2014). The loose sand is not conducive for long term settlement or extensive agricultural activities. No rocky outcrops or exposed bedrock was identified within the project area. Please see Figure 5-10 for track logs of the pre-disturbance survey.

Plan 5

Copper Sunset Sand

Extension Application
Heritage Reconnaissance

Legend

- Heritage Reconnaissance Track Log
- Project Area
- City
- Other Town
- Dam
- Arterial / National Route
- Main Road
- Minor Road
- Track
- Railway Line
- Perennial Stream
- Dam Wall
- Dam / Lake
- Wetland

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6 Heritage Impact Assessment

Based on the results of the desktop study and pre-disturbance survey, no heritage impacts are envisioned for the Copper Sunset Expansion Project. No significant heritage resources were identified within the site specific project area as a result of the desktop study. Heritage resources were identified at a local level including Stone Age surface occurrences, burial grounds and historical structures, though none were identified within the site specific project area. No heritage resources or surface indicators of sub-surface heritage resources were identified during the pre-disturbance survey.

6.1 Cultural Significance Assessment

The assessment of CS considered criteria defined in Box 2 above. The CS assigned to the identified Madzaringwe Formation is summarised in Table 6-1 and presented in detail in Table 6-2.

Table 6-1: Summary of identified heritage resources CS

Summary of Identified Heritage Resources and CS	Number
Very High CS	**1**
Natural Feature	1
Madzaringwe Formation	1
Grand Total	**1**

The Madzaringwe Formation is a highly significant geological formation due to the important plant fossil (*Glossopteris*) that are present within the formation. The motivation is based on this formation's global scientific importance and due to the fossils contained within it being under-collected during recent years. The integrity of the formation underlying the Copper Sunset Project area was also considered to be excellent, thereby contributing to a very high significance rating. This rating is consistent with the sensitivity rating provided in the SAHRIS Fossil Heritage Layer Browser.

Table 6-2: CS of identified heritage resources

Resource ID	Madzaringwe Formation
Type	Natural feature
Description	Madzaringwe Formation with potential Glossopterid coal flora

Cultural Significance	Very High
CS Motivation	The geological formation can be considered in particular dimensions against scientific criteria.
Field Rating	General Protection IV A
Field Rating Motivation	The heritage sites are defined according to section 2 of the NHRA and are generally protected under Section 35 of the NHRA
Mitigation	Based on the project activities, there is no need for mitigation measures.

6.2 Impact Assessment

There will be no impacts to the very highly significant Madzaringwe Formation, as the loose sandy soil has been found to extend to 6 m deep. The proposed mining activities are planned to extend no deeper than 3 m, therefore the Madzaringwe Formation will not be impacted.

As such, no impact assessment has been conducted as part of this HBAR. Potential risks and unplanned events have been identified and are discussed below.

6.3 Unplanned Events and Low Risks

Unplanned events may occur on any project at any time. Based on the proposed project activities, potential unplanned events and the associated impacts and management measures have been identified and summarised in Table 6-3 below.

Table 6-3: Unplanned events and their management measures

Unplanned event	Potential impact	Mitigation/ Management/ Monitoring
Accidental exposure of unidentified heritage resources	Damage and/or destruction of heritage resources generally protected under section 34 to 37 of the NHRA	Chance Finds Procedures (CFPs) must be developed and included as a condition of authorisation that clearly describes the reporting process and appropriate management of the exposure of previously unidentified heritage resources. The established and defined CFPs must be implemented prior to any development taking place as part of the prospecting activities
Accidental exposure and damage to palaeontological resources in areas where unidentified Madzaringwe outcrops may occur.	Damage and/or destruction of heritage resources generally protected under section 35 of the NHRA	Fossil Finds Procedures (FFPs) must be included in the EMP that clearly define the reporting procedures and appropriate management of uncovered palaeontological resources.

7 Recommendations

Chance Finds Procedures (CFPs) must be developed and included as a condition of authorisation that clearly describes the process and appropriate management of the

exposure of previously unidentified heritage resources. The established and defined CFPs must be implemented prior to any development taking place.

Project specific monitoring and management measures must be developed as a condition of authorisation. The protocol must detail required monitoring activities, ideally during construction, administrative reporting structures and management / mitigation measures in the event of damage to structures generally protected under section 34 - 37 of the NHRA.

It is recommended that detailed CFPs must be developed, but as minimum, the following be included in the EMP.

- The Environmental Control Officer and/or contractors must inspect groundworks during site clearance;
- Should any heritage resources be uncovered during site clearance, the find must be stabilised and the site must be secured to protect it from further damage;
- The find must be reported and a qualified archaeologist must be contacted to assess the find;
- Should the find be significant, a report must be written regarding the find and any mitigation measures conducted. The report will include recommendations for any additional specialist work that may be necessary, or request approval to continue with the development.

It is recommended that the following Fossil Monitoring be adopted for implementation during the construction and operational phase of the Copper Sunset Project:

- Should any bedrock be encountered during the sand mining operations, the bedrock (of no economic value) must be given a cursory inspection by the mine geologist or designated person before mining can continue. Any fossiliferous material should be put aside in a suitably protected place.
- Photographs of similar fossil plants must be provided to the mine to assist in recognizing the fossil plants;
- On a regular basis, to be agreed upon by the mine management and the qualified palaeobotanist sub-contracted for this project, the palaeobotanist should visit the mine to inspect the selected material and check the mining area where feasible. The frequency of inspections will be dependent on the schedule for the establishment of the box cut;
- Fossil plants considered of good quality or scientific interest by the palaeobotanist must be removed, catalogued and housed in a suitable institution where they can be made available for further study. Before the fossils are removed from the mine a SAHRA permit must be obtained. Annual reports must be submitted to SAHRA;
- If no good fossil material is recovered then the site inspections by the palaeobotanist, the need for future inspections can be reviewed. Reports by the palaeobotanist must be sent to SAHRA; and

- If the fossil material is deemed to be of scientific interest then further visits by a professional palaeontologist would be required to collect more material. Given the shortage of such qualified people in South Africa and the stringent safety laws for access by the mining companies, any long term monitoring of the fossils is impractical.

8 Conclusion

The Copper Sunset Expansion Project area is located 7.5 km from Vereeniging, MLM, Free State Province. Geologically, the site specific area is underlain by the Madzaringwe Formation in the Karoo Supergroup. The Madzaringwe Formation has the potential to hold fossils such as *Glossopterid* coal flora. No rocky outcrops or exposed bedrock was identified within the site specific project area. Based on the project activities, there will be no impact on the highly sensitive Madzaringwe Formation.

Archaeologically, Stone Age, historical sites and burial grounds have been recorded within the larger regional and local study areas under consideration here, though none of these sites have been identified within the site specific project area.

Based on the results of the desktop study and pre-disturbance survey, no heritage impacts are envisioned for the Copper Sunset Expansion Project. No significant heritage resources were identified within the site specific project area as a result of the desktop study. Heritage resources were identified at a local level including Stone Age surface occurrences, burial grounds and historical structures, though none were identified within the site specific project area. No heritage resources or surface indicators of sub-surface heritage resources were identified during the pre-disturbance survey

There will be no impacts to the very highly significant Madzaringwe Formation, as the loose sandy soil has been found to extend to 6 m deep. The proposed mining activities are planned to extend no deeper than 3 m, therefore the Madzaringwe Formation will not be impacted.

Based on the findings of this report, Digby Wells recommends the following mitigation and management plans:

- Exemption from further palaeontological assessments for the proposed infrastructure footprint due to the limited impact of the project activities on the geological formation;
- Chance Finds Procedures, inclusive of Fossil Finds Procedures must be developed and implemented as part of the EMP that clearly describe the reporting process and appropriate management of the exposure of previously unidentified heritage resources; and
- The ECO/contractors must be trained to identify various types of heritage resources that are likely to be found within the project area.

9 References

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Pistorius, J. C., 2007. *A Phase 1 Heritage Impact Assessment Study for water and sewage pipeline corridors near Vanderbijlpark in the Gauteng Province of South Africa,* Pretoria: Unpublished report by JCC Pistorius on file at SAHRA as 2007-SAHRA-0358.

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van der Walt, J., 2005. *Archaeological Scoping Assessment New Vaal Colliery near Vereeniging,* Pretoria: Unpublished report by Professional Grave Solutions on file at SAHRA as 2005-SAHRA-0319.

Van Schalkwyk, J., 1998. *A survey of cultural resources in the Emfuleni Development Area, Vanderbijlpark, Gauteng,* Pretoria: Unpublished report on file at SAHRA as 1998-SAHRA-0036.

Van Vollenhoven, A. C., 2008. *A report on a cultural heritage impact Assessment for two proposed water pipe lines in the Midvaal Municipal Area, Gauteng Province,* Unpublished report by Archaetnos Culture and Cultural Resources Consultants on file at SAHRA as 2008-SAHRA-0331: Pretoria.

Appendix A: Specialist CV

DIGBY WELLS
ENVIRONMENTAL

Mr. Justin du Piesanie

Heritage Management Consultant: Archaeologist

Social Sciences Department

Digby Wells Environmental

1 Education

Date	Degree(s) or Diploma(s) obtained	Institution
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
08/2011 to present	Digby Wells Environmental	Heritage Management Consultant: Archaeologist

Period	Company	Title/position
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 Professional Affiliations

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

5 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

6 Experience

I have 5 years experiences in the field of heritage resources management (HRM) including archaeological and heritage assessments, grave relocation, social consultation and mitigation of archaeological sites. During my studies I was involved in academic research projects associated with the Stone Age, Iron Age, and Rock Art. These are summarised below:

- Wits Fieldschool - Excavation at Meyersdal, Klipriviersberg Johannesburg (Late Iron Age Settlement).
- Wits Fieldschool - Phase 1 Survey of Prentjiesberg in Ugie / Maclear area, Eastern Cape.
- Wits Fieldschool – Excavation at Kudu Kopje, Mapungubwe National Park Limpopo Province.

