

HERITAGE IMPACT ASSESSMENT REPORT

HERITAGE IMPACT ASSESSMENT (HIA) REPORT FOR THE PROPOSED
REALIGNMENT OF THE RAILWAY LINE AT THE PROPOSED 37 OPEN PIT,
AMANDELBULT MINE,
LIMPOPO PROVINCE

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***Disclaimer:** This report is a first phase heritage investigation into the heritage sensitivity of the area demarcated for the project. The report is meant to be a guide for further fieldwork and is not meant to be totally encompassing. Information is derived solely from published works.*

Statement of Independence

As the duly appointed representative of G&A Heritage, I Stephan Gaigher, hereby confirm my independence as a specialist and declare that neither I nor G&A Heritage have any interests, be it business or otherwise, in any proposed activity, application or appeal in respect of which the Environmental Consultant was appointed as Environmental Assessment Practitioner, other than fair remuneration for work performed on this project.

SIGNED OFF BY: STEPHAN GAIGHER



EXECUTIVE SUMMARY

Site name and location: Amandelbult 37 Open Pit Railway Re-alignment

Developer: Anglo Platinum Ltd

Consultant: G&A Heritage, PO Box 522, Louis Trichardt, 0920, South Africa.
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Date of Report: 21 November 2016

The purpose of the management summary is to distil the information contained in the report into a format that can be used to give specific results quickly and facilitate management decisions. It is not the purpose of the management summary to repeat in shortened format all the information contained in the report, but rather to give a statement of results for decision making purposes.

This study encompasses the heritage impact investigation. A preliminary layout has been supplied to lead this phase of this study.

This study focuses on the proposed re-alignment of the railway line at the proposed 37 Open Pit at Amandelbult Mine. The line will be moved closer to the existing haulage road and lengthened by 52m.

Scope of Work

A Heritage Impact Assessment determine the impacts on heritage resources within the study areas through:

- A desk-top investigation of the area;
- Review of the available archaeological and historical literature covering the area, as well as previous cultural resource management studies in the area;
- Review of the SAHRIS database of heritage sites;
- A site visit to the proposed development site;
- Identification of possible archaeological, cultural, historic, built and palaeontological sites within the proposed development area;
- Evaluation of the potential impacts of construction and operation of the proposed development on archaeological, cultural, historical resources; built and palaeontological resources; and
- Recommending mitigation measures to ameliorate any negative impacts on areas of archaeological, cultural, historical, built and palaeontological importance.

The purpose of this study is to determine the possible occurrence of sites with cultural heritage significance within the study area. The study is based on archival work and document review, combined with fieldwork investigations.

Findings

No sites of heritage significance were identified on site.

Fatal Flaws

No fatal flaws were identified.

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HERITAGE IMPACT ASSESSMENT

HERITAGE IMPACT ASSESSMENT FOR THE PROPOSED 37 OPEN PIT AMANDELBULT MINE RAILWAY LINE

INTRODUCTION

LEGISLATION AND HISTORY OF ARCHAEOLOGICAL RESEARCH

In South Africa, cultural heritage is protected under the *National Heritage Resources Act, 1999 (NHRA), Act no 25 of 1999.*

Section 38(1) of the NHRA requires that a heritage study is undertaken for:

- (a) Construction of a road, wall, power line, pipeline, canal or other similar form of linear development or barrier exceeding 300 m in length;
- (b) Construction of a bridge or similar structure exceeding 50 m in length; and
- (c) Any development, or other activity which will change the character of an area of land, or water –
 - (1) Exceeding 10 000 m² in extent;
 - (2) Involving three or more existing erven or subdivisions thereof; or
 - (3) Involving three or more erven, or subdivisions thereof, which have been consolidated within the past five years; or
 - (d) The costs of which will exceed a sum set in terms of regulations; or
 - (e) Any other category of development provided for in regulations.

While the above describes the parameters of developments that fall under this Act, Section 38 (8) of the NHRA is applicable to this development. This section states that;

- (8) *The provisions of this section do not apply to a development as described in subsection (1) if an evaluation of the impact of such development on heritage resources is required in terms of the Environment Conservation Act, 1989 (Act 73 of 1989), or the integrated environmental management guidelines issued by the Department of Environment Affairs and Tourism, or the Minerals Act, 1991 (Act 50 of 1991), or any other legislation: Provided that the consenting authority must ensure that the evaluation fulfils the requirements of the relevant heritage resources authority in terms of subsection (3), and any comments and recommendations of the relevant heritage resources authority with regard to such development have been taken into account prior to the granting of the consent.*

In regards to a development such as this that falls under Section 38 (8) of the NHRA, the requirements of Section 38 (3) applies to the subsequent reporting, stating that;

- (3) *The responsible heritage resources authority must specify the information to be provided in a report required in terms of subsection (2) (a): Provided that the following must be included:*
 - (a) *The identification and mapping of all heritage resources in the area affected;*
 - (b) *An assessment of the significance of such resources in terms of the heritage assessment criteria set out in section 6 (2) or prescribed under section 7;*
 - (c) *An assessment of the impact of the development on such heritage resources;*
 - (d) *An evaluation of the impact of the development on heritage resources relative to the sustainable social and economic benefits to be derived from the development;*

- (e) The results of consultation with communities affected by the proposed development and other interested parties regarding the impact of the development on heritage resources;*
- (f) If heritage resources will be adversely affected by the proposed development, the consideration of alternatives; and*
- (g) Plans for mitigation of any adverse effects during and after the completion of the proposed development.*
 - (1) Ancestral graves,
 - (2) Royal graves and graves of traditional leaders,
 - (3) Graves of victims of conflict i.e. graves of important individuals,
 - (4) Historical graves and cemeteries older than 60 years, and
 - (5) Other human remains which are not covered under the Human Tissues Act, 1983 (Act No.65 of 1983 as amended);
- (h) Movable objects, including:
 - (1) Objects recovered from the soil or waters of South Africa including archaeological and paleontological objects and material, meteorites and rare geological specimens;
 - (2) Ethnographic art and objects;
 - (3) Military objects;
 - (4) Objects of decorative art;
 - (5) Objects of fine art;
 - (6) Objects of scientific or technological interest;
 - (7) Books, records, documents, photographic positives and negatives, graphic, film or video material or sound recordings; and
 - (8) Any other prescribed categories, but excluding any object made by a living person;
- (i) Battlefields;
- (j) Traditional building techniques.

A **'place'** is defined as:

- (a) A site, area or region;
- (b) A building or other structure (which may include equipment, furniture, fittings and articles associated with or connected with such building or other structure);
- (c) A group of buildings or other structures (which may include equipment, furniture, fittings and articles associated with or connected with such group of buildings or other structures); and (d) an open space, including a public square, street or park; and in relation to the management of a place, includes the immediate surroundings of a place.

'Structures' means any building, works, device, or other facility made by people and which is fixed to land and any fixtures, fittings and equipment associated therewith older than 60 years.

'Archaeological' means:

- (a) Material remains resulting from human activity which are in a state of disuse and are in or on land and are older than 100 years, including artefacts, human and hominid remains and artificial features and structures;
- (b) Rock art, being a form of painting, engraving or other graphic representation on a fixed rock surface or loose rock or stone, which was executed by human agency and is older than 100 years including any area within 10 m of such representation; and
- (c) Wrecks, being any vessel or aircraft, or any part thereof, which was wrecked in South Africa, whether on land or in the maritime cultural zone referred to in section 5 of the Maritime Zones Act 1994 (Act 15 of 1994), and any cargo, debris or artefacts found or associated therewith, which are older than 60 years or which in terms of national legislation are considered to be worthy of conservation;
- (d) Features, structures and artefacts associated with military history which are older than 75 years and the sites on which they are found.

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

'Grave' means a place of interment and includes the contents, headstone or other marker of and any

other structures on or associated with such place. The South African Heritage Resources Agency (SAHRA) will only issue a permit for the alteration of a grave if it is satisfied that every reasonable effort has been made to contact and obtain permission from the families concerned.

The removal of graves is subject to the following procedures as outlined by the SAHRA:

- Notification of the impending removals (using English, Afrikaans and local language media and notices at the grave site);
- Consultation with individuals or communities related or known to the deceased;
- Satisfactory arrangements for the curation of human remains and / or headstones in a museum, where applicable;
- Procurement of a permit from the SAHRA;
- Appropriate arrangements for the exhumation (preferably by a suitably trained archaeologist) and re-interment (sometimes by a registered undertaker, in a formally proclaimed cemetery);
- Observation of rituals or ceremonies required by the families.

The limitations and assumptions associated with this heritage impact assessment are as follows;

- Field investigations were performed on foot and by vehicle where access was readily available.
- The site was evaluated by means of description of the cultural landscape, direct observations and analysis of written sources and available databases.
- It was assumed that the site layout as provided by Aurecon is accurate.
- We assumed that the public participation process performed as part of the EIA process was sufficiently encompassing not to be repeated in the Heritage Assessment.

Table 1. Impacts on the NHRA Sections

Act	Section	Description	Possible Impact	Action
National Heritage Resources Act (NHRA)	34	Preservation of buildings older than 60 years	No impact	None
	35	Archaeological, paleontological and meteor sites	No impact	None
	36	Graves and burial sites	No impact	None
	37	Protection of public monuments	No impact	None
	38	Does activity trigger a HIA?	Yes	HIA

Table 2. NHRA Triggers

Action Trigger	Yes/No	Description
Construction of a road, wall, power line, pipeline, canal or other linear form of development or barrier exceeding 300m in length.	Yes	Railway Line
Construction of a bridge or similar structure exceeding 50m in length.	No	N/A
Development exceeding 5000 m ²	No	N/A
Development involving more than 3 erven or sub divisions	No	N/A
Development involving more than 3 erven or sub divisions that have been consolidated in the past 5 years	No	N/A
Re-zoning of site exceeding 10 000 m ²	No	N/A
Any other development category, public open space, squares, parks or recreational grounds	No	N/A

BACKGROUND INFORMATION

PROPOSED AMANDELBULT RAILWAY RE-ALIGNMENT PROJECT DESCRIPTION

Anglo Platinum Ltd proposed the re-alignment of 900m of railway line parallel to the haulage road on the farm Middellaagte 382KQ and Elandskuil 378, so as to allow the mining of the proposed 37 Open Pit. The line will be lengthened by 52m, but the relocated portion of the railway line will be between 900 and 1000m in length.



