

Phase 1 Heritage Impact Assessment Report

HERITAGE IMPACT ASSESSMENT FOR THE
PROPOSED BHP BILLITON ENERGY COAL SOUTH
AFRICA, WOLVEKRANS COLLIERY,
BOSCHMANSKRANS EXPANSION PROJECT

PREPARED BY:
G&A HERITAGE



PREPARED FOR:



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Disclaimer; Although all possible care is taken to identify all sites of cultural importance during the investigation of study areas, it is always possible that hidden or sub-surface sites could be overlooked during the study. G&A Heritage and its personnel will not be held liable for such oversights or for costs incurred as a result of such oversights.

SIGNED OFF BY: STEPHAN GAIGHER



MANAGEMENT SUMMARY

Site name and location: BHP Billiton Energy Coal South Africa, Wolvekrans Colliery, Boschmanskrans Expansion.

Municipal Area: Steve Tshwete Local Municipality.

Developer: BHP Billiton Energy Coal South Africa (BECSA).

Consultant: G&A Heritage, PO Box 522, Louis Trichardt, 0920, South Africa. 38A Voster Str. Louis Trichardt, 0920

Date of Report: 17 October 2011

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 focuses on the planned expansion of the existing Wolvekrans Colliery into the Boschmanskrans section to the south. This forms part of the larger BHP Billiton Energy Coal South Africa project. The development will include a new alignment for the existing water management system canal as well as the proposed expansion of the open pit mining activities and its associated infrastructure.

A preliminary alignment for the canal has been drawn to lead the study; however this could be altered to some extent to avoid any identified heritage sites.

The area is a possible repository for fossil materials as was indicated in a report by Dr. de Jong. The information supplied by Roger Price, Council for Geoscience, is still applicable and it was found unnecessary to duplicate the paleontological study here.

The purpose of this heritage impact assessment is to outline the cultural heritage sensitivity of the proposed development area and to advise on mitigation should any heritage sites or landscapes be affected.

Findings

Nine sites of heritage significance could be identified within the indicated study area. Most of these are associated with recent burial sites (within the last 100 years), while several historic buildings were also identified in some areas. Where heritage resources are to be affected by the alignment of the water run-off management canal it is possible to mitigate the impacts by re-alignment of the canal. Where sites are however affected by the expansive open-pit mining activities, alternative mitigations will be necessary.

No culturally sensitive landscape types could be identified within any of the study areas.

Recommendations

Where cultural heritage sites are to be effected by the alignment of the water run-off management canal it is recommended that the alignment of the canal be altered to facilitate the preservation of these sites. Where re-alignment is found to be impractical or to costly, second phase investigations are recommended into alternative mitigation measures. Some of the burial grounds and one of the historic structure sites are located within the area demarcated for open-pit mining. Due to the extent of the impact of this type of mining, it is recommended that the historic buildings be subjected to a second phase of investigation to determine their provenience and cultural significance and particularly how this relates to the cultural

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landscape of mining in the area.

Where burial grounds are located within the open-pit mining area it is recommended that they be relocated to a formal, official graveyard under local administration.

Fatal Flaws

No fatal flaws were identified. All the sites identified can be mitigated.

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LIST OF ABBREVIATIONS

Bp.....	Before Present
EIA.....	Early Iron Age
ESA.....	Early Stone Age
Fm.....	Femtometre (10^{-15} m)
GPS.....	Geographic Positioning System
HIA.....	Heritage Impact Assessment
LIA.....	Late Iron Age
LSA.....	Late Stone Age
MYA.....	Million Years Ago
MSA.....	Middle Stone Age
NHRA.....	National Heritage Resources Act no 22 of 1999
SAHRA.....	South African Heritage Resource Agency
S&EIR.....	Scoping & Environmental Impact Reporting
Um.....	Micrometre (10^{-6} m)
WGS 84.....	World Geodetic System for 1984

HERITAGE IMPACT REPORT

HERITAGE IMPACT ASSESSMENT REPORT FOR THE PROPOSED BHP BILLITON ENERGY COAL SOUTH AFRICA, WOLVEKRANS COLLIERY, BOSCHMANSKRANS EXTENSION.