- Wits Fieldschool – Excavation of Weipe 508 (2229 AB 508) on farm Weipe, Limpopo Province.
- Survey at Meyerdal, Klipriviersberg Johannesburg.
- Mapping of Rock Art Engravings at Klipbak 1 & 2, Kalahari.
- Survey at Sonop Mines, Windsorton Northern Cape (Vaal Archaeological Research Unit).
- Excavation of Kudu Kopje, Mapungubwe National Park Limpopo Province.
- Excavation of KK (2229 AD 110), VK (2229 AD 109), VK2 (2229 AD 108) & Weipe 508 (2229 AB 508) (Origins of Mapungubwe Project)
- Phase 1 Survey of farms Venetia, Hamilton, Den Staat and Little Muck, Limpopo Province (Origins of Mapungubwe Project)
- Excavation of Canteen Kopje Stone Age site, Barkley West, Northern Cape
- Excavation of Khami Period site AB32 (2229 AB 32), Den Staat Farm, Limpopo Province

Since 2011 I have been actively involved in environmental management throughout Africa, focusing on heritage assessments incompliance with International Finance Corporation (IFC) Performance Standards and other World Bank Standards and Equator Principles. This exposure to environmental, and specifically heritage management has allowed me to work to international best practice standards in accordance with international conservation bodies such as UNESCO and ICOMOS. In addition, I have also been involved in the collection of quantitative data for a Relocation Action Plan (RAP) in Burkina Faso. The exposure to this aspect of environmental management has afforded me the opportunity to understand the significance of integration of various studies in the assessment of heritage resources and recommendations for feasible mitigation measures. I have work throughout South Africa, as well as Burkina Faso, the Democratic Republic of Congo, Liberia and Mali.

7 Project Experience

Please see the following table for relevant project experience:

Project Title	Project Location	Date:	Description of the Project	Role of Firm in the Project	Own Role in the Project	Time involved (man months)	Name of Client	Contract Outcomes	Reference
Klipriviersberg Archaeological Survey	Meyersdal, Gauteng, South Africa	2005 2006	Survey of residential development in Meyersdal. This included the recording of identified stone walled settlements through detailed mapping and photographs. Included was the Phase 2 Mitigation of two stone walled settlements	Archaeological Impact Assessments	Researcher, Archaeological Assistant	2 months		Completed survey, excavations and reporting	Archaeological Resource Management (ARM) Prof T.N. Huffman thomas.huffman@wits.ac.za
Sun City Archaeological Site Mapping	Sun City, Pilanesberg, North West Province, South Africa	2006 2006	Recording of an identified Late Iron Age stonewalled settlement through detailed mapping	Mapping	Archaeological Assistant, Mapper	1 month	Sun City	Completed mapping	Archaeological Resources Management (ARM) Prof T.N. Huffman thomas.huffman@wits.ac.za
Witbank Dam Archaeological Impact Assessment	Witbank, Mpumalanga, South Africa	2007 2007	Archaeological survey for proposed residential development at the Witbank dam	Archaeological Impact Assessment	Archaeological Assistant	1 week		Completed Archaeological Impact Assessment report	Archaeological Resources Management (ARM) Prof T.N. Huffman thomas.huffman@wits.ac.za
Archaeological Assessment of Modderfontein AH Holdings	Johannesburg, Gauteng, South Africa	2008 2008	Archaeological survey and basic assessment of Modderfontein Holdings	Archaeological Impact Assessment	Archaeologist	1 month		Completed the assessment of 13 properties	Heritage Contracts Unit Jaco van der Walt jaco.heritage@gmail.com
Heritage Assessment of Rhino Mines	Thabazimbi, Limpopo Province, South Africa	2008 2008	Heritage Assessment for expansion of mining area at Rhino Mines	Heritage Impact Assessment	Archaeologist	2 weeks	Rhino Mines	Completed the assessment	Archaeological Resources Management (ARM) Prof T.N. Huffman thomas.huffman@wits.ac.za
Cronimet Project	Thabazimbi, Limpopo Province, South Africa	2008 2008	Archaeological survey of Moddergat 389 KQ, Schilpadnest 385 KQ, and Swartkop 369 KQ,	Archaeological Impact Assessment	Archaeologist	1 weeks	Cronimet	Completed field survey and reporting	Heritage Contracts Unit Jaco van der Walt jaco.heritage@gmail.com

Eskom Thohoyandou SEA Project	Limpopo Province, South Africa	2008 2008	Heritage Statement defining the cultural landscape of the Limpopo Province to assist in establishing sensitive receptors for the Eskom Thohoyadou SEA Project	Heritage Statement	Archaeologist	2 months	Eskom	Completed Heritage Statement	Heritage Contracts Unit Jaco van der Walt jaco.heritage@gmail.com
Wenzelrust Excavations	Shoshanguve, Gauteng, South Africa	2009 2009	Contracted by the Heritage Contracts Unit to help facilitate the Phase 2 excavations of a Late Iron Age / historical site identified in Shoshanguve	Excavation and Mapping	Archaeologist	1 week	Heritage Contracts Unit	Completed excavations	Heritage Contracts Unit Jaco van der Walt jaco.heritage@gmail.com
University of the Witwatersrand Parys LIA Shelter Project	Parys, Free State, South Africa	2009 2009	Mapping of a Late Iron Age rock shelter being studied by the Archaeology Department of the University of the Witwatersrand	Mapping	Archaeologist	1 day	University of the Witwatersrand	Completed mapping of the shelter	University of the Witwatersrand Karim Sadr karim.sadr@wits.ac.za
Transnet NMPP Line	Kwa-Zulu Natal, South Africa	2010 2010	Heritage Survey of the Anglo-Boer War Vaalkrans Battlefield where the servitude of the NMP pipeline	Heritage Impact Assessment	Archaeologist	1 week	Umlando Consultants	Completed survey	Umlando Consultants Gavin Anderson umlando@gmail.com
Archaeological Impact Assessment – Witpoortjie Project	Johannesburg, Gauteng, South Africa	2010 2010	Heritage survey of Witpoortjie 254 IQ, Mindale Ext 7 and Nooitgedacht 534 IQ for residential development project	Archaeological Impact Assessment	Archaeologist	1 week	ARM	Completed survey for the AIA	Archaeological Resources Management (ARM) Prof T.N. Huffman thomas.huffman@wits.ac.za
Der Brochen Archaeological Excavations	Steelpoort, Mpumalanga, South Africa	2010 2010	Phase 2 archaeological excavations of Late Iron Age Site	Archaeological Excavation	Archaeologist	2 weeks	Heritage Contracts Unit	Completed excavations	Heritage Contracts Unit Jaco van der Walt jaco.heritage@gmail.com
De Brochen and Booysendal Archaeology Project	Steelpoort, Mpumalanga, South Africa	2010 2010	Mapping of archaeological sites 23, 26, 27, 28a & b on the Anglo Platinum Mines De Brochen and Booysendal	Mapping	Archaeologist	1 week	Heritage Contracts Unit	Completed Mapping	Heritage Contracts Unit Jaco van der Walt jaco.heritage@gmail.com

Eskom Thohoyandou Electricity Master Network	Limpopo Province, South Africa	2010	2010	Desktop study to identify heritage sensitivity of the Limpopo Province	Desktop Study	Archaeologist	1 Month	Strategic Environmental Focus	Completed Report	Strategic Environmental Focus (SEF) Vici Napier vici@sefsa.co.za
Batlhako Mine Expansion	North-West Province, South Africa	2010	2010	Mapping of historical sites located within the Batlhako Mine Expansion Area	Mapping	Archaeologist	1 week	Heritage Contracts Unit	Completed Mapping	Heritage Contracts Unit Jaco van der Walt jaco.heritage@gmail.com
Kibali Gold Project Grave Relocation Plan	Orientale Province, Democratic Republic of Congo	2011	2013	Implementation of the Grave Relocation Project for the Randgold Kibali Gold Project	Grave Relocation	Archaeologist	2 years	Randgold Resources	Successful relocation of approximately 3000 graves	Kibali Gold Mine Cyrille Mutombo Cyrille.c.mutombo@kibaligold.com
Kibali Gold Hydro-Power Project	Orientale Province, Democratic Republic of Congo	2012	2014	Assessment of 7 proposed hydro-power stations along the Kibali River	Heritage Impact Assessment	Heritage Consultant	2 years	Randgold Resources	Completed Heritage Impact Assessment	Randgold Resources Charles Wells Charles.wells@randgoldreources.com
Everest North Mining Project	Steelpoort, Mpumalanga, South Africa	2012	2012	Heritage Impact Assessment on the farm Vygenhoek	Heritage Impact Assessment	Heritage Consultant	6 months	Aquarius Resources	Completed Heritage Impact Assessment	Aquarius Resources
Environmental Authorisation for the Gold One Geluksdal TSF and Pipeline	Gauteng, South Africa	2012	2012	Heritage impact Assessment for the proposed TSF and Pipeline of Geluksdal Mine	Heritage Impact Assessment	Heritage Consultant	4 months	Gold One International	Completed Heritage Impact Assessment	Gold One International
Platreef Burial Grounds and Graves Survey	Mokopane, Limpopo Province, South Africa	2012	2012	Survey for Burial Grounds and Graves	Burial Grounds and Graves Management Plan	Heritage Consultant	4 months	Platreef Resources	Project closed by client due to safety risks	Platreef Resources Gerick Mouton
Resgen Boikarabelo Coal Mine	Limpopo Province, South Africa	2012	2012	Archaeological Excavation of identified sites	Archaeological Excavation	Heritage Consultant	4 months	Resources Generation	Completed excavation and reporting, destruction permits approved	Resources Generation Louise Nicolai
Bokoni Platinum Road Watching Brief	Burgersfort, Limpopo Province, South Africa	2012	2012	Watching brief for construction of new road	Watching Brief	Heritage Consultant	1 week	Bokoni Platinum Mine	Completed watching brief, reviewed report	Bokoni Platinum Mines (Pty) Ltd