Figure 1. Re-alignment with red showing the existing line and yellow showing the proposed new line

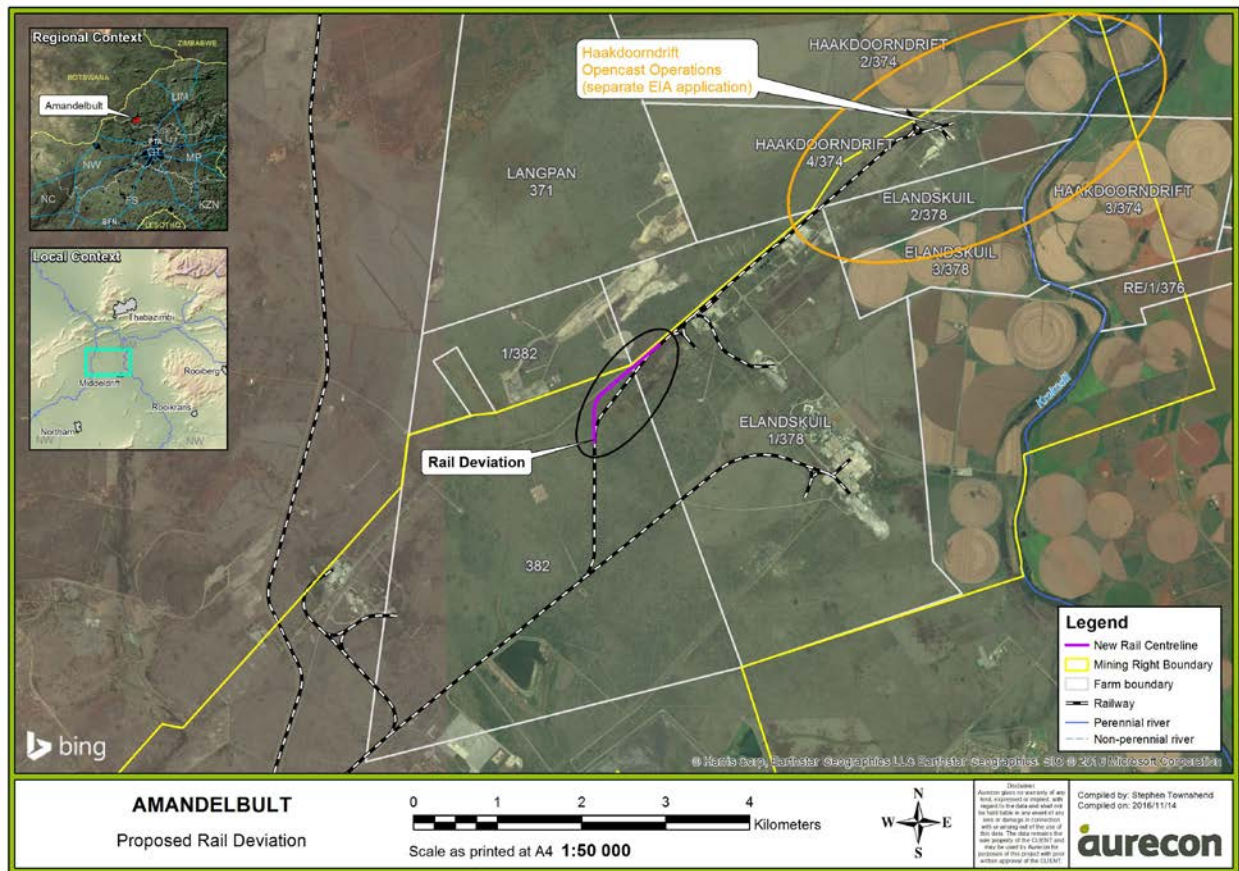


Figure 2. Location of the proposed rail deviation at Amandelbult Mine

HERITAGE INDICATORS WITHIN THE RECEIVING ENVIRONMENT

REGIONAL CULTURAL CONTEXT

PALEONTOLOGY

The rocks of the Bushveld Igneous Complex are non-fossiliferous and are of no palaeontological concern. No fossils have been reported from the study area and the probability of fossils occurring in the Tertiary to Quaternary aeolian sand and soils in the study area is very low. These sediments are correlated with the Kalahari Group sediments. The fossils reported from Kalahari Group sediments are very sparse, occur sporadically and are low in diversity. Although no fossils have been reported for the study area, fossils such as root casts, burrows, termitaria, ostrich egg shells, mollusc shells and isolated bones have been discovered in the Kalahari Group elsewhere (Almond & Pether 2008).

STONE AGE

During the Middle Stone Age, 200 000 years ago, modern man or Homo sapiens emerged, manufacturing a wider range of tools, with technologies more advanced than those from earlier periods. This enabled skilled hunter-gatherer bands to adapt to different environments. From this time onwards, rock shelters and caves were used for occupation and reoccupation over very long periods of time (Mitchell 2002). Two Middle Stone Age sites at the Withoek Spruit were researched 17 years ago, but no information on this discovery has been published.

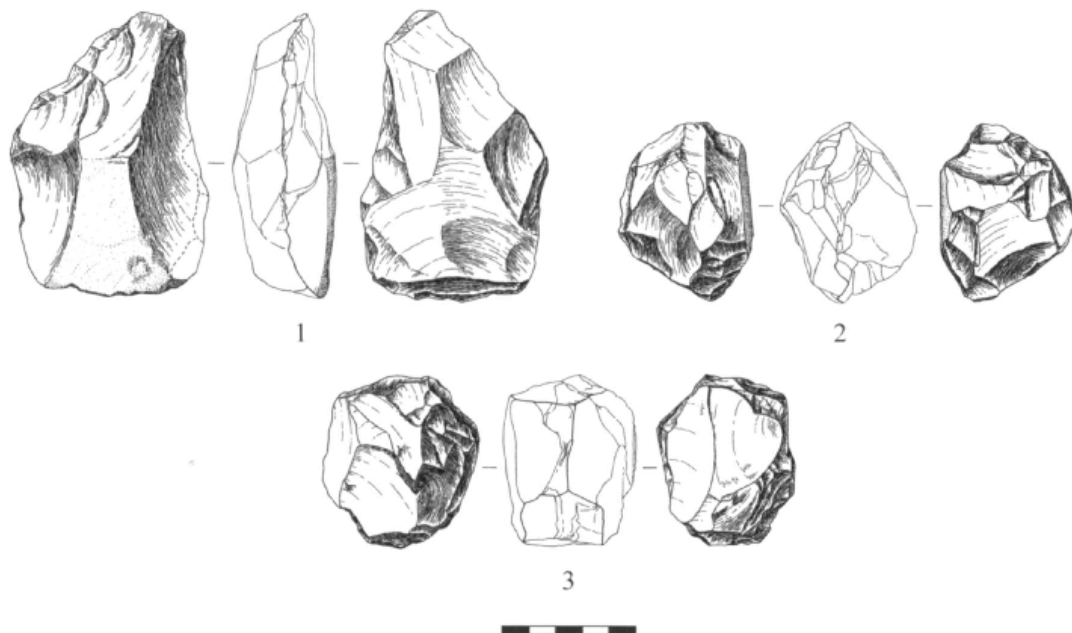


Figure 3. (1) handaxe on flake; (2) thick discoidal core; (3) polyhedral core (Pollarolo, Kuman, Bruxelles, 2010)