INTRODUCTION

Legislation and methodology

G&A Heritage was appointed by Synergistics Environmental Services to undertake a heritage impact assessment for the proposed Boschmanskrans expansion of the Woverkarnas Colliery. Section 27(1) of the South African Heritage Resources Act (25 of 1999) requires that a heritage impact assessment 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.

A heritage impact assessment is not limited to archaeological artefacts, historical buildings and graves. It is far more encompassing and includes intangible and invisible resources such as places, oral traditions and rituals. A heritage resource is defined as any place or object of cultural significance i.e. of aesthetic, architectural, historical, scientific, social, spiritual, linguistic or technological value or significance. This includes the following:

- (a) places, buildings, structures and equipment;
- (b) places to which oral traditions are attached or which are associated with living heritage;
- (c) historical settlements and townscapes;
- (d) landscapes and natural features;
- (e) geological sites of scientific or cultural importance;
- (f) archaeological and paleontological sites;
- (g) graves and burial grounds, including –
 - (1) ancestral graves,
 - (2) royal graves and graves of traditional leaders,
 - (3) graves of victims of conflict (iv) 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;

- Limited field investigations were performed on foot and by vehicle where access was readily available.
- Sites were 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 Jones & Wagener is accurate.
- We assumed that the public participation process performed as part of the Scoping and

Environmental Impact Reporting (S&EIR) process was sufficiently encompassing not to be repeated in the Heritage Assessment Phase.

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	Mine building structures at WCB 007	Second phase investigation
	35	Archaeological, paleontological and meteor sites	No impact	None
	36	Graves and burial sites	Burial grounds at WCB 001, WCB 002, WCB 004, WCB 006, WCB 008, WCB 009	Re-alignment of canal. Exhumation in pit mining areas
	37	Protection of public monuments	None	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	Water run-off management canal exceeding 300m. Access roads in mining area.
Construction of a bridge or similar structure exceeding 50m in length.	No	N/A
Development exceeding 5000 m ²	Yes	Open pit mining
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	Yes	From agricultural to mining.
Any other development category, public open space, squares, parks or recreational grounds	No	N/A

BACKGROUND INFORMATION

PROPOSED WOLVEKRANS COLLIERY, BOSCHMANSKRANS EXTENSION PROJECT DESCRIPTION

The main aim of the mining project is the expansion of the existing Wolvekrans Colliery into the Boschmanskrans section to the south. This expansion will result in the re-alignment of a water management system canal. The main activities that could impact on the heritage sensitivity of this area will be the construction of the new water run-off management canal, the open-pit strip mining activities and their associated infrastructures, such as access roads, overburden storage areas etc..

The larger mining area was subjected to a Heritage Impact Assessment by Vhufa Hashu Heritage Consultants CC in August 2009. The report titled; *Phase 1. Heritage Scoping Study for the BHP Billiton Middelburg Mines Services (Pty) Ltd Boschmanskrans (BMK) Section Within the Steve Chwete, Local Municipality of Nkangala District, Mpumalanga Province* was however found to be of very little use and contained nearly no relevant information on heritage management of the area. None of the sites identified during the current study were mentioned in this report and in-fact, only one heritage site was mentioned in the report. The location of this could however not be confirmed.

SITE LOCATION

The study area is located to the south and east of the existing Wolvekrans Colliery, originally the Douglas Colliery. Part of the study area lies sandwiched between the R575 provincial road to the north and a decommissioned provincial road just to the south of the R575. A further triangular section extends further south from this road. The study area is approximately 13 km² in size, although some areas that fall just

outside of the study area was also investigated if it was believed that they contained sites with significant cultural value.

ALTERNATIVES CONSIDERED

One alternative was considered

- No-go option where no development takes place.