SEGA Gold Mining Project	Burkina Faso	2012 2013	Socio Economic and Asset Survey	RAP	Social Consultant	3 months	Cluff Gold PLC	Completed field survey and data collection	Cluff Gold PLC
SEGA Gold Mining Project	Burkina Faso	2013 2013	Specialist Review of Heritage Impact Assessment	Reviewer	Heritage Consultant	1 week	Cluff Gold PLC	Reviewed specialist report and made appropriate recommendations	Cluff Gold PLC
Consbrey and Harwar Collieries Project	Breyton, Mpumalanga, South Africa	2013 2013	Heritage Impact Assessment for the proposed Consbrey and Harwar Collieries	Heritage Impact Assessment	Heritage Consultant	2 months	Msobo	Completed Heritage Impact Assessments	Msobo
New Liberty Gold Project	Liberia	2013 2014	Implementation of the Grave Relocation Project for the New Liberty Gold Project	Grave Relocation	Heritage Consultant	On-going	Aureus Mining	Project is on-going	Aureus Mining
Falea Uranium Mine Environmental Assessment	Falea, Mali	2013 2013	Heritage Scoping for the proposed Falea Uranium Mine	Heritage Scoping	Heritage Consultant	2 months	Rockgate Capital	Completed scoping report and recommended further studies	Rockgate Capital
Putu Iron Ore Mine Project	Petroken, Liberia	2013 2014	Heritage impact Assessment for the proposed Putu Iron Ore Mine, road extension and railway line	Heritage Impact Assessment	Heritage Consultant	6 months	Atkins Limited	Completed Heritage Impact Assessment and provided recommendations for further studies	Atkins Limited Irene Bopp Irene.Bopp@atkinsglobal.com
Sasol Twistdraai Project	Secunda, Mpumalanga, South Africa	2013 2014	Notification of intent to Develop and Heritage Statement for the Sasol Twistdraai Expansion	NID	Heritage Consultant	2 months	ERM Southern Africa	Completed NID and Heritage Statement	ERM Southern Africa Alan Cochran Alan.Cochran@erm.com
Daleside Acetylene Gas Production Facility	Gauteng, South Africa	2013 2013	Project Management of the heritage study	NID	Project Manager	3 months	ERM Southern Africa	Project completed	ERM Southern Africa Kasantha Moodley Kasantha.Moodley@erm.com
Exxaro Belfast, Paardeplaats and Eerstelingsfontein GRP	Belfast, Mpumalanga, South Africa	2013 2014	Grave Relocation Plan for the Belfast, Paardeplaats and Eerstelingsfontein Projects	GRP	Project Manager, Heritage Consultant	On-going	Exxaro	Project is on-going	Exxaro Johan van der Bijl Johan.vanderbijl@exxaro.com

Nzoro 2 Hydro Power Project	Orientale Province, Democratic Republic of Congo	2014 2014	Social consultation for the Relocation Action Plan component of the Nzoro 2 Hydro Power Station	RAP	Social Consultant	On-going	Randgold Resources	Completed introductory meetings – project on-going	Kibali Gold Mine Cyrille Mutombo Cyrille.c.mutombo@kibaligold.com
Eastern Basin AMD Project	Springs, Gauteng, South Africa	2014 2014	Heritage Impact Assessment for the proposed new sludge storage facility and pipeline	Heritage Impact Assessment	Heritage Consultant	On-going	AECOM	Project is on-going	AECOM
Soweto Cluster Reclamation Project	Soweto, Gauteng, South Africa	2014 2014	Heritage Impact Assessment for reclamation activities associated with the Soweto Cluster Dumps	Heritage Impact Assessment	Heritage Consultant	On-going	ERGO	Project is on-going	ERGO Greg Ovens Greg.ovens@drdgold.com
Klipspruit South Project	Ogies, Mpumalanga, South Africa	2014 2014	NID and Heritage Statement for the Section 102 Amendment of the Klipspruit Mine EMP	NID	Heritage Consultant	On-going	BHP Billiton	Project is on-going	BHP Billiton
Klipspruit Extension: Weltevreden Project	Ogies, Mpumalanga, South Africa	2014 2014	NID and Heritage Statement for the expansion of the Klipspruit Mine	NID	Heritage Consultant	On-going	BHP Billiton	Project is on-going	BHP Billiton
Ergo Rondebult Pipeline Basic Assessment	Johannesburg, South Africa	2014 2014	NID and Heritage Statement for the construction of the Rondebult Pipeline	NID	Heritage Consultant	1 Week	ERGO	Completed screening assessment and NID	ERGO
Kibali ESIA Update Project	Orientale Province, Democratic Republic of Congo	2014 2014	Update of the Kibali ESIA for the inclusion of new open-cast pit areas	Heritage Impact Assessment	Heritage Consultant	On-going	Randgold Resources	Project is on-going	Randgold Resources Charles Wells Charles.wells@randgoldresources.com
GoldOne EMP Consolidation	Westonaria, Gauteng, South Africa	2014 2014	Gap analysis for the EMP consolidation of operations west of Johannesburg	Gap Analysis	Heritage Consultant	On-going	Gold One International	Project is on-going	Gold One International

JOHAN NEL

Mr Johan Nel

Unit manager: Heritage Resources Management

Social Sciences

Digby Wells Environmental

1 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

2 LANGUAGE SKILLS

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

3 EMPLOYMENT

Period	Company	Title/position
09/2011 to present	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
	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,

4 EXPERIENCE

Johan Nel has 13 years of combined experience in the field of cultural heritage resources management (HRM) including archaeological and heritage assessments, grave relocation, social consultation and mitigation of archaeological sites. I have gained experience both within urban settings and remote rural landscapes. Since 2010 I have been actively involved in environmental management that has allowed me to investigate and implement the integration of heritage resources management into environmental impact assessments (EIA). Many of the projects since have required compliance with International Finance Corporation (IFC) requirements and other World Bank standards. This exposure has allowed me to develop and implement a HRM approach that is founded on international best practice and leading international conservation bodies such as UNESCO and ICOMOS. I have worked in most South African Provinces, as well as Swaziland, the Democratic Republic of the Congo, Liberia and Sierra Leone. I am fluent in English and Afrikaans, with excellent writing and research skills.

5 PROFESSIONAL REGISTRATION

Position	Professional Body	Registration Number
Council member	Association for Southern African Professional Archaeologists (ASAPA); ASAPA Cultural Resources Management (CRM) section	095
Member	International Association of Impact Assessors (IAIA)	N/A
Member	International Council on Monuments and Sites (ICOMOS)	
Member	Society for Africanist Archaeologists (SAfA)	N/A

6 PUBLICATIONS AND CONFERENCE PAPERS

Authors and Year	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.

7 PROJECT EXPERIENCE

7.1 Archaeological Surveys and Impact Assessments

- 2003-2004. Freelance consulting archaeologist. Roodt & Roodt CC. RSA. Archaeological surveys. Specialist.
- 2004-2005. Resident archaeologist Rock Art Mapping Project. University of KwaZulu-Natal. Kwazulu-Natal, RSA. Rock art mapping & recording. Specialist.

7.2 Archaeological Mitigation

- 2007. Archaeological investigation of Old Johannesburg Fort. Johannesburg Development Agency. Gauteng, RSA. Archaeological mitigation. Project manager.
- 2008. Final consolidated report: Watching Brief on Soutpansberg Road Site for the new Head Offices of the Department of Foreign Affairs, Pretoria Gauteng. Imbumba-Aganang D & C Joint Venture. Gauteng, RSA. Watching Brief. Project manager.
- 2011. Sessenge archaeological site mitigation. Randgold Resources. Doko, DRC. Archaeological mitigation. Specialist.
- 2011. Mitigation of three sites, Koidu Kimberlite Project. Koidu Holdings SA. Koidu, Sierra Leone. Archaeological mitigation. Project manager.
- 2012. Boikarabelo Phase 2 Mitigation of Archaeological Sites. Ledjadja Coal (Pty) Ltd. Limpopo, RSA. Archaeological permitting and mitigation. Project manager.
- 2012. Additional Archaeology Mitigation of Sites. Ledjadja Coal (Pty) Ltd. Limpopo, RSA. Archaeological permitting and mitigation. Project manager.
- 2013. Archaeological Excavations of Old Well, Rhodes University, Grahamstown. Rhodes University. Eastern Cape, RSA. Archaeological mitigation. Specialist.
- 2014. Archaeological Site Destruction. Ledjadja Coal (Pty) Ltd. Limpopo, RSA. Archaeological permitting and mitigation. Project manager.