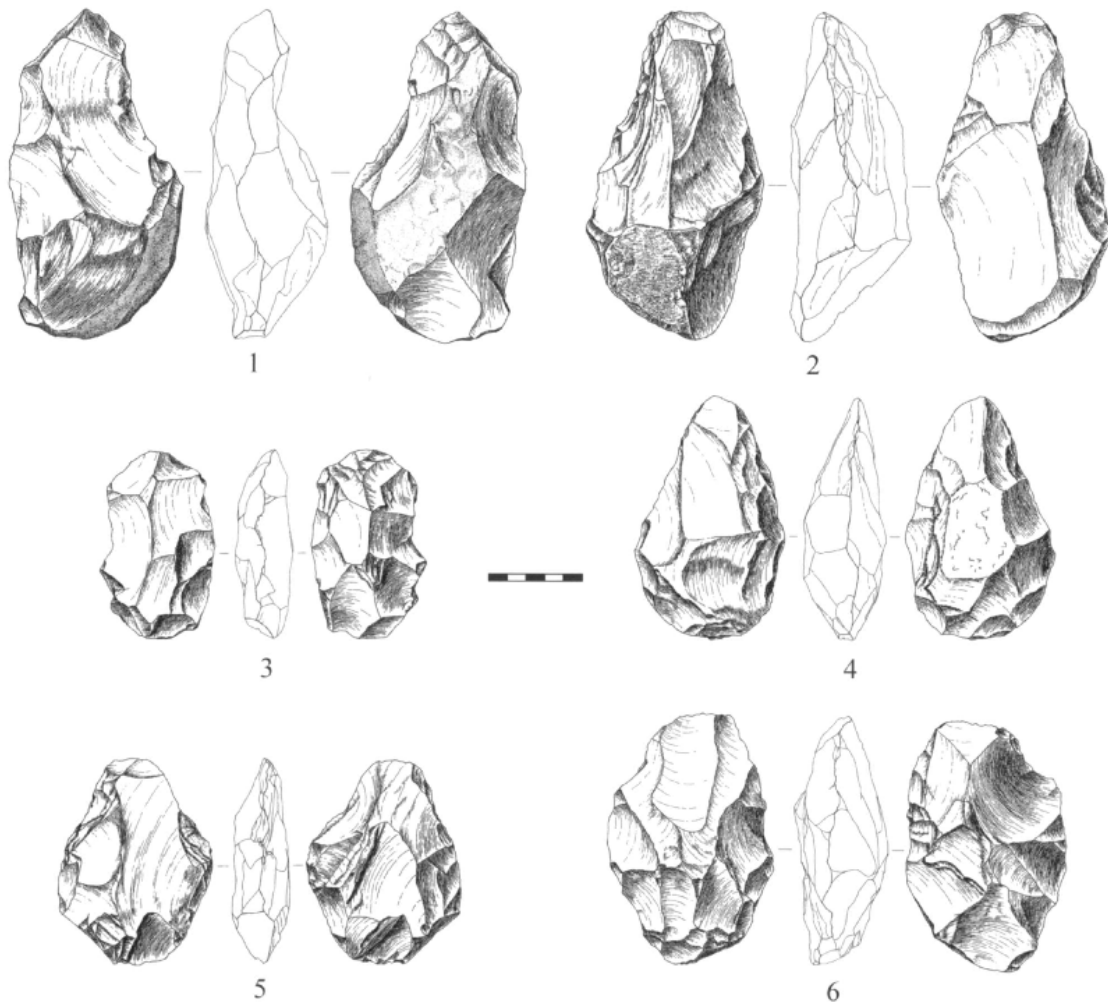


Figure 4. (1,2) Handaxes with large side removal; (3-6) handaxes (Pollarolo, Susino, Kuman, Bruxelles, 2010)

The Late Stone Age, considered to have started some 20 000 years ago, is associated with the predecessors of the San and Khoi Khoi. San hunter-gatherer bands with their small (microlithic) stone tools may have lived in Eastern Gauteng, as a magnificent engraving site near Duncanville attests to their presence in Vereeniging, south of, but close to Ekurhuleni. Stone Age hunter-gatherers lived well into the 19th century in some places in SA, but may not have been present when the first European colonists crossed the Vaal River during the early part of the 19th century. Stone Age sites may occur all over the area where an unknown number may have been obliterated by mining activities, urbanization, industrialization, agriculture and other development activities during the past decades (Morris 2004).

IRON AGE

This area is located in a region where both components of the Iron Age (both Early and Late) are found, although the Late Iron Age (LIA) is far more common. During the later stages of the 18th and 19th centuries the Bakwena were living in megalithic sites such as Boitsimogale and Kaditshwene in the Bankeveld. The 18th and 19th centuries constituted an era of momentous change in the South African interior. The era was characterised, among other things, by the emergence and decline of large African polities, colonial expansion, the forging of new identities and the disappearance of others, as well as significant population movements, such as witnessed during the difaqane and the Great Trek. This period also saw the introduction of new cultigens, materials and technologies, including the gradual adoption of writing as a primary archive. It was during this formative period that the area beyond the Orange and Vaal Rivers became inextricably woven into the fabric of a broader South African society as the thrust of colonial advance reached deep into the interior. The whole region south of the Limpopo River became

part of an embryonic but irreversibly globalised world that had started to emerge a few centuries earlier in the wake of European colonisation and expansion (Boeyens, 2011).

Tlokwa oral traditions recalls that a chiefly branch of this Tswana cluster had shifted their capital to a large plain close to the Pilwe Hills towards the end of the 18th century. Oral records associated the capital site, known as Marothodi, with the historical farm Bultfontein 204 JP, (close to Pilansberg in the Groot Marico) onto which a small section of the stone walling extends (Ellenberger 1939: 172-173, 1940:223; Schapera 1938: xii, 308).



Figure 5. Aerial view of Marothodi

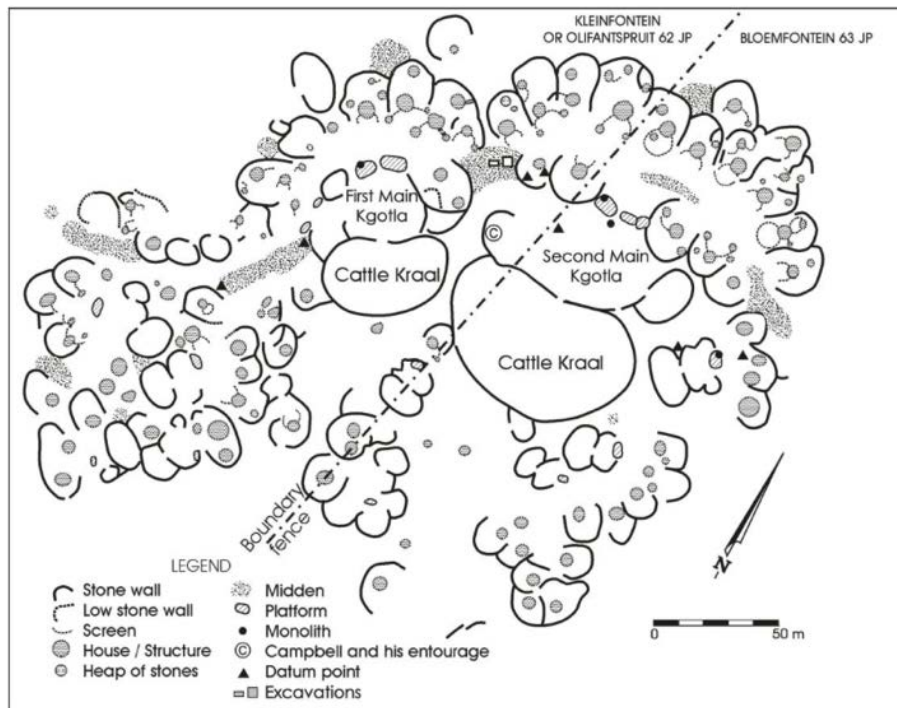


Figure 6. Kaditshwene

THE HISTORIC ERA

The historic era is dominated by the conflict between Mzilikazi and the tribes living in the area. Mzilikazi established temporary settlements near present-day Rustenburg, then launched into action against the baKwena. After falling on the Kwena at Silkaatsnek, the Matabele turned on the Po, who were easily overwhelmed. Kgatla Chief Pilane fled to the hills that now bear his name. Mzilikazi ruthlessly massacred the remaining Tswana groups in the area. Using the Magaliesberg as his centre, Mzilikazi expanded his kingdom, which by then stretched from the Vaal River in the south to the confluence of the Crocodile and Limpopo Rivers.

The first white farmers settled in this part of the country after 1841. The district of Waterberg was established in 1866. This indicates that there must have been enough people to make the establishment of a district a viable option.

Thabazimbi ("*Mountain of Iron*") was named for the exceptionally lucrative iron ore that is found in the vicinity. The iron ore was discovered in 1919 by J.H. Williams. The railway from Rustenburg reached the area in the 1930s and full scale iron and steel production began. The Thabazimbi mine has been in operation since 1931 and uses conventional opencast methods. Thabazimbi was proclaimed in 1953.

In the last decade, Thabazimbi was developed into an ecotourism hub, with its large variety of wildlife, birds and hiking trails. Marakele National Park is situated 15km north of the town.

In a 2004 article in the Mining Weekly it was stated that Amandelbult is Anglo Platinum's largest contributor and the second largest platinum mine in the world. A series of shafts has been sunk at the mine since 1973. The mine was temporarily closed from 1973 to 1976, but since has continued to increase production, and in October 2002 produced 2 tons of platinum in a month.

The Amandelbult East Upper UG2 Project conventionally mines the UG2 reef, using existing mining infrastructure previously employed to extract the Merensky reef, at the vertical number 2 shaft and at three decline shafts at 44 East, 50 East and 62 East. The recently completed 75 000 tons per month UG2 concentrator was expanded to 210 000 tons per month and by 2012, the Project contributed an additional 100 000 ounces of refined platinum per annum to Amandelbult's production.

Sources:

<http://www.sahistory.org.za/people/king-mzilikazi>

<http://www.limpopohappenings.co.za/thabazimbihomepage.htm>

Mining Weekly, 21 May 2004, Andrew Lanham

<http://www.angloamericanplatinum.com/media/press-releases/archive/2006/12-12-2006.aspx>

CULTURAL LANDSCAPE

The cultural landscape in the study area is mostly agricultural and associated mining activities and the specific sites are severely altered, making it impossible to comment on the possible existence of sub-surface sites.