METHODOLOGY

This study defines the heritage component of the S&EIR process being undertaken for the Wolvekrans Colliery, Boschmanskrans extension. It is described as a first phase (HIA). This report attempts to evaluate both the accumulated heritage knowledge of the area as well as information derived from direct physical observations.

EVALUATING HERITAGE IMPACTS

A combination of document research as well as the 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 access by foot. Vehicular access was facilitated by the client to comply with the mine's safety standards.

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 as well as the result of archival studies based on the SAHRA provincial databases.

Geological maps guided investigations into the paleontological riches of the area.

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.

ASSUMPTIONS AND RESTRICTIONS

- It is assumed that the SAHRA database locations are correct
- It is assumed that the paleontological information collected for the project is comprehensive.
- It is assumed that the social impact assessment and public participation process of the S&EIR will result in the identification of any intangible sites of heritage potential.

HERITAGE INDICATORS WITHIN THE RECEIVING ENVIRONMENT

REGIONAL CULTURAL CONTEXT

PALEONTOLOGY

The Barberton Greenstone Belt (BGB) is a geological formation in Mpumalanga that has produced some of the oldest evidence of life anywhere in the World. This formation is not limited to the Barberton area and several versions of it are found close to the study area. These include the Kromberg, Onverwacht and Hoogenoeg sites. The BGB comprises 5 to 6 km of predominantly komatiitic and basaltic pillow lavas and sheet flows and related intrusions that are interlayered with cherts and overlain by cherts, banded iron formations, and shales. This magmatic sequence has been interpreted to represent 3480- to 3220-million-year-old oceanic crust and island arc assemblages. These rocks have undergone metamorphism from prehnite-pumpellyite to green-schist facies. Within the originally glassy rims of many BGB pillow lavas, dense populations of mineralized tubular structures 1 to 9 μm in width (average width, 4 μm) and up to 200 μm in length (average length, 50 μm) are observed. These structures consist of fine-grained titanite and extend away from healed fractures along which seawater once flowed.

According to Roger Price, Council for Geoscience, there are lots of fossils and trace fossils. Several studies have been done in the past by mining companies but most of the studies have probably been sedimentological rather than paleontological, with comments on palaeontology as an afterthought. It is impossible to predict where fossils and trace fossils might occur and the only way to find out is to randomly check for any occurrences during site preparation work (*Cultmatrix*, 2009).

STONE AGE

This area is home to all three of the known phases of the Stone Age, namely: the Early- (2.5 million – 250 000 years ago), Middle- (250 000 – 22 000 years ago) and Late Stone Age (22 000 – 200 years ago). The Late Stone Age in this area also contains sites with rock art from the San and Khoi San cultural groups. Early to Middle Stone Age sites are uncommon in this area, however rock-art sites and Late Stone Age sites are much better known.

No substantial number of Stone Age sites from any period of the Stone Age is however known to exist in this specific area – primarily as a result of a lack of research and general ignorance amongst the layman in recognizing stone tools that often may occur on the surface of the earth. However, it is possible that the first humans in the Middelburg area may have been preceded by *Homo erectus*, who roamed large parts of the world during the Acheulian period of the Early Stone Age, 500 000 years ago. The forbearer of *H. erectus*, *Australopithecus*, considered to be the earliest ancestor of humans, lived in the Blaauwbank Valley around Krugersdorp (today part of the Cradle of Humankind – a World Heritage Site) several million years ago.

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.

The Late Stone Age, considered to have started some 20 000 years ago, is associated with the predecessors of the San and Khoi Khoi. Stone Age hunter-gatherers lived well into the 19th century in some places in SA, but may not have been present in Middelburg 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, urbanisation, industrialisation, agriculture and other development activities during the past decades.

IRON AGE

A considerable number of Late Iron Age, stone walled sites, dating from the 18th and the 19th centuries (some of which may have been occupied as early as the 16th century), occur along and on top of the rocky ridges in the area. These settlements and features in these sites, such as huts, were built with dry stone, reed and clay available from the mountain and the Klip River (Mason 1968, 1986).