7.3 Heritage Impact Assessments

- 2005. Final consolidated Heritage Impact Assessment report: Proposed development of high-cost housing and filling station, Portion of the farm Mooiplaats 147 JT. Go-Enviroscience. Mpumalanga, RSA. Heritage Impact Assessment. Project manager.
- 2006. Final report: Heritage resources Scoping survey and preliminary assessment for the Transnet Freight Line EIA, Eastern Cape and Northern Cape. ERM Southern Africa (Pty) Ltd. Northern & Eastern Cape, RSA. Heritage Scoping Assessment. Project manager.
- 2007. Proposed road upgrade of existing, and construction of new roads in Burgersfort, Limpopo Province. AGES South Africa (Polokwane). Limpopo, RSA. Heritage Impact Assessment. Project manager.
- 2007. Recommendation of Exemption: Above-ground SASOL fuel storage tanks located at grain silos in localities in the Eastern Free State. Sasol Group Services (Pty) Ltd. Free State, RSA. Letter of Exemption. Project manager.
- 2008. Summary report: Old dump on premises of the new Head Offices, Department of Foreign Affairs, Pretoria, Gauteng. Imbumba-Aganang D & C Joint Venture. Gauteng, RSA. Archaeological Impact Assessment. Project manager.
- 2008. Van Reenen Eco-Agri Development Project. Go-Enviroscience. Kwazulu-Natal & Free State, RSA. Heritage Impact Assessment. Project manager.
- 2008. Heritage Impact Assessment for proposed water pipeline routes, Mogalakwena District, Limpopo Province. AGES South Africa (Polokwane). Limpopo, RSA. Heritage Impact Assessment. Project manager.
- 2008. Phase 1 Heritage and Archaeological Impact Assessment: Proposed establishment of an access road between Sapekoe Drive and Koedoe Street, Erf 3366 (Extension 22) and the Remainder of Erf 430 (Extension 4). AGES South Africa (Polokwane). Limpopo, RSA. Heritage Impact Assessment. Project manager.
- 2008. Heritage resources scoping survey and preliminary assessment: Proposed establishment of township on Portion 28 of the farm Kennedy's Vale 362 KT, Steelpoort, Limpopo Province. AGES South Africa (Polokwane). Limpopo, RSA. Heritage Scoping Assessment. Project manager.
- 2008. Randwater Vlakfontein-Mamelodi water pipeline survey. Archaeology Africa CC. Gauteng, RSA. Heritage Impact Assessment. Specialist.
- 2010. Heritage Impact Assessment for conversion of PR to MRA. Georock Environmental. Northwest, RSA. Heritage Impact Assessment. Project manager.
- 2010. Temo Coal Project. Namane Commodities (Pty) Ltd. Limpopo, RSA. Heritage Impact Assessment. Specialist.
- 2011. Marapong Treatment Works. Ceenex (Pty) Ltd. Limpopo, RSA. Archaeological Impact Assessment. Project manager.

- 2011. Complete Environmental Authorisation. Rhodium Reefs Ltd. Limpopo, RSA. Archaeological Impact Assessment. Specialist.
- 2011. Big 5 PV Solar Plants. Orlight (Pty) Ltd. Western and Northern Cape, RSA. Heritage Impact Assessment. Specialist.
- 2011. Heritage Impact Assessment for Koidu Diamond Mine. Koidu Holdings SA. Koidu, Sierra Leone. Heritage Impact Assessment. Specialist.
- 2012. TSF and Pipeline. Gold One. Gauteng, RSA. Heritage Impact Assessment. Project manager.
- 2012. Kangra Coal Heritage Screening Assessment. ERM Southern Africa (Pty) Ltd. Mpumalanga, RSA. Heritage Screening Assessment. Project manager.
- 2012. Environmental and Social Studies. Platreef Resources (Pty) Ltd. Limpopo, RSA. Heritage specialist advice. Project manager.
- 2012. ESKOM Powerline EIA. Ledjadja Coal (Pty) Ltd. Limpopo, RSA. Notification of Intent to Develop. Project manager.
- 2012. Falea Project ESIA. Denison Mines Corp. (Rockgate Capital Corp). Falea, Mali. Heritage Impact Assessment. Specialist.
- 2012. EIA for Proposed Emergency Measures to Pump and Treat. AECOM SA (Pty) Ltd. Gauteng, RSA. Heritage Impact Assessment. Specialist.
- 2012. Tonguma Baseline Studies. Koidu Holdings SA. Tonguma, Sierra Leone. Heritage Impact Assessment. Specialist.
- 2012. Vedanta IPP. Black Mountain Mining (Pty) Ltd. Limpopo, RSA. Heritage Impact Assessment. Specialist.
- 2012. Boikarabelo Railway Realignment. Ledjadja Coal (Pty) Ltd. Limpopo, RSA. Heritage Impact Assessment. Specialist.
- 2012. Platreef ESIA. Platreef Resources (Pty) Ltd. Limpopo, RSA. Heritage Impact Assessment. Specialist.
- 2012. Roodekop EIA. Universal Coal Development 4 (Pty) Ltd. Mpumalanga, RSA. Heritage Impact Assessment. Specialist.
- 2012. Kangala HIA. Universal Coal Development 1 (Pty) Ltd. Mpumalanga, RSA. Heritage Impact Assessment and permitting. Specialist.
- 2012. Roodepoort Strengthening. Eskom Holdings SOC Ltd. Gauteng, RSA. Notification of Intent to Develop. Specialist.
- 2012. Trichardtsfontein EIA / EMP. Xstrata Coal South Africa. Limpopo, RSA. Heritage Impact Assessment. Specialist.
- 2012. Zandbaken EIA/EMPR. Xstrata Coal South Africa. Limpopo, RSA. Heritage Impact Assessment. Specialist.

- 2013. ATCOM Tweefontein NID. Jones & Wagener (Pty) Ltd. Mpumalanga, RSA. Burial grounds and graves consultation, permitting and relocation. Project manager.
- 2013. Roodepoort Heritage Impact Assessment. Fourth Element Consulting (Pty) Ltd. Gauteng, RSA. Heritage Impact Assessment. Project manager.
- 2013. JHB BRT Phase 2 Heritage Impact Assessment. Iliso Consulting (Pty) Ltd. Gauteng, RSA. Heritage Impact Assessment. Project manager.
- 2013. Kangra Coal HIA. ERM Southern Africa (Pty) Ltd. Mpumalanga, RSA. Heritage Impact Assessment. Project manager.
- 2013. Slypsteen Bulk Sample Application. Summer Season Trading (Pty) Limited. Northern Cape, RSA. Heritage Impact Assessment. Project manager.
- 2013. Kempton Park Heritage Statement and NID. ERM Southern Africa (Pty) Ltd. Gauteng, RSA. Notification of Intent to Develop. Project manager.
- 2013. Sasol Twistdraai CFD. ERM Southern Africa (Pty) Ltd. Gauteng, RSA. Notification of Intent to Develop. Project manager.
- 2013. HRS & NID - River Crossings Upgrade. Iliso Consulting (Pty) Ltd. Gauteng, RSA. Notification of Intent to Develop. Project manager.
- 2013. Waterberg Prospecting Right Applications. Platinum Group Metals (Pty) Ltd. Limpopo, RSA. Notification of Intent to Develop. Project manager.
- 2013. Landau Waste Licence Application. Anglo Operations (Pty) Limited. Mpumalanga, RSA. Notification of Intent to Develop. Reviewer / specialist.
- 2013. Prospecting Right Consultation Report. Rustenburg Platinum Mines Limited. Mpumalanga, RSA. Notification of Intent to Develop. Reviewer / specialist.
- 2013. Witrand Prospecting EMP. Rustenburg Platinum Mines Limited. Mpumalanga, RSA. Notification of Intent to Develop. Reviewer / specialist.
- 2013. EMP Amendment for CST. Copper Sunset Trading (Pty) Ltd. Mpumalanga, RSA. Notification of Intent to Develop. Reviewer / specialist.
- 2013. Maseve IFC ESHIA. Maseve Investment (Pty) Ltd. Mpumalanga, RSA. Notification of Intent to Develop. Reviewer / specialist.
- 2013. Dalyshope ESIA. Anglo Operations (Pty) Limited. Limpopo, RSA. Heritage Impact Assessment. Specialist.
- 2013. Klipfontein Opencast Project. Bokoni Platinum Mines (Pty) Ltd. Limpopo, RSA. Heritage Impact Assessment. Specialist.
- 2013. Consbrey and Harwar MPRDA EIA/EMP. Msobo Coal (Pty) Ltd. Mpumalanga, RSA. Heritage Impact Assessment. Specialist.
- 2013. Slypsteen 102 EMP Amendment. Summer Season Trading (Pty) Limited. Northern Cape, RSA. Heritage Impact Assessment. Specialist.