Figure 7. Proposed development area



Figure 8. Current railway alignment



Figure 9. High pressure air line on the site



Figure 10. Current railway embankment on the site

Historic Landscape Type	Description	Occurrence possible?
1 Paleontological	Mostly fossil remains. Remains include microbial fossils such as found in Barberton Greenstones	No
3 Historic Built Environment	<ul style="list-style-type: none"> - Historical townscapes/streetscapes - Historical structures; i.e. older than 60 years - Formal public spaces - Formally declared urban conservation areas - Places associated with social identity/displacement 	No
4 Historic Farmland	<p>These possess distinctive patterns of settlement and historical features such as:</p> <ul style="list-style-type: none"> - Historical farm yards - Historical farm workers villages/settlements - Irrigation furrows - Tree alignments and groupings - Historical routes and pathways - Distinctive types of planting - Distinctive architecture of cultivation e.g. planting blocks, trellising, terracing, ornamental planting. 	No
5 Historic rural town	<ul style="list-style-type: none"> - Historic mission settlements - Historic townscapes 	No
6 Pristine natural landscape	<ul style="list-style-type: none"> - Historical patterns of access to a natural amenity - Formally proclaimed nature reserves 	No

	<ul style="list-style-type: none"> - Evidence of pre-colonial occupation - Scenic resources, e.g. view corridors, viewing sites, visual edges, visual linkages - Historical structures/settlements older than 60 years - Pre-colonial or historical burial sites - Geological sites of cultural significance. 	
7 Relic Landscape	<ul style="list-style-type: none"> - Past farming settlements - Past industrial sites - Places of isolation related to attitudes to medical treatment - Battle sites - Sites of displacement, 	No
8 Burial grounds and grave sites	<ul style="list-style-type: none"> - Pre-colonial burials (marked or unmarked, known or unknown) - Historical graves (marked or unmarked, known or unknown) - Graves of victims of conflict - Human remains (older than 100 years) - Associated burial goods (older than 100 years) - Burial architecture (older than 60 years) 	Yes
9 Associated Landscapes	<ul style="list-style-type: none"> - Sites associated with living heritage e.g. initiation sites, harvesting of natural resources for traditional medicinal purposes - Sites associated with displacement & contestation - Sites of political conflict/struggle - Sites associated with an historic event/person - Sites associated with public memory 	No
10 Historical Farmyard	<ul style="list-style-type: none"> - Setting of the yard and its context - Composition of structures - Historical/architectural value of individual structures - Tree alignments - Views to and from - Axial relationships - System of enclosure, e.g. defining walls - Systems of water reticulation and irrigation, e.g. furrows - Sites associated with slavery and farm labour - Colonial period archaeology 	No
11 Historic institutions	<ul style="list-style-type: none"> - Historical prisons - Hospital sites - Historical school/reformatory sites - Military bases 	No
12 Scenic visual	<ul style="list-style-type: none"> - Scenic routes 	No
13 Amenity landscape	<ul style="list-style-type: none"> - View sheds - View points - Views to and from - Gateway conditions - Distinctive representative landscape conditions - Scenic corridors 	No

PREVIOUS STUDIES

Extensive research into the SAHRIS database resulted in the identification of the following heritage studies that have been performed over the last decade in the study area.

- Van Schalkwyk, J. 2010. Survey of Heritage Resources in the Location of the Proposed Merensky Mining Project, Amandelbult Section, Rustenburg Platinum Mine, Limpopo Province.
- Van der Walt, J. 2014. Archaeological Impact Assessment for the Proposed Zwartkop Industrial Development, Amandelbult, Limpopo Province.
- Van der Walt, J. 2009. Archaeological Impact Assessment Chronimet Underground Mine and

- Process Plant, Amandelbult, Limpopo Province.
- Van Schalkwyk, J., Teichert, F., Pelsler, A. 2003. A Survey of Archaeological Sites for the Amandelbult Platinum Mine Seismic Exploration Program.
 - Van Schalkwyk, J. 1994. A Survey of Archaeological and Cultural Historical Resources in the Amandelbult Mining Lease Area.
 - Cairncross, B. 2011. The Thabazimbi Mine Cave, Limpopo Province, South Africa: Assessment of the Cave and its Speleothems.
 - Bamford, M. 2012. Palaeontological Impact Assessment of the Cave Mosterr Adit, Thabazimbi Mountain.
 - Miller, S. 2011. First Phase Cultural Essay for the farms Donkerpoort 448KQ, Randstephne 445KQ and Waterval 443 KQ, Thabazimbi, Limpopo Province.
 - Almond, J.E. 2012. Palaeontological Impact Assessment: Gatkop Cave on Farm Randstephane 415 KQ near Thabazimbi, Limpopo Province.
 - Kruger, N. 2014. Archaeological Impact Assessment (AIA) of a Demarcated Surface Portion on the Farm Grootkuil 409KQ for the Proposed Platinum Photovoltaic Power Plant Development, Thabazimbi Local Municipality, Waterberg District Municipality, Limpopo Province.
 - Fourie, W. 2012. Mostert Tunnel Level Cave (MTC) – Wachteenbietjiesdraai 350 KQ and Kwaggashoek 345 KQ – Heritage Impact Report on proposed mining activities of project Phoenix.
 - Almond, J.E. 2014. Palaeontological Assessment: Combined Desktop and Site Visit Report Proposed Meletse Iron Ore Project on Remaining Extent of the farms Donkerpoort 448KQ and Randstephane 445KQ near Thabazimbi, Waterberg District, Limpopo Province.
 - Pistorius, J.C.C. 2010. A Base Line Heritage Assessment Report for the Eskom's Thabatsipi Substation and 132Kv Power Line project near Amadelbult an Thabazimbi in the Limpopo Province of South Africa.
 - Van Vollenhoven. A. 2013. A Report on a Cultural Heritage Impact Assessment for the Continental Limestone Mine, close to Thabazimbi, Limpopo Province.
 - Miller, S. 2014. 1st Phase Cultural Heritage Impact Assessment for the Farm Donkerpoort 448 KQ Remaining Extent, Randstephne 445 KQ Remaining Extent and Waterval 443 KQ, Thabazimbi, Limpopo Province.
 - Van Schalkwyk, J. 2012. Heritage Impact Assessment for the Proposed new development at the SAPS Verdrag Training Centre, Thabazimbi Region, Limpopo Province.
 - Hutten, M. 2012. Heritage Impact Assessment for the Proposed Development of a Residential Eco Estate on the farm Groothoek 278 KA approximately 15km north-east of Thabazimbi, Limpopo Province.
 - Mapira, N., Van Wyk Rowe, C. 2009. Phase 1 Archaeological Impact Assessment (AIA) for portion 81 of the farm Doornhoek 318 KQ Thabazimbi, Limpopo Province.
 - Huffman, T. 2009. Archaeological Assessment for the Rhino Andalusite Mine, Thabazimbi. A Phase 1 report with Appendix prepared for Rhino Minerals.
 - Pistorius, J.C.C. 2012. A Baseline Heritage Impact Assessment Study for Eskom's proposed new 132Kv Power Line and Substation for the Proposed Simthabi project near Thabazimbi and Rooiberg in the Limpopo Province, South Africa.
 - Van Essen, R. 2008. Heritage Scoping Report (Basic Assessment): Proposed Development on Erf 1802, Northan Extension 6, Thabazimbi Local Municipality, Waterberg District Municipality, Limpopo Province.
 - Van Schalkwyk, J. 2008. Heritage Impact Survey Report for the Proposed Green House Lodge, Madikwe Game Reserve, Thabazimbi Magisterial District, Limpopo Province.
 - Roodt, F. 2006. Heritage Resources Scoping Report: Nooitgedacht Open Cape Archaeological Survey CCT Mine on the Farm Nooitgedacht 22 JQ, Northam: Thabazimbi Municipality.
 - Kusel, U. 2007. Cultural Heritage Resources Impact Assessment of Hanover 341 KQ in the Thabazimbi Area Limpopo Province.
 - Hutten, M. 2012. Heritage Impact Assessment for the Proposed Development of the Kambaku Private School on the Farm Vlakplaats 137 KQ, approximately 15km north of Thabazimbi, Limpopo Province.
 - Kusel, U. 2005. Cultural Heritage Resources Impact Assessment on the Farm Koedoesfontein 324 KQ Thabazimbi.
 - Kusel, U. 2007. Cultural Heritage Resources Impact Assessment on the Farm Hardekoolbult 548 KQ in the Thabazimbi Municipal Area, Limpopo Province.
 - Fourie, W., van der Walt, J. 2007. Sunbird Heritage Impact Assessment Proposed Estate

- Development on Portions of the Farm Doornhoek 318 KQ, Thabazimbi, Limpopo Province.
- Gaigher, S. 2007. Heritage Impact Assessment for the Proposed Thabazimbi Extension 38 Housing Project on the Farm Doornhoek 318 KQ, Limpopo Province.
 - Van der Walt, J. 2006. Portions of the Farm Grootkuil 376 KQ, Thabazimbi, Limpopo Province.
 - Miller, S. 2015. Assessment and comments on the illegal destruction of site 4L on the Waterval 443 KQ, Thabazimbi, Limpopo Province.
 - Fourie, W. 2007. Request for Heritage Assessment: Portion 1, 4, 5, 6, 7 and 19 of the Farm Maroelasfontein 366 KQ, Thabazimbi, Limpopo Province.

FINDINGS

ANALYSIS OF PREVIOUS STUDIES

The only study of any real relevance to this study was the 2006 report by Van Schalkwyk regarding the proposed UG2 Mining Development. The area investigated by Van Schalkwyk was within 400m of the current study area;