Stone walled settlements are concentrated in clusters of sites and sometimes are dispersed over large areas making them vulnerable to developments of various kinds. A site consists of a circular or elliptical outer wall that is composed of a number of scalloped walls facing inwards towards one or more enclosures. Whilst the outer scalloped walls served as dwelling quarters for various family groups, cattle, sheep and goat were stock in the centrally located enclosures. Huts with clay walls and floors were built inside the dwelling units. Pottery and metal items are common on the sites. However, iron and copper were not produced locally on these sites.

THE HISTORIC ERA

This area is well known for its rich historic character and contains sites connected with several historic military and political conflicts. Historic cemeteries (victims of conflict sites), provincial and private museums, battlefield sites and other historic sites are found here.

CULTURAL LANDSCAPE

The main cultural landscape type associated with this area is one of heavy industrial and mining activities combined with agricultural activities and power generation. The mine dumps visible from the site adds to the atmosphere of mining and exploration. This cultural identity has grown to such an extent that it overshadows any previous cultural identity that the area might have had in the past.

The cultural landscape for this area is also richly associated with the colonial period as well as its violent past. A unique stone architectural heritage was established in the Eastern Highveld from the second half of the 19th century well into the early 20th century. During this time period stone was used to build farmsteads and dwellings, both in urban and in rural areas. Although a contemporary stone architecture also existed in the Karoo and in the Eastern Free State Province of South Africa a wider variety of stone types were used in the Eastern Highveld. These included sandstone, ferricrete (oukclip), dolerite (.bloukclip.), granite, shale and slate.

The origins of a vernacular stone architecture in the Eastern Highveld may be ascribed to various reasons of which the ecological characteristics of the region may be the most important. Whilst this region is generally devoid of any natural trees which could be used as timber in the construction of farmsteads, outbuildings, cattle enclosures and other structures, the scarcity of fire wood also prevented the manufacture of baked clay bricks. Consequently stone served as the most important building material in the Eastern Highveld.



Figure 1. Landscape

MEASURING AND EVALUATING THE CULTURAL SENSITIVITY OF THE STUDY AREA

In 2003 the SAHRA compiled the following guidelines to evaluate the cultural significance of individual heritage resources:

TYPE OF RESOURCE

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

TYPE OF SIGNIFICANCE

1. HISTORIC VALUE

It is important in the community, or pattern of history

- o Important in the evolution of cultural landscapes and settlement patterns
- o Important in exhibiting density, richness or diversity of cultural features illustrating the human occupation and evolution of the nation, province, region or locality.
- o 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.
- o 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

- o 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

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

2. AESTHETIC VALUE

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

- o Important to a community for aesthetic characteristics held in high esteem or otherwise valued by the community.
- o Importance for its creative, design or artistic excellence, innovation or achievement.
- o 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.
- o 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.

3. 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.

4. SOCIAL VALUE

- 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.

DEGREES OF SIGNIFICANCE

1. RARITY

It possesses uncommon, rare or endangered aspects of natural or cultural heritage.

- Importance for rare, endangered or uncommon structures, landscapes or phenomena.

2. 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			

What other similar sites may be compared to this site?

ASSESSMENT OF IMPACTS

HERITAGE ENVIRONMENTS THAT WILL BE AFFECTED

POST-CONTACT HERITAGE (GRAVE SITES)

Water Management System

Nature of Impacts: The re-alignment of the Wolvekrans Colliery Water Management System could negatively affect the graveyard sites located at WCB 001, 002 & 004 through ground moving activities.

Extent of Impacts: Localised damage to the site (see *Impact Statement* section for application).

Nature of Impact: Possible post-contact site could be damaged locally by excavation activities		
	Without Mitigation	With Mitigation
Extent	Local	Local
Duration	Long term	Long term
Magnitude	High	Low
Probability	