- 2013. Putu Iron Ore ESIA. Atkins Limited Incorporated. Putu, Liberia. Heritage Impact Assessment. Specialist.
- 2013. Ash backfilling at Sigma Colliery. Sasol Mining (Pty) Ltd. Gauteng, RSA. Notification of Intent to Develop. Specialist.
- 2013. Syferfontein Block 4 - Underground Coal Mining for Sasol. Sasol Mining (Pty) Ltd. Mpumalanga, RSA. Notification of Intent to Develop. Specialist.
- 2013. Prospecting Right Amendment to Include Bulk Sampling. Sikhuliso Resources (Pty) Ltd. Mpumalanga, RSA. Notification of Intent to Develop. Specialist.
- 2013. Nooitgedacht EIA, EMP Amendment & Gap Analysis. Xstrata Coal South Africa. Limpopo, RSA. Heritage Impact Assessment. Specialist.
- 2014. Gold One EMP Consolidation Phase 0. Gold One. Gauteng, RSA. Heritage Impact Assessment. Reviewer / specialist.
- 2014. Kilbarchan Audit and EIA. Eskom Holdings SOC Ltd. Kwazulu-Natal, RSA. Heritage Impact Assessment. Reviewer / specialist.
- 2014. Klipspruit Extension Environmental Assessment. BHP Billiton Energy Coal South Africa Limited. Mpumalanga, RSA. Heritage Impact Assessment. Reviewer / specialist.
- 2014. Klipspruit South BECSA EIA. BHP Billiton Energy Coal South Africa Limited. Mpumalanga, RSA. Heritage Impact Assessment. Reviewer / specialist.
- 2014. EIA/EMP Soweto Cluster. DRD GOLD ERGO (Ergo Mining (Pty) Ltd. Gauteng, RSA. Notification of Intent to Develop. Reviewer / specialist.
- 2014. London Road Heritage Statement. ERM Southern Africa (Pty) Ltd. Gauteng, RSA. Notification of Intent to Develop. Reviewer / specialist.
- 2014. Grootegeluk MPRDA, NEMA and IWULA. Exxaro Coal (Pty) Ltd. Limpopo, RSA. Notification of Intent to Develop. Reviewer / specialist.
- 2014. Kibali ESIA & EMP Update. Randgold Resources. Doko, DRC. Heritage Impact Assessment. Specialist.
- 2014. Nokuhle Colliery NEMA Process. HCI Coal (Pty) Ltd. Mpumalanga, RSA. Heritage Impact Assessment. Specialist.
- 2014. HRM Process for Hendrina Wet Ashing. Lidwala Consulting Engineers (Pty) Ltd. Mpumalanga, RSA. Heritage Impact Assessment. Specialist.
- 2014. Weltevreden NEMA. Northern Coal (Pty) Ltd. Mpumalanga, RSA. Heritage Impact Assessment. Specialist.
- 2014. Sasol Sigma Mooikraal Pipeline BA. Sasol Mining (Pty) Ltd. Mpumalanga, RSA. Notification of Intent to Develop. Specialist.

7.4 Burial Grounds and Graves Consultation and Relocation

- 2005. Report on exhumation, relocation and re-internment of 49 graves on Portion 10 of the farm Tygervallei 334 JR, Kungwini Municipality, Gauteng D Georgiades East Farm (Pty) Ltd. Gauteng, RSA. Burial grounds and graves consultation, permitting and relocation. Project manager.
- 2005. Southstock Collieries Grave Relocation. Doves Funerals, Witbank. Mpumalanga, RSA. Burial grounds and graves consultation, permitting and relocation. Project manager.
- 2005. Social consultation for Smoky Hills Platinum Mine Grave Relocation. PGS (Pty) Ltd. Limpopo, RSA. Stakeholder consultation on burial grounds and graves. Social consultant.
- 2005. Social consultation for Elawini Lifestyle Estate Grave Relocation. PGS (Pty) Ltd. Mpumalanga, RSA. Stakeholder consultation on burial grounds and graves. Social consultant.
- 2006. Social consultation for Zonkezizwe Grave Relocation. PGS (Pty) Ltd. Gauteng, RSA. Stakeholder consultation on burial grounds and graves. Social consultant.
- 2006. Social consultation for Motaganeng Residential Development Grave Relocation. PGS (Pty) Ltd. Mpumalanga, RSA. Stakeholder consultation on burial grounds and graves. Social consultant.
- 2006. Social consultation for Zondagskraal Coal Mine Grave (Pty) Ltd. Mpumalanga, RSA. Stakeholder consultation on burial grounds and graves. Social consultant.
- 2007. Exploratory excavation of an unknown cemetery at Du Preezhoek, Fountains Valley, Portion 383 of the farm Elandspoort 357 JR, Pretoria, Gauteng. Bombela Civil Joint Venture. Gauteng, RSA. Burial grounds and graves consultation, permitting and relocation. Project manager.
- 2007. Final consolidated report: Phase 2 test excavations ascertaining the existence of alleged mass graves, Tlhabane West, Extension 2, Rustenburg, Northwest Province. Bigen Africa Consulting Engineers. Northwest, RSA. Burial grounds and graves consultation, permitting and relocation. Project manager.
- 2007. Repatriation of Mapungubwe Human Remains. Department of Environmental Affairs and Tourism. Limpopo, RSA. Repatriation. Project manager.
- 2008. Report on skeletal material found at Pier 30, R21 Jones Street off-ramp, Kempton Park. Bombela Civil Joint Venture. Gauteng, RSA. Heritage Scoping Assessment. Project manager.
- 2011. Kibali Grave Relocation. Randgold Resources. Doko, DRC. International grave relocation. Specialist.
- 2012. Platreef Platinum Mine Burial Grounds and Graves Census. Platreef Resources (Pty) Ltd. Limpopo, RSA. Stakeholder consultation on burial grounds and graves. Project manager.

- 2013. New Liberty Grave Relocation Process. Aureus Mining Inc. Kinjor, Liberia. International grave relocation. Project manager.
- 2013. Bokoni Burial Grounds and Grave Census and Grave Relocation Plan. Bokoni Platinum Mines (Pty) Ltd. Limpopo, RSA. Stakeholder consultation on burial grounds and graves. Project manager.
- 2014. Arnot Colliery Grave Relocation Project. Exxaro Coal (Pty) Ltd. Mpumalanga, RSA. Burial grounds and graves consultation, permitting and relocation. Project manager.
- 2014. Paardeplaats and Belfast RAPs. Exxaro Coal (Pty) Ltd. Mpumalanga, RSA. Burial grounds and graves consultation, permitting and relocation. Reviewer / specialist.
- 2014. Thabametsi EIA, EMP, IWULA, IWWMP and PPP. Exxaro Coal (Pty) Ltd. Limpopo, RSA. Stakeholder consultation on burial grounds and graves. Specialist.

7.5 Research Reports and Reviews

- 2007. Research report on cultural symbols. Ministry of Intelligence Services. RSA. Research report. Project manager.
- 2007. Research report on the remains of kings Mampuru I and Nyabela. National Department of Arts and Culture. RSA. Research report. Project manager.
- 2012. Baseline Scoping and Pre-feasibility Songwe Rare Earth Element Project. Mkango Resources Limited. Songwe, Malawi. Heritage Impact Assessment. Reviewer / specialist.
- 2013. Fatal Flaw Analysis and EIA Process for AMD Man in Eastern Basin. AECOM SA (Pty) Ltd. Gauteng, RSA. Heritage Impact Assessment. Reviewer / specialist.

NATASHA HIGGITT

Ms Natasha Higgitt

Assistant Heritage Consultant

Social Department

Digby Wells Environmental

1 EDUCATION

- University of Pretoria
- BA Degree (2008)
- Archaeology Honours (2010)
- Title of Dissertation- Pass the Salt: An Archaeological analysis of lithics and ceramics from Salt Pan Ledge, Soutpansberg, for evidence of salt working and interaction.

2 LANGUAGE SKILLS

- English - Excellent (read, write and speak)
- Afrikaans - Fair (read, write and speak)
- Italian – Poor (Speaking only)

3 EMPLOYMENT

- July 2011 to Present: Assistant Heritage Consultant at Digby Wells Environmental
- April 2011 to June 2011: Lab assistant at the Albany Museum Archaeology Department, Grahamstown, Eastern Cape
- April 2010 to March 2011: Intern at the Archaeology Department, Albany Museum, Grahamstown, Eastern Cape under the Department of Sports, Recreation, Arts and Culture, Eastern Cape Government, South Africa (DSRAC)

4 FIELD EXPERIENCE

- Human remains rescue excavation at St Francis Bay, Eastern Cape
- Human remains rescue excavation at Wolwefontein, Eastern Cape
- Recorded two rock art sites at Blaauwbosch Private Game Reserve, Eastern Cape

- Attended a 2 week excavation/study tour in the Friuli Region in Italy, organised by the *Società Friulana di Archeologia*, sponsored by *Ente Friuli nel Mondo*, and excavated a 12th century medieval castle
- Attended a 2 week excavation in Limpopo, Waterpoort Archaeological Project organised by Xander Antonites (Yale PhD Candidate)
- A total of 5 University of Pretoria Archaeology field schools in Limpopo and Gauteng spanning over 4 years

5 PROJECT EXPERIENCE

- Notification of Intent to Develop for the Doornkloof Flood Remedial Measures Project, Centurion, Gauteng Province for Iliso Consulting (Pty) Ltd (Digby Wells Environmental)
- Notification of Intent to Develop for the Oakleaf Open Cast Coal Mine, Bronkhorstspruit, Gauteng Province for Oakleaf Resources (Digby Wells Environmental)
- Notification of Intent to Develop for the Rietfontein 101IS Prospecting Project for Rustenburg Platinum (Digby Wells Environmental)
- Heritage Impact Assessment for the Weltevreden Open Cast Coal Mine, Belfast, Mpumalanga for Northern Coal (Pty) Ltd (Digby Wells Environmental)
- Notification of Intent to Develop for the Grootegeluk Expansion Project, Lephalale, Limpopo Province for Exxaro Resources (Pty) Ltd (Digby Wells Environmental)
- Notification of Intent to Develop and Heritage Statement for the London Road Petrol Station, Alexandria, Gauteng for ERM Southern Africa (Pty) Ltd (Digby Wells Environmental)
- Heritage Impact Assessment for the Roodepoort Strengthening Project, Roodepoort, Gauteng for Fourth Element (Digby Wells Environmental)
- Heritage Statement for the Stoffel Park Bridge Upgrade, Mamelodi, Gauteng for Iliso Consulting (Pty) Ltd (Digby Wells Environmental)
- Heritage Statement for the Witrand Prospecting EMP, Bethal, Mpumalanga for Rustenburg Platinum (Digby Wells Environmental)
- Heritage Statement for the Onverwacht Prospecting EMP, Kinross, Mpumalanga for Rustenburg Platinum (Digby Wells Environmental)
- Heritage Statement for a Proposed Acetylene Gas Production Facility, located near Witkopdorp, Daleside, south of Johannesburg, Gauteng Province for Erm Southern Africa (Pty) Ltd (Digby Wells Environmental)
- Heritage Impact Assessment for the Platreef Platinum Project, Mokopane, Limpopo for Platreef Resources (Digby Wells Environmental)
- Heritage Statement for ATCOM and Tweefontein Dragline Relocation Project, near Witbank, Mpumalanga Province for Jones and Wagner Consulting Civil Engineers (Digby Wells Environmental)