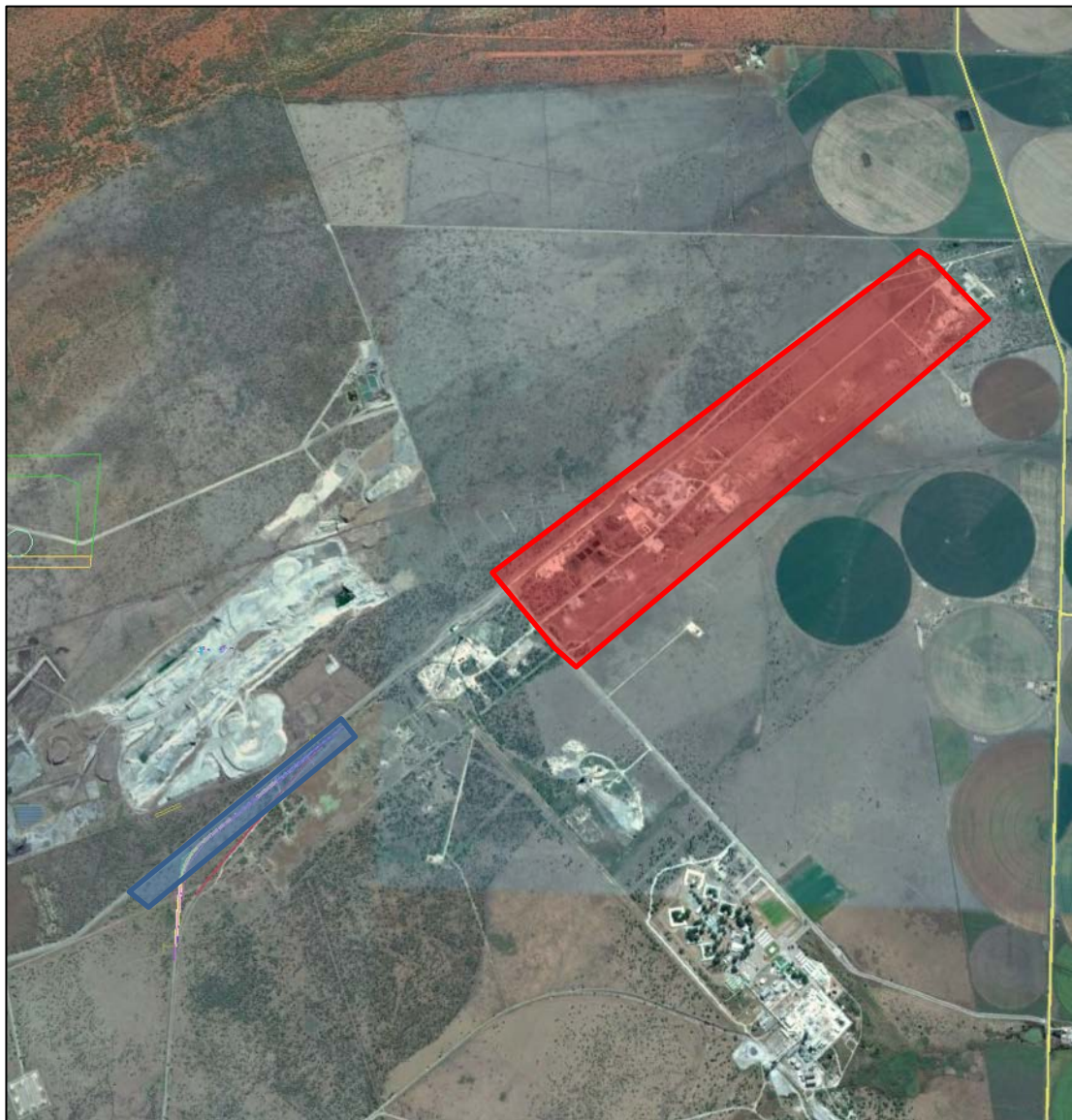


Figure 11. Current study in blue, with Van Schalkwyk's study area in red

Van Schalkwyk's study finds the following: "... Archaeologically speaking, the surveyed area is not an area of high significance, as environmental constraints (such as lack of open water, suitable soil for settling on and lack of stone for building material) forced people, especially during pre-colonial times, to select other areas to live in. Previous mining development, as well as prior agricultural activities had an impact on the area and would have had a negative effect on any heritage resources that might have occurred here in the past..."

This corroborates the findings of the current study.

HISTORIC MAPS

Only two versions of the Surveyor General's 1:50 000 topographic map sets could be found during the archival study. These are the 1980 and 2005 sets.

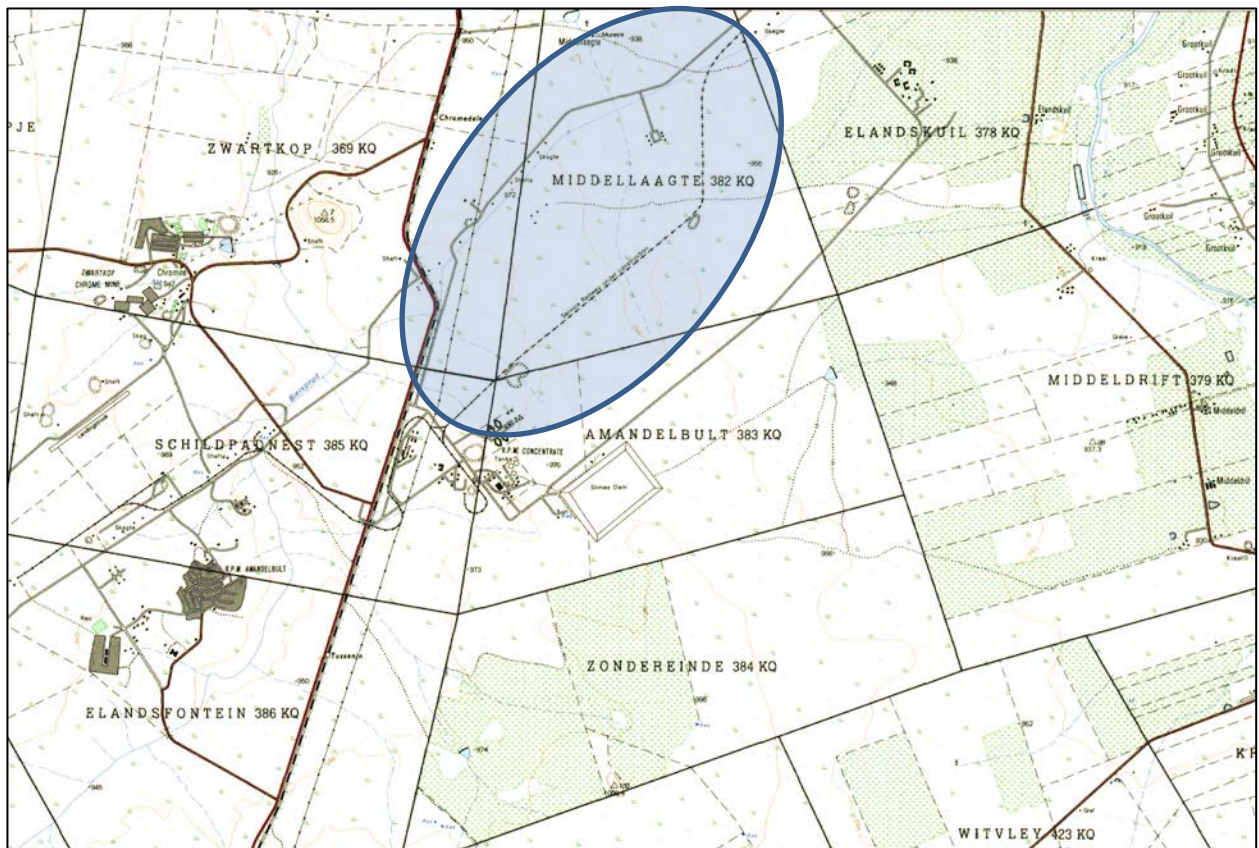


Figure 12. 1980 Topographic map 2427 CD

The 1980s map shows that the railway line in question was being constructed during this phase. This means that the railway line itself is not old enough to be protected under the NHRA and, therefore, can be altered at will.

FIELDWORK FINDINGS

No sites of heritage significance could be identified during the fieldwork session. Some stone heaps around the eastern end of the study area were initially thought to be possible graves. However, after further investigation, they were found to be material dumps associated with the railway line construction, since the materials are the same as those used on the railway and these do not occur naturally in the area.



Figure 13. Stone heaps next to railway line

Chapter 3

IMPACT ASSESSMENT

METHODOLOGY

This study defines the heritage component of the EIA process being undertaken for the Railway Re-alignment at the proposed 37 Open Pit at Amandelbult Mine. It is described as a first phase Heritage Impact Assessment (HIA). This report attempts to evaluate both the accumulated heritage knowledge of the area, as well as information derived from direct physical observations.

INVENTORY

Inventory studies involve the in-field survey and recording of archaeological resources within a proposed development area. The nature and scope of this type of study is defined primarily by the results of the overview study. In the case of site-specific developments, direct implementation of an inventory study may preclude the need for an overview.

There are a number of different methodological approaches to conducting inventory studies. Therefore, the proponent, in collaboration with the archaeological consultant, must develop an inventory plan for review and approval by the SAHRA prior to implementation (*Dincause, Dena F., H. Martin Wobst, Robert J. Hasenstab and David M. Lacy 1984*).

EVALUATING HERITAGE IMPACTS

A combination of documentary research, determination of the geographic suitability of areas and the evaluation of aerial photographs determined which areas could and should be accessed.

After plotting of the site on a GPS, the areas were accessed using suitable combinations of vehicle access and on foot.



Figure 14. GPS Track Paths

Sites were documented by digital photography and geo-located with GPS readings using the WGS 84 datum.

Further techniques (where possible) included interviews with local inhabitants, visiting local museums and information centers and discussions with local experts. All this information was combined with information from an extensive literature study and the results of archival studies, based on the SAHRA (South African Heritage Resource Agency) provincial databases.

This HIA relies on the analysis of written documents, maps, aerial photographs and other archival sources, combined with the results of site investigations and interviews with effected people. Site investigations are not exhaustive and often focus on areas such as river confluence areas, elevated sites or occupational ruins.

The following documents were consulted in this study:

- South African National Archive Documents;
- SAHRIS (South African Heritage Resources Information System) Database of Heritage Studies;
- Internet Search;
- Historic Maps;
- 1980 and 2005 Surveyor General Topographic Map series;
- 1952 1:10 000 aerial photo survey;
- Google Earth 2016 imagery;
- Published articles and books; and
- JSTOR Article Archive.

FIELDWORK

Fieldwork for this study was performed on the 15th of November 2016. Most of the area was found to be accessible on foot. The survey was tracked using GPS and a track file in GPX format is available on request.

The study was mainly focused on systematic field surveys of the study area.

Where sites were identified, they were documented photographically and plotted using GPS with the WGS 84 datum point as reference. The image (figure 6), shows the GPS track paths for both the on-foot and car reconnaissance of the study area.