- Heritage Statement Report for the Wilgespruit Bridge Upgrade, Pretoria, Gauteng Province for Iliso Consulting (Pty) Ltd (Digby Wells Environmental)
- Heritage Statement Report for the Kosmosdal sewer pipe bridge upgrade, Pretoria, Gauteng Province for Iliso Consulting (Pty) Ltd (Digby Wells Environmental)
- Phase 1 Heritage Impact Assessment for the Thabametsi Coal Mine, Lephalale, Limpopo for Exxaro Coal (Digby Wells Environmental)
- Heritage Statement for the Zandbaken Coal Mine Project, Zandbaken 585 IR, Sandbaken 363 IR and Bosmans Spruit 364 IS, Standerton, Mpumalanga for Xtrata Coal South Africa (Digby Wells Environmental)
- Phase 1 Heritage Impact Assessment for the Brakfontein Thermal Coal Mine, Mpumalanga for Universal Coal (Digby Wells Environmental)
- Development of a RAP for Aureus Mining for the New Liberty Gold Mine Project, Liberia (Digby Wells Environmental)
- Phase 1 Archaeological Impact Assessment for the MBET Pipeline, Steenbokpan, Limpopo (Digby Wells Environmental)
- Notice of Intent to Develop and Cultural Resources Pre-Assessment for Orlight SA (PTY) Ltd Solar PV Project. 2012. (Digby Wells Environmental)
- Agricultural Survey for Platreef ESIA, Mokopane, Limpopo. 2011. (Digby Wells Environmental)
- Cultural Resources Pre-Assessment for the Proposed Sylvania Everest North Mining Development in Mpumalanga, near Lydenburg. 2011. (Digby Wells Environmental)
- Phase 2 Mitigation of Archaeological sites at Boikarabelo Coal Mine, Steenbokpan, Limpopo. 2011. (Digby Wells Environmental)
- Cultural Resources Pre-Assessment for Proposed Platinum Mine Prospecting in Mpumalanga, near Bethal for Anglo Platinum. 2011. (Digby Wells Environmental)
- Cultural Resources Pre-Assessment for proposed Platinum Mine at Mokopane, Limpopo for Ivanhoe Platinum. 2011. (Digby Wells Environmental)
- Phase 1 AIA Mixed-use housing Development, Kwanobuhle, Extension 11, Uitenhage, Eastern Cape. 2011.
- Phase 1 AIA Centane to Qholora and Kei River mouth road upgrade survey, Mnquma Municipality, Eastern Cape. 2011. (SRK Consulting)
- Phase 1 AIA Clidet Data Cable survey, Western Cape, Northern Cape, Free State and Eastern Cape. 2011. (SRK Consulting)
- Phase 1 AIA Karoo Renewable Energy Facility, Victoria West, Northern Cape. 2011. (Savannah Environmental)
- Phase 1 AIA Windfarm survey in Hamburg, Eastern Cape. 2010. (Savannah Environmental)

- Phase 1 AIA Windfarm survey in Molteno, Eastern Cape. 2010. (Savannah Environmental)
- Phase 1 AIA Housing Development at Motherwell, P.E. 2010. (SRK Consulting)
- Phase 1 AIA Sand quarry survey in Paterson, Eastern Cape. 2010. (SRK Consulting)
- Phase 1 AIA Quarry Survey at Victoria West. 2010. (Acer [Africa] Environmental Management Consultants)
- Phase 1 AIA Quarry Survey at Port Elizabeth. 2010. (E.P Brickfields)

6 PROFESSIONAL AFFILIATIONS

- Association of Southern African Professional Archaeologists (ASAPA): Professional member
- Association of Southern African Professional Archaeologists (ASAPA): CRM Practitioner (Field Supervisor: Stone Age, Iron Age and Rock Art)
- South African Museums Association (SAMA): Member

Appendix B: Impact Assessment Methodology

DIGBY WELLS
ENVIRONMENTAL

Heritage Resources Management: Assessment Matrix Methodology

Methodology Statement

October 2015

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This document has been prepared by Digby Wells Environmental.

Report Type:	**Methodology Statement**
Project Name:	**Heritage Resources Management: Assessment Matrix Methodology**

Name	Responsibility	Signature	Date
Johan Nel	HRM Unit Manager		23 October 2015

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1 Introduction

This methodology provides an objective manner in which to evaluate the way in which project activities interact with cultural heritage resources. This interaction may result in an impact, adverse or beneficial, wholly or partially resulting from organisations activities.

In terms of heritage management, potential impacts to heritage resources must be assessed relative to the significance of the resource. The methodology employed in the assessment of potential impacts is discussed in more detail below.

2 Evaluation of Significance

The significance rating process is designed to provide a numerical rating of the cultural significance[1] of identified heritage resources. The evaluation was done as objectively as possible through a matrix developed by Digby Wells for this purpose. In addition, the methodology aims to allow ratings to be reproduced independently should it be required, provided that the same information sources are used.

This matrix takes into account heritage resources assessment criteria set out in subsection 3(3) of the National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA) (see Box 1), which determines the intrinsic, comparative and contextual significance of identified heritage resources. A resource's importance rating is based on information obtained through review of available credible sources and representivity or uniqueness (i.e. known examples of similar resources to exist). The final significance attributed to a resource furthermore takes into account the physical integrity of the fabric of the resource. The formula used to determine significance can is summarised in Box 2.

Dimension		Attributes considered	NHRA Ref.
Aesthetic & technical	1	Importance in aesthetic characteristics	S.3(3)(e)
	2	Degree of technical / creative skill at a particular period	S.3(3)(f)
Historical importance & associations	3	Importance to community or pattern in country's history	S.3(3)(a)
	4	Site of significance relating to history of slavery	S.3(3)(i)
	5	Association with life or work of a person, group or organisation of importance in the history of the country	S.3(3)(h)
Information potential	6	Possession of uncommon, rare or endangered natural or cultural heritage aspects	S.3(3)(b)
	7	Information potential	S.3(3)(c)
	8	Importance in demonstrating principle characteristics	S.3(3)(d)
Social	9	Association to community or cultural group for social, cultural or spiritual reasons	S.3(3)(g)

Box 1: NHRA section 3 criteria

The rationale behind the heritage value matrix takes into account the fact that a heritage resource's value is a direct indication of its sensitivity to change (impacts). Value therefore needs to be determined prior to the completion of any assessment of impacts.

[1] 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.

This matrix rates the potential, or importance, of an identified resource relative to its contribution to certain values – aesthetic, historical, scientific and social.

Value = Importance x Integrity

where

Importance = average sum

of

Aesthetic + Historic + Scientific + Social

Box 2: CS formula

The significance of a resource is directly related to the impact on it that could result from project-related activities, as it provides minimum accepted levels of change to the resource. The South African Heritage Resources Agency (SAHRA) has published minimum standards that include minimum required mitigation of heritage resources. These minimum requirements are integrated into the matrix to guide both assessments of impacts and recommendations for mitigation and management of resources.

The weight assigned to the various parameters for significance in the formula, significance ratings and recommended mitigation are presented in Table 3-1.

3 Field Rating

Although grading of heritage resources remains the responsibility of Heritage Resources Authorities (HRAs), SAHRA requires in terms of its Minimum Standards that heritage reports include Field Ratings for identified resources to comply with section 38 of the NHRA. The NHRA in terms of section 7 provides for a system of grading of heritage resources that form part of the national estate, distinguishing between three categories.

Field Rating = average sum

of

Aesthetic + Historic + Scientific + Social

Box 3: Field rating formula

The field rating process is designed to provide a numerical rating of the recommended grading of identified heritage resources. The evaluation was done as objectively as possible by integrating the field rating into the significance matrix. Field ratings guide decision-making in terms of appropriate minimum required mitigation measures and consequent management responsibilities in accordance with section 8 of the NHRA. The formula used to determine field ratings is summarised in Box 3. The weight assigned to the various field rating parameters in the formula and the sum of the average ratings are is presented in Table 3-1.

Table 3-1: Ratings and descriptions used in determining CS and field ratings

Rating	IMPORTANCE *A heritage resource's contribution to aesthetic, historic, scientific and social value.*	INTEGRITY *The undivided or unbroken state, material wholeness, completeness or entirety of a resource or site*	FIELD RATING *Recommended grading of identified heritage resources in terms of NHRA Section 7*
-	Not assessed - dimension and/or attribute not considered in determining value.		Not assessed - dimension and/or attribute not considered in field rating.
0	The resource exhibits attributes that may be considered in a particular dimension, but it is so poorly represented that it cannot or does not contribute to the resource's overall value.	No information potential, complete loss of meaning, Fabric completely degraded, original setting lost	
1	Common, well represented throughout diverse cultural landscapes	Fabric poorly preserved, limited information, little meaning ascribed, extensive encroachment on setting	Resources under general protection in terms of NHRA sections 34 to 37 with Negligible significance *Grade IV C*
2	Generally well represented but exhibits superior qualities in comparison to other similar examples	Fabric is preserved, some information potential (quality questionable) and meaning evident, some encroachment on setting	Resources under general protection in terms of NHRA sections 34 to 37 with Low significance *Grade IV B*
3	The resource exhibits attributes that are rare and uncommon within a region. It is important to specific communities.	Fabric well preserved, good quality information and meaning evident, limited encroachment	Resources under general protection in terms of NHRA sections 34 to 37 with Medium to Medium-High significance *Grade IV A*
4	Rare and uncommon, value of national importance	Excellent preservation of fabric, high information potential of high quality, meaning is well established, no encroachment on setting	Resources under general protection in terms of NHRA sections 34 to 37 with High significance *Grade III B*
5	The resource exhibits attributes that are considered singular, unique and/or irreplaceable to the degree that its significance can be universally accepted.		Resources under general protection in terms of NHRA sections 34 to 37 with Very High significance *Grade III A*
6			Heritage resources under formal protection that can be considered to have special qualities which make them significant within the context of a province or a region *Grade II*
7			Heritage resources under formal protection that can be considered to have special qualities which make them significant within a national and / or international context. *Grade I*

4 Impact Assessment Methodology

The following are terms and definitions applicable to the Environmental Impact Assessment (EIA) concept (ISO 14001):

- **Project Activity:** Activities associated with the project that result in an environmental interaction during the different phases (construction, operation and decommissioning);
- **Interaction:** An "environmental interaction" is an element or characteristic of an activity, product, or service that interacts or can interact with the environment. Environmental interactions can cause environmental impacts (but may not necessarily do so). They can have either beneficial impacts or adverse impacts and can have a direct and decisive impact on the environment or contribute only partially or indirectly to a larger environmental change.
- **Environmental Aspect:** The term "environmental aspect" refers to the various natural and human environments that an activity may interact with. These environments extend from within the activity itself to the global system, and include air, water, land, flora, fauna (including people) and natural resources of all kinds.
- **Environmental Impact:** An "environmental impact" is a change to the environment that is caused either partly or entirely by one or more environmental interactions. An environmental interaction can have either a direct and decisive impact on the environment or contribute only partially or indirectly to a larger environmental change. In addition, it can have either a beneficial environmental impact or an adverse environmental impact.

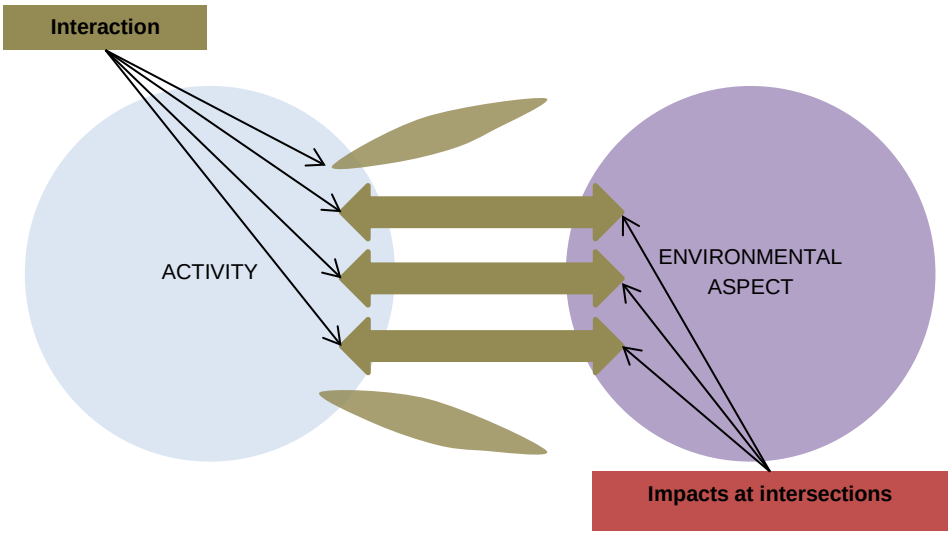

Figure 4-1: Graphical representation of impact assessment concept

The potential impacts were considered through an examination of the project phase and activity, the environmental aspect, the interdependencies between aspects, an assessment

and classification of categories, and consideration of the potential impact on heritage resources. An example of this process is presented in Figure 4-2

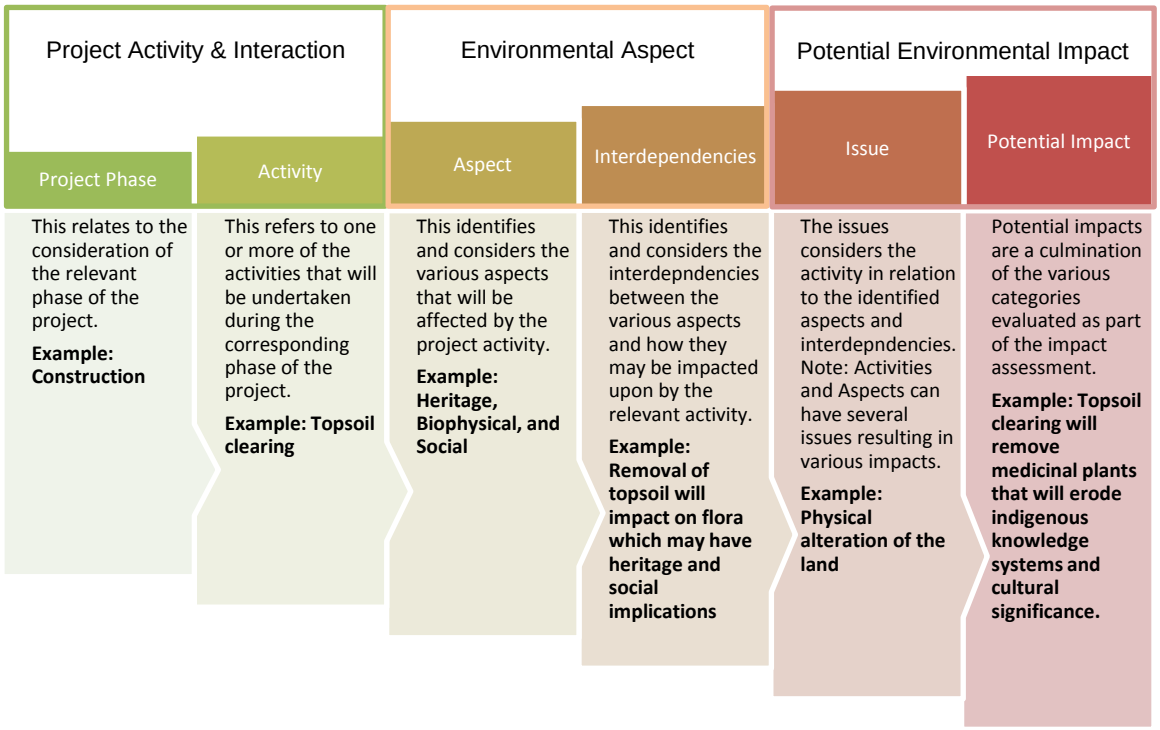

Figure 4-2: Example of how potential impacts were considered

4.1 Defining Heritage Impacts

Different heritage impacts may manifest in different geographical areas and diverse communities. For instance, heritage impacts can simultaneously affect the physical resource and have social repercussions: this is compounded when the intensity of physical impacts and social repercussions differ significantly. In addition, heritage impacts can influence the cultural significance of heritage resources without any actual physical impact on the resources taking place. Heritage impacts can, therefore, generally be placed into three broad categories (adapted from Winter & Bauman 2005: 36):

- **Direct or primary heritage impacts** affect the fabric or physical integrity of the heritage resource, for example destruction of an archaeological site or historical building. Direct or primary impacts may be the most immediate and noticeable. Such impacts are usually ranked as the most intense, but can often be erroneously assessed as high-ranking.
- **Indirect, induced or secondary heritage impacts** can occur later in time or at a different place from the causal activity, or as a result of a complex pathway. For example, restricted access to a heritage resource resulting in the gradual erosion of its cultural significance that may be dependent on ritual patterns of access. Although

the physical fabric of the resource is not affected through any primary impact, its significance is affected that can ultimately result in the loss of the resource itself.

- **Cumulative heritage impacts** result from in-combination effects on heritage resources acting within a host of processes that are insignificant when seen in isolation, but which collectively have a significant effect. Cumulative effects can be:
  - **Additive**: the simple sum of all the effects, e.g. the total number of development activities that will occur within the study area.
  - **Synergistic**: effects interact to produce a total effect greater than the sum of the individual effects, e.g. the effect of each different activity on the archaeological landscape in the study area.
  - **Time crowding**: frequent, repetitive impacts on a particular resource at the same time, e.g. the effect of regular blasting activities on a nearby rock art site or protected historical building high.
  - **Neutralizing**: where the effects may counteract each other to reduce the overall effect, e.g. the effect of changes in land use could reduce the overall impact on sites within the archaeological landscape of the study area.
  - **Space crowding**: high spatial density of impacts on a heritage resource, e.g. density of new buildings resulting in suburbanisation of a historical rural landscape.

The relevance of the distinction to defining the study areas arises from the fact that heritage resources do not exist in isolation to the wider natural, social, cultural and heritage landscape: cultural significance is therefore also linked to rarity / uniqueness, physical integrity and importance to diverse communities.

In addition, the NHRA requires that heritage resources are graded 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.

4.2 Impact Assessment

The impact rating process is designed to provide a numerical rating of the identified heritage impacts. The significance rating follows an established impact/risk assessment formula is shown in Box 5.

The weight assigned to the various parameters for positive and negative impacts in the formula is presented in Table 4-2 below.

Project-related impacts on heritage resources have taken into account the inherent value of heritage resources, described above, and only applied to resources with values above negligible. As a result, the impact assessment did not consider individual resources, but was applied to diverse resources grouped in terms of similar values.

The magnitude was then applied to pre- and post-mitigation scenarios with the intention of removing all impacts on heritage resources. Where project related mitigation will not avoid or sufficiently reduce negative changes/impacts on heritage resources with high values, mitigation of these resources may be required. This may include alteration, restoration or demolition of structures under a permit issued by the HRAs.