The study area was surveyed using standard archaeological surveying methods. The area was surveyed using directional parameters supplied by the GPS and surveyed by foot. This technique has been proven to result in the maximum coverage of an area.

Standard archaeological documentation formats were employed in the description of sites. Using standard site documentation forms as comparable medium, it enabled the surveyors to evaluate the relative importance of sites found. Furthermore GPS (Global Positioning System) readings of all finds and sites were taken. This information was then plotted using a **Garmin Colorado** GPS (WGS 84- datum).

MEASURING IMPACTS

In 2003 the SAHRA (South African Heritage Resources Agency) compiled the following guidelines to evaluate the cultural significance of individual heritage resources (these are applicable to Botswana as well):

TYPE OF RESOURCE

- Place
- Archaeological Site
- Structure
- Grave
- Paleontological Feature
- Geological Feature

TYPE OF SIGNIFICANCE

HISTORIC VALUE

It is important in the community, or pattern of history

- Important in the evolution of cultural landscapes and settlement patterns
- Important in exhibiting density, richness or diversity of cultural features illustrating the human occupation and evolution of the nation, province, region or locality.
- Important for association with events, developments or cultural phases that have had a significant role in the human occupation and evolution of the nation, province, region or community.
- Important as an example for technical, creative, design or artistic excellence, innovation or achievement in a particular period.

It has strong or special association with the life or work of a person, group or organisation of importance in history

- Importance for close associations with individuals, groups or organisations whose life, works or activities have been significant within the history of the nation, province, region or community.

It has significance relating to the history of slavery

- Importance for a direct link to the history of slavery in South Africa.

AESTHETIC VALUE

It is important in exhibiting particular aesthetic characteristics valued by a community or cultural group.

- Important to a community for aesthetic characteristics held in high esteem or otherwise valued by the community.
- Importance for its creative, design or artistic excellence, innovation or achievement.
- Importance for its contribution to the aesthetic values of the setting demonstrated by a landmark quality or having impact on important vistas or otherwise contributing to the identified aesthetic qualities of the cultural environs or the natural landscape within which it is located.
- In the case of an historic precinct, importance for the aesthetic character created by the individual components which collectively form a significant streetscape, townscape or cultural environment.

SCIENTIFIC VALUE

It has potential to yield information that will contribute to an understanding of natural or cultural heritage

- Importance for information contributing to a wider understanding of natural or cultural history by virtue of its use as a research site, teaching site, type locality, reference or benchmark site.
- Importance for information contributing to a wider understanding of the origin of the universe or of the development of the earth.
- Importance for information contributing to a wider understanding of the origin of life; the development of plant or animal species, or the biological or cultural development of hominid or human species.
- Importance for its potential to yield information contributing to a wider understanding of the history of human occupation of the nation, Province, region or locality.
- It is important in demonstrating a high degree of creative or technical achievement at a particular period
- Importance for its technical innovation or achievement.

(a) Does the site contain evidence, which may substantively enhance understanding of culture history, culture process, and other aspects of local and regional prehistory?

- internal stratification and depth
- chronologically sensitive cultural items
- materials for absolute dating
- association with ancient landforms
- quantity and variety of tool type
- distinct intra-site activity areas
- tool types indicative of specific socio-economic or religious activity
- cultural features such as burials, dwellings, hearths, etc.
- diagnostic faunal and floral remains
- exotic cultural items and materials
- uniqueness or representativeness of the site
- integrity of the site

(b) Does the site contain evidence which may be used for experimentation aimed at improving archaeological methods and techniques?

- monitoring impacts from artificial or natural agents
- site preservation or conservation experiments
- data recovery experiments
- sampling experiments
- intra-site spatial analysis

(c) Does the site contain evidence which can make important contributions to paleo-environmental studies?

- topographical, geomorphological context
- depositional character
- diagnostic faunal, floral data

(d) Does the site contain evidence which can contribute to other scientific disciplines such as hydrology, geomorphology, pedology, meteorology, zoology, botany, forensic medicine, and environmental hazards research, or to industry including forestry and commercial fisheries?

SOCIAL VALUE / PUBLIC SIGNIFICANCE

- It has strong or special association with a particular community or cultural group for social, cultural or spiritual reasons
- Importance as a place highly valued by a community or cultural group for reasons of social, cultural, religious, spiritual, symbolic, aesthetic or educational associations.
- Importance in contributing to a community's sense of place.

(a) Does the site have potential for public use in an interpretive, educational or recreational capacity?

- integrity of the site
- technical and economic feasibility of restoration and development for public use
- visibility of cultural features and their ability to be easily interpreted
- accessibility to the public

- opportunities for protection against vandalism
- representativeness and uniqueness of the site
- aesthetics of the local setting
- proximity to established recreation areas
- present and potential land use
- land ownership and administration
- legal and jurisdictional status

- local community attitude toward development

(b) Does the site receive visitation or use by tourists, local residents or school groups?

ETHNIC SIGNIFICANCE

(a) Does the site presently have traditional, social or religious importance to a particular group or community?

- ethnographic or ethno-historic reference
- documented local community recognition or, and concern for, the site

ECONOMIC SIGNIFICANCE

(a) What value of user-benefits may be placed on the site?

- visitors' willingness-to-pay
- visitors' travel costs

SCIENTIFIC SIGNIFICANCE

(a) Does the site contain evidence, which may substantively enhance understanding of historic patterns of settlement and land use in a particular locality, regional or larger area?

(b) Does the site contain evidence, which can make important contributions to other scientific disciplines or industry?

HISTORIC SIGNIFICANCE

(a) Is the site associated with the early exploration, settlement, land use, or other aspect of southern Africa's cultural development?

(b) Is the site associated with the life or activities of a particular historic figure, group, organization, or institution that has made a significant contribution to, or impact on, the community, province or nation?

(c) Is the site associated with a particular historic event whether cultural, economic, military, religious, social or political that has made a significant contribution to, or impact on, the community, province or nation?

(d) Is the site associated with a traditional recurring event in the history of the community, province, or nation, such as an annual celebration?

PUBLIC SIGNIFICANCE

(a) Does the site have potential for public use in an interpretive, educational or recreational capacity?

- visibility and accessibility to the public
- ability of the site to be easily interpreted
- opportunities for protection against vandalism
- economic and engineering feasibility of reconstruction, restoration and maintenance
- representativeness and uniqueness of the site
- proximity to established recreation areas
- compatibility with surrounding zoning regulations or land use
- land ownership and administration
- local community attitude toward site preservation, development or destruction
- present use of site

(b) Does the site receive visitation or use by tourists, local residents or school groups?

OTHER

- (a) Is the site a commonly acknowledged landmark?
- (b) Does, or could, the site contribute to a sense of continuity or identity either alone or in conjunction with similar sites in the vicinity?
- (c) Is the site a good typical example of an early structure or device commonly used for a specific purpose throughout an area or period of time?
- (d) Is the site representative of a particular architectural style or pattern?

DEGREES OF SIGNIFICANCE

SIGNIFICANCE CRITERIA

There are several kinds of significance, including scientific, public, ethnic, historic and economic, that need to be taken into account when evaluating heritage resources. For any site, explicit criteria are used to measure these values. These checklists are not intended to be exhaustive or inflexible. Innovative approaches to site evaluation which emphasize quantitative analysis and objectivity are encouraged. The process used to derive a measure of relative site significance must be rigorously documented, particularly the system for ranking or weighting various evaluated criteria.

Site integrity, or the degree to which a heritage site has been impaired or disturbed as a result of past land alteration, is an important consideration in evaluating site significance. In this regard, it is important to recognize that although an archaeological site has been disturbed, it may still contain important scientific information.

Heritage resources may be of scientific value in two respects. The potential to yield information, which, if properly recovered, will enhance understanding of Southern African human history, is one appropriate measure of scientific significance. In this respect, archaeological sites should be evaluated in terms of their potential to resolve current archaeological research problems. Scientific significance also refers to the potential for relevant contributions to other academic disciplines or to industry.

Public significance refers to the potential a site has for enhancing the public's understanding and appreciation of the past. The interpretive, educational and recreational potential of a site are valid indications of public value. Public significance criteria such as ease of access, land ownership, or scenic setting are often external to the site itself. The relevance of heritage resource data to private industry may also be interpreted as a particular kind of public significance.

Ethnic significance applies to heritage sites which have value to an ethnically distinct community or group of people. Determining the ethnic significance of an archaeological site may require consultation with persons having special knowledge of a particular site. It is essential that ethnic significance be assessed by someone properly trained in obtaining and evaluating such data.

Historic archaeological sites may relate to individuals or events that made an important, lasting contribution to the development of a particular locality or the province. Historically important sites also reflect or commemorate the historic socioeconomic character of an area. Sites having high historical value will also usually have high public value.

The economic or monetary value of a heritage site, where calculable, is also an important indication of significance. In some cases, it may be possible to project monetary benefits derived from the public's use of a heritage site as an educational or recreational facility. This may be accomplished by employing established economic evaluation methods; most of which have been developed for valuating outdoor recreation. The objective is to determine the willingness of users, including local residents and tourists, to pay for the experiences or services the site provides even though no payment is presently being made. Calculation of user benefits will normally require some study of the visitor population (*Smith, L.D. 1977*).

RARITY

- It possesses uncommon, rare or endangered aspects of natural or cultural heritage.
- Importance for rare, endangered or uncommon structures, landscapes or phenomena.

REPRESENTIVITY

- It is important in demonstrating the principal characteristics of a particular class of natural or cultural places or objects.
- Importance in demonstrating the principal characteristics of a range of landscapes or environments, the attributes of which identify it as being characteristic of its class.
- Importance in demonstrating the principal characteristics of human activities (including way of life, philosophy, custom, process, land-use, function, design or technique) in the environment of the nation, province, region or locality.