Significance = consequence of an event x probability of the event occurring

where:

Consequence = type of impact x (Intensity + Spatial Scale + Duration)

and

Probability = Likelihood of an impact occurring

In the formula for calculating consequence:

Type of impact = +1 (positive**) or -1 (**negative**)**

Box 5: Impact assessment formula

Impacts were rated prior to mitigation and again after consideration of the proposed mitigation measures. Impacts were then categories into one of eight categories listed in Table 4-2. The relationship between the consequence, probability and significance ratings is also graphically depicted in Table 4-2.

Table 4-1: Description of duration, extent, intensity and probability ratings used in impact assessment

Value	DURATION RATING - A measure of the lifespan of the impact		EXTENT RATING A measure of how wide the impact would occur		INTENSITY RATING- A measure of the degree of harm, injury or loss.		PROBABILITY RATING - A measure of the chance that consequences of that selected level of severity could occur during the exposure window.	
	Probability	Description	Exposure	Description	Intensity	Description	Probability	Description
7	**Permanent**	Impact will permanently alter or change the heritage resource and/or value (Complete loss of information)	**International**	Impacts on heritage resources will have international repercussions, issues or effects, i.e. in context of international cultural significance, legislation, associations, etc.	**Extremely high**	Major change to Heritage Resource with High-Very High Value	**Certain/Definite**	Happens frequently. The impact will occur regardless of the implementation of any preventative or corrective actions.
6	**Beyond Project Life**	Impact will reduce over time after project life (Mainly renewable resources and indirect impacts)	**National**	Impacts on heritage resources will have national repercussions, issues or effects, i.e. in context of national cultural significance, legislation, associations, etc.	**Very high**	Moderate change to Heritage Resource with High-Very High Value	**High probability**	Happens often. It is most likely that the impact will occur.
5	**Project Life**	The impact will cease after project life.	**Region**	Impacts on heritage resources will have provincial repercussions, issues or effects, i.e. in context of provincial cultural significance, legislation, associations, etc.	**High**	Minor change to Heritage Resource with High-Very High Value	**Likely**	Could easily happen. The impact may occur.
4	**Long Term**	Impact will remain for >50% - Project Life	**Municipal area**	Impacts on heritage resources will have regional repercussions, issues or effects, i.e. in context of the regional study area.	**Moderately high**	Major change to Heritage Resource with Medium-Medium High Value	**Probable**	Could happen. Has occurred here or elsewhere
3	**Medium Term**	Impact will remain for >10% - 50% of Project Life	**Local**	Impacts on heritage resources will have local repercussions, issues or effects, i.e. in context of the local study area.	**Moderate**	Moderate change to Heritage Resource with Medium - Medium High Value	**Unlikely / Low probability**	Has not happened yet, but could happen once in a lifetime of the project. There is a possibility that the impact will occur.
2	**Short Term**	Impact will remain for <10% of Project Life	**Limited**	Impacts on heritage resources will have site specific repercussions, issues or effects, i.e. in context of the site specific study area.	**Low**	Minor change to Heritage Resource with Medium - Medium High Value	**Rare / Improbable**	Conceivable, but only in extreme circumstances. Have not happened during the lifetime of the project, but has happened elsewhere. The possibility of the impact materialising is very low as a result of design, historic experience or implementation of adequate mitigation measures
1	**Transient**	Impact may be sporadic/limited duration and can occur at any time. E.g. Only during specific times of operation, and not affecting heritage value.	**Very Limited**	Impacts on heritage resources will be limited to the identified resource and its immediate surroundings, i.e. in context of the specific heritage site.	**Very low**	No change to Heritage Resource with values medium or higher, or Any change to Heritage Resource with Low Value	**Highly Unlikely /None**	Expected never to happen. Impact will not occur.

Table 4-2: Impact significance ratings, categories and relationship between consequence, probability and significance

Score	Description	Rating
109 to 147	A very beneficial impact which may be sufficient by itself to justify implementation of the project. The impact may result in permanent positive change.	Major (positive)
73 to 108	A beneficial impact which may help to justify the implementation of the project. These impacts would be considered by society as constituting a major and usually a long-term positive change to the heritage resources.	Moderate (positive)
36 to 72	An important positive impact. The impact is insufficient by itself to justify the implementation of the project. These impacts will usually result in positive medium to long-term effect on the heritage resources.	Minor (positive)
3 to 35	A small positive impact. The impact will result in medium to short term effects on the heritage resources.	Negligible (positive)
-3 to -35	An acceptable negative impact for which mitigation is desirable but not essential. The impact by itself is insufficient even in combination with other low impacts to prevent the development being approved. These impacts will result in negative medium to short term effects on the heritage resources.	Negligible (negative)
-36 to -72	An important negative impact which requires mitigation. The impact is insufficient by itself to prevent the implementation of the project but which in conjunction with other impacts may prevent its implementation. These impacts will usually result in negative medium to long-term effect on the heritage resources.	Minor (negative)
-73 to -108	A serious negative impact which may prevent the implementation of the project. These impacts would be considered by society as constituting a major and usually a long-term change to the heritage resources and result in severe effects.	Moderate (negative)
-109 to -147	A very serious negative impact which may be sufficient by itself to prevent implementation of the project. The impact may result in permanent change. Very often these impacts are immitigable and usually result in very severe effects.	Major (negative)

Relationship between consequence, probability and significance ratings

Probability \ Significance	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
7	-147	-140	-133	-126	-119	-112	-105	-98	-91	-84	-77	-70	-63	-56	-49	-42	-35	-28	-21	21	28	35	42	49	56	63	70	77	84	91	98	105	112	119	126	133	140	147
6	-126	-120	-114	-108	-102	-96	-90	-84	-78	-72	-66	-60	-54	-48	-42	-36	-30	-24	-18	18	24	30	36	42	48	54	60	66	72	78	84	90	96	102	108	114	120	126
5	-105	-100	-95	-90	-85	-80	-75	-70	-65	-60	-55	-50	-45	-40	-35	-30	-25	-20	-15	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	105
4	-84	-80	-76	-72	-68	-64	-60	-56	-52	-48	-44	-40	-36	-32	-28	-24	-20	-16	-12	12	16	20	24	28	32	36	40	44	48	52	56	60	64	68	72	76	80	84
3	-63	-60	-57	-54	-51	-48	-45	-42	-39	-36	-33	-30	-27	-24	-21	-18	-15	-12	-9	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60	63
2	-42	-40	-38	-36	-34	-32	-30	-28	-26	-24	-22	-20	-18	-16	-14	-12	-10	-8	-6	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42
1	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21

Consequence

5 Mitigation Measures and Recommendations

The desired outcome of an impact assessment is the removal of negative impacts on heritage resources through the implementation of feasible mitigation measures. The mitigation and management measures recommended in this section comply with the General Principles set out under section 5 of the NHRA. The recommendations further considered the cultural significance of heritage resources and the recommended minimum level of mitigation as published in SAHRA Minimum Standards[2] (See Box 4).

Designation	Recommended mitigation
Negligible	Sufficiently recorded, no mitigation required
Low	Resource must be recorded before destruction, including detailed site mapping, surface sampling may be required
Medium	Mitigation of resource to include detailed recording and mapping, and limited sampling, e.g. STPs.
Medium High	Project design should aim to reduce or remove changes; Mitigation of resource to include extensive sampling and recording, e.g. test excavation, analyses, etc.
High	Project design must aim to avoid change to resource; Partly conserved, Conservation Management Plan (CMP)
Very High	Project design must change to avoid all change to resource; Conserved in entirety, CMP

Box 4: Recommended minimum level of required mitigation

Recommended mitigation is therefore divided into two categories: *project related* and *mitigation of heritage resources* defined below.

- Project-related mitigation requires changes or amendments to project design, planning and siting of infrastructure to avoid or reduce physical impacts on heritage resources. Project-related mitigation measures are always the preferred option, especially where heritage resources with higher cultural significance will be impacted on. Project-related mitigation may include:
  - In situ preservation (i.e. no-development) of heritage resources for which Conservation Management Plans (CMPs) are required; and
  - Conservation of heritage resources through, for example, incorporating the resources into project design and planning, for which CMPs are also required.
- Mitigation of heritage resources may be necessary where project-related mitigation will not sufficiently conserve or preserve heritage resources, thus resulting in partial or complete changes (including destruction) to a resource. Such resources need to be mitigated to ensure that they are fully recorded, documented and researched before any negative change occurs. This may require mitigation such as:
  - Intensive detailed recording of sites through various non-intrusive techniques to create a documentary record of the site – “preservation by record”;

[2] It must be noted that these minimum standards serve as a guide, and the recommendations provided in this HIA are project specific.

- Intrusive recording and sampling such as shovel test pits (STPs) and excavations, relocation (usually burial grounds and graves, but certain types of sites may be relocated), restoration and alteration. Any form of intrusive mitigation is a regulated permitted activity for which permits need to be issued by the relevant heritage authorities. Such mitigation may result in a reassessment of the value of a resource that could require conservation measures to be implemented. Alternatively, an application for a destruction permit may be made if the resource has been sufficiently sampled; and
- Where resources have negligible significance the specialist may recommend that no further mitigation is required and the site may be destroyed, for which a destruction permit must be applied for.

Appropriate mitigation measures were identified for each impact, and the procedure discussed above was to assess the possible consequence, probability and significance of each impact post-mitigation.

The post-mitigation rating provided an indication of the significance of residual impacts, while the difference between an impact's pre- and post-mitigation ratings represents the degree to which the recommended mitigation measures are expected to be effective in reducing or ameliorating that impact.