The table below illustrates how a site's heritage significance is determined

Spheres of Significance	High	Medium	Low
International			
National			
Provincial			
Regional			
Local			
Specific Community			

ASSESSMENT OF HERITAGE POTENTIAL

ASSESSMENT MATRIX

DETERMINING ARCHAEOLOGICAL SIGNIFICANCE

In addition to guidelines provided by the NHRA, a set of criteria based on Deacon (J) and Whitelaw (1997) for assessing archaeological significance has been developed for Eastern Cape settings (Morris 2007a). These criteria include estimation of landform potential (in terms of its capacity to contain archaeological traces) and assessing the value to any archaeological traces (in terms of their attributes or their capacity to be construed as evidence, given that evidence is not given but constructed by the investigator).

Estimating site potential

Table 1 (below) is a classification of landforms and visible archaeological traces used for estimating the potential of archaeological sites (after J. Deacon and, National Monuments Council). Type 3 sites tend to be those with higher archaeological potential, but there are notable exceptions to this rule, for example the renowned rock engravings site Driekopseiland near Kimberley which is on landform L1 Type 1 – normally a setting of lowest expected potential. It should also be noted that, generally, the older a site the poorer the preservation, so that sometimes any trace, even of only Type 1 quality, could be of exceptional significance. In light of this, estimation of potential will always be a matter for archaeological observation and interpretation.

Classification of landforms and visible archaeological traces for estimating the potential for archaeological sites (after J. Deacon, NMC as used in Morris)

Class	Landform	Type 1	Type 2	Type 3
L1	Rocky Surface	Bedrock exposed	Some soil patches	Sandy/grassy patches
L2	Ploughed land	Far from water	In floodplain	On old river terrace
L3	Sandy ground, inland	Far from water	In floodplain or near features such as hill/dune	On old river terrace
L4	Sandy ground, coastal	>1 km from sea	Inland of dune cordon	Near rocky shore
L5	Water-logged deposit	Heavily vegetated	Running water	Sedimentary basin
L6	Developed urban	Heavily built-up with no known record of early settlement	Known early settlement, but buildings have	Buildings without extensive basements over known historical

			basements	sites
L7	Lime/dolomite	>5 myrs	<5000 yrs	Between 5000 yrs and 5 myrs
L8	Rock shelter	Rocky floor	Loping floor or small area	Flat floor, high ceiling
Class	Archaeological traces	Type 1	Type 2	Type 3
A1	Area previously excavated	Little deposit remaining	More than half deposit remaining	High profile site
A2	Shell of bones visible	Dispersed scatter	Deposit <0.5 m thick	Deposit >0.5 m thick; shell and bone dense
A3	Stone artefacts or stone walling or other feature visible	Dispersed scatter	Deposit <0.5m thick	Deposit >0.5 m thick

Site attributes and value assessment (adopted from Whitelaw 1997 as used in Morris)

Class	Landforms	Type 1	Type 2	Type 3
1	Length of sequence /context	No sequence Poor context Dispersed distribution	Limited sequence	Long sequence Favourable context High density of arte / ecofacts
2	Presence of exceptional items (incl. regional rarity)	Absent	Present	Major element
3	Organic preservation	Absent	Present	Major element
4	Potential for future archaeological investigation	Low	Medium	High
5	Potential for public display	Low	Medium	High
6	Aesthetic appeal	Low	Medium	High
7	Potential for implementation of a long-term management plan	Low	Medium	High

ASSESSING VISUAL IMPACT

Visual impacts of developments result when sites that are culturally celebrated are visually affected by a development. The exact parameters for the determination of visual impacts have not yet been rigidly defined and are still mostly open to interpretation. CNdV Architects and The Department of Environmental Affairs and Development Planning (2006) have developed some guidelines for the management of the visual impacts of wind turbines in the Western Cape, although these have not yet been formalised. In these guidelines they recommend a buffer zone of 1km around significant heritage sites to minimise the visual impact.

IMPACT EVALUATION

This HIA Methodology assists in evaluating the overall effect of a proposed activity on the heritage environment. The determination of the effect of a heritage impact on a heritage parameter is determined through a systematic analysis of the various components of the impact. This is undertaken using information that is available to the heritage practitioner through the process of heritage impact assessment. The impact evaluation of predicted impacts was undertaken through an assessment of the significance of the impacts.

METHODOLOGY FOR RATING OF IMPACTS

The assessment of the significance of impacts for a proposed development is by its nature, a matter of judgement. To deal with the uncertainty associated with judgement and ensure repeatable results,

Aurecon rates impacts using a standardised and internationally recognised methodology adhering to ISO 14001 and World Bank/IFC requirements.

For each predicted impact, criteria are applied to establish the **significance** of the impact based on likelihood and consequence, both without mitigation being applied and with the most effective mitigation measure(s) in place.

The criteria that contribute to the **consequence** of the impact are **intensity** (the degree to which pre-development conditions are changed), **duration** (length of time that the impact will continue); and the **extent** (spatial scale) of the impact. The sensitivity of the receiving environment and/or sensitive receptors is incorporated into the consideration of consequence by appropriately adjusting the thresholds or scales of the intensity, duration and extent criteria, based on expert knowledge. For each impact, the specialist applies professional judgement to ascribe a numerical rating for each criterion according to the examples provided below. The consequence is then established using the formula:

$$\text{Consequence} = \text{intensity} + \text{duration} + \text{extent}$$

Depending on the numerical result, the impact's consequence would be defined as either extremely, highly, moderately or slightly detrimental; or neutral; or slightly, moderately, highly or extremely beneficial. These categories are provided below.

To determine the significance of an impact, the **probability** (or likelihood) of that impact occurring is also taken into account. In assigning probability, the specialist takes into account the likelihood of occurrence but also takes cognisance of uncertainty and detectability of the impact. The most suitable numerical rating for probability is selected from below and applied with the consequence according to the following equation:

$$\text{Significance} = \text{consequence} \times \text{probability}$$

When assigning **probability** to an impact, it is vitally important to distinguish this from the concepts of **frequency** and **confidence**, with which it is sometimes confused.

- **Probability** refers to the likelihood that an impact will occur.
- **Frequency** refers to the regularity with which an impact occurs. To illustrate the difference between frequency and probability, it must be considered that something that happens infrequently may still be a certainty (i.e. have a high probability). For instance, Halley's Comet only comes close to the sun every 75 to 76 years (i.e. it has a very low frequency), but it is still a certainty.
- **Confidence** refers to the degree of certainty of a prediction. Confidence may be related to any of the impact assessment criteria (extent, intensity, duration or probability) and is not necessarily only related to probability. Confidence may be influenced by any factors that introduce uncertainty into a prediction.

Depending on the numerical result of this calculation, the impact would fall into a significance category of negligible, minor, moderate or major, and the type would be either positive or negative. Examples of these categories are provided below.

Once the significance of an impact occurring without mitigation has been established, the specialist must apply his/her professional judgement to assign ratings for the same impact after the proposed mitigation has been implemented.

Lastly, two further points are important when applying these criteria to impacts:

- Specialists need to assess the impact, **not** the source or origin of the impact (i.e. the activity that causes the impact). For instance, although the activity that causes a specific impact may take place over a long period of time, this does not necessarily imply that the impact itself will persist for the same length of time. The assessment must focus on the impact (the change in the environment) rather than on the activity that causes an impact.
- When assessing impacts, consider the **proposed project design** rather than assuming that the project will necessarily affect highly sensitive resources, even if those resources occur on a part

of the site that is left unaffected by the design. If the design of a project avoids an area where a highly sensitive or irreplaceable resource occurs, it would be a mistake to assume that this resource would experience an impact, simply because the resource occurs within the boundaries of the site. As an example, if a wetland or archaeological site occurs on portion A, but the project is located on portion B, then clearly the wetland or archaeological site would not be affected, hence, there would be no direct impact on these resources.

The tables on the following pages show the scales used to classify the above variables, and define each of the rating categories.

Definition of Intensity ratings

Rating	Criteria	
	Negative impacts (Type of impact = -1)	Positive impacts (Type of impact = +1)
7	Complete destruction (irreversible and irreplaceable loss) of natural or social systems, resources (e.g. species) and human health. No chance of these processes or resources ever being restored to their pre-impact condition.	Noticeable, sustainable benefits that improve the quality and extent of natural or social system or resources, including formal protection.
6	Very high degree of damage to natural or social systems or resources. These processes or resources may restore to their pre-project condition over very long periods of time (more than a typical human life time).	Great improvement to ecosystem or social processes and services or resources.
5	Serious damage to components of natural or social systems or resources and the contravention of legislated standards.	On-going and widespread benefits to natural or social systems or resources.
4	High degree damage to natural or social system components, species or resources.	Average to intense positive benefits for natural or social systems or resources.
3	Moderate damage to natural or social system components, species or resources.	Average, on-going positive benefits for natural or social systems or resources.
2	Minor damage to natural or social system components, species or resources. Likely to recover over time. Ecosystems and valuable social processes not affected.	Low positive impacts on natural or social systems or resources.
1	Negligible damage to individual components of natural or social systems or resources, such that it is hardly noticeable.	Limited low-level benefits to natural or social systems or resources.

Definition of Duration ratings

Rating	Criteria
--------	----------

7	Permanent: The impact will remain indefinitely.
6	Beyond project life: The impact will remain for some time after the life of the project.
5	Project life: The impact will cease after the operational life span of the project
4	Long-term: The impact will continue for 6-15 years.
3	Medium-term: The impact will continue for 2-5 years.
2	Short-term: The impact will continue for between 1 month and 2 years.
1	Immediate: The impact will continue for less than 1 month.

Definition of Extent ratings

Rating	Criteria
7	International: The effect will occur across international borders.
6	National: The impact will affect the entire country.
5	Province/ Region: The impact will affect the entire province or region
4	Municipal Area: The impact will affect the whole municipal area.
3	Local: The impact will extend across the site and to nearby properties.
2	Limited: The impact will be limited to the site.
1	Very limited: The impact will be limited to the footprint of the development and will not extend to the boundaries of the site.

Definition of Probability ratings

Rating	Criteria
7	Certain/ Definite: There are sound scientific reasons to expect that the impact will definitely occur.
6	Almost certain/Highly probable: It is most likely that the impact will occur.
5	Likely: This impact has occurred numerous times here or elsewhere in a similar environment and with a similar type of development and could very conceivably occur.
4	Probable: This impact has occurred here or elsewhere in a similar environment and with a similar type of development and could conceivably occur.
3	Unlikely: This impact has not happened yet but could happen.
2	Rare/ improbable: The impact is conceivable, but only in extreme circumstances. The possibility of the impact manifesting is very low as a result of design, experience or implementation of adequate mitigation measures.
1	Highly unlikely/None: The impact is expected never to happen or has a very low chance of occurring.

Application of Consequence ratings

Range		Significance rating
-21	-18	Extremely detrimental
-17	-14	Highly detrimental
-13	-10	Moderately detrimental
-9	-6	Slightly detrimental
-5	5	Negligible
6	9	Slightly beneficial
10	13	Moderately beneficial
14	17	Highly beneficial
18	21	Extremely beneficial

Application of significance ratings

Range		Significance rating
-147	-109	Major - negative
-108	-73	Moderate - negative
-72	-36	Minor - negative
-35	-1	Negligible - negative
0	0	Neutral
1	35	Negligible - positive
36	72	Minor - positive
73	108	Moderate - positive
109	147	Major - positive

Despite attempts at ensuring objectivity and impartiality, environmental assessment remains an act of judgement and can never escape the subjectivity inherent in attempting to define significance. The determination of the significance of an impact depends on context (spatial and duration) and intensity of that impact. Since the rationalisation of context and intensity will ultimately be prejudiced by the observer, there can be no wholly objective measure by which to judge the components of significance, let alone how they are integrated into a single comparable measure.

This notwithstanding, in order to facilitate informed decision-making, environmental assessments must endeavour to come to terms with the significance of the environmental impacts. Recognising this,

Aurecon has attempted to address potential subjectivity in the current ESIA process as follows:

- Being explicit about the difficulty of being completely objective in the determination of significance, as outlined above;
- Developing an explicit methodology for assigning significance to impacts and outlining this methodology in detail. Having an explicit methodology not only forces the specialist to come to terms with the various facets that contribute to significance (thereby avoiding arbitrary assessment), but also provides the reader with a clear summary of how the specialist derived the significance;
- Wherever possible, differentiating between the significance of potential environmental impacts as experienced by the various affected parties; and
- Utilising a team approach and internal review of the assessment to facilitate a rigorous and defensible system.

Although these measures may not totally eliminate subjectivity, they provide an explicit context within which to review the assessment of impacts.

The specialists appointed to contribute to this impact assessment have empirical knowledge of their respective fields and are thus able to comment on the confidence they have in their findings based on the availability of data and the certainty of their findings (Example provided below).

Definition of Confidence ratings

Rating	Criteria
Low	Judgement is based on intuition and there some major assumptions used in assessing the impact may prove to be untrue.
Medium	Determination is based on common sense and general knowledge. The assumptions made, whilst having a degree of uncertainty, are fairly robust.
High	Substantive supportive data or evidence exists to verify the assessment.

METHODOLOGY FOR RATING OF CUMULATIVE IMPACTS

To address potential system-wide consequences resulting from the combination of individual effects of multiple actions over time, the International Finance Corporation (IFC) has published a guideline to advice on the assessment and management of cumulative impacts, the *Good Practice Handbook Cumulative Impact Assessment and Management: Guidance for the Private Sector in Emerging Markets*. The IFC Good Practice Handbook proposes as a useful preliminary to conduct a rapid cumulative impact assessment (RCIA).

A table format has been used to identify the Valued Environmental and Social Component (VEC); namely:

- the project activity causing the impacts;
- the impacts to the VEC; and
- the subsequent effect on the receptor.

The future baseline with respect to that VEC is then also described, taking taken into account the future development scenario. This is undertaken as a qualitative exercise and is based on the specialist studies undertaken as part of this Basic Assessment and other available information. Lastly, a significance rating is applied based on the Design Manual for Roads and Bridges (DMRB) methodology.

The IFC Handbook (2013) states that in order to assess the significance of a cumulative impact on a VEC, it is necessary to establish whether the cumulative impact on VEC condition will approach, be near to, or exceed a threshold. The analysis may reveal that significant cumulative impacts will exist without the project.

Five categories of cumulative impacts are proposed, depending on the cumulative impact on each VEC.

Framework for assessing significance of cumulative effects

Significance	Effect
Severe	Effects that the decision-maker must take into account as the receptor/resource is irretrievably compromised.
Major	Effects that may become key decision-making issue.
Moderate	Effects that are unlikely to become issues on whether the project design should be selected, but where future work may be needed to improve on current performance.
Minor	Effects which are locally significant.
Not Significant	Effects that are beyond the current forecasting ability or are within the ability of the resource to absorb such change.

The IFC Handbook requires that the methodology should include the identification, where necessary, of additional project mitigation (beyond that identified in the project ESIA) to reduce an unacceptable cumulative impact on a VEC to an acceptable level. For example, the study could identify the potential for other regional strategies that could maintain VECs at acceptable conditions.

Rating	Definition	
	Intensity	
	Negative impacts (Type of impact = -1)	Positive impacts (Type of impact = +1)
7	Irreparable damage to natural systems and human health. Irreplaceable loss of species.	Noticeable, on-going benefits to which have improved the quality and extent of natural systems, including formal protection.
6	Irreparable damage to natural systems and the contravention of legislated standards	Great improvement to ecosystem processes and services.
5	Very serious impacts and irreparable damage to components of natural systems.	On-going and widespread positive benefits to natural systems.
4	On-going damage to natural system components and species.	Average to intense positive benefits for natural systems.
3	Damage to natural system components and species.	Average, on-going positive benefits for natural systems.
2	Minor damage to natural system components and species. Likely to recover over time. Ecosystem processes not affected.	Low positive impacts on natural systems.
1	Negligible damage to individual components of natural systems.	Some low-level benefits to degraded natural systems.
Extent		
7	<u>International</u> : The effect will occur across international borders	
6	<u>National</u> : Will affect the entire country	
5	<u>Province/ Region</u> : Will affect the entire province or region	
4	<u>Municipal Area</u> : Will affect the whole municipal area	
3	<u>Local</u> : Extending across the site and to nearby settlements	
2	<u>Limited</u> : Limited to the site and its immediate surroundings	
1	<u>Very limited</u> : Limited to specific isolated parts of the site	
Duration		
7	<u>Permanent</u> : The impact will remain long after the life of the project	
6	<u>Beyond project life</u> : The impact will remain for some time after the life of the project	

5	Project Life: The impact will cease after the operational life span of the project
4	Long term: 6-15 years
3	Medium term: 1-5 years
2	Short term: Less than 1 year

ANTICIPATED IMPACT OF THE DEVELOPMENT

ALL HERITAGE SIGNIFICANCE

IMPACT TABLE FORMAT		
Heritage component	<i>Heritage sites of significance</i>	
Issue/Impact/Heritage Impact/Nature	<i>Proposed Railway Re-alignment</i>	
<i>Extent</i>	<i>Very limited (-1)</i>	
<i>Intensity</i>	<i>Negligible (-1)</i>	
<i>Duration</i>	<i>Medium Term (-3)</i>	
Consequence	<i>Negligible (-5)</i>	
<i>Consequence</i>	-5	
<i>Probability</i>	<i>Rare (-2)</i>	
Significance	<i>Negligible (-10)</i>	
Confidence Rating	<i>High</i>	
Cumulative Significance Rating	<i>Minor</i>	
	With Mitigation	Without Mitigation
Extent	-1	-1
Intensity	-1	-1
Duration	-3	-3
Consequence	-5	-5
Probability	-2	-2
Cumulative effect	-1	-1
Mitigation measure	<i>Should any graves be identified during the construction phase of the project, the attached recommendations should be followed in the mitigation of impacts on these graves.</i>	

RESOURCE MANAGEMENT RECOMMENDATIONS

The current and previous studies showed that the area has a low geographic suitability factor. Therefore, occupation in this specific area is unlikely. No sites of heritage significance were found and no negative impacts from the project are anticipated.

Although unlikely, sub-surface remains of heritage sites could still be encountered during the project's construction. Such sites would offer no surface indication of their presence due to the high state of alterations in some areas, as well as heavy plant cover in other areas. The following indicators of unmarked sub-surface sites could be encountered:

- Ash deposits (unnaturally grey appearance of soil compared to the surrounding substrate);
- Bone concentrations, either animal or human;

- Ceramic fragments such as pottery shards either historic or pre-contact;
- Stone concentrations of any formal nature.

The following recommendations are given, should any sub-surface remains of heritage sites be identified:

- All operators of excavation equipment should be made aware of the possibility of the occurrence of sub-surface heritage features and the following procedures should they be encountered;
- All construction in the immediate vicinity (50m radius of the site) should cease;
- The heritage practitioner should be informed as soon as possible;
- In the event of obvious human remains, the South African Police Services (SAPS) should be notified;
- Mitigation measures (such as refilling etc.) should not be attempted;
- The area in a 50m radius of the find should be cordoned off with hazard tape;
- Public access should be limited;
- The area should be placed under guard; and
- No media statements should be released until such time as the heritage practitioner has had sufficient time to analyse the finds.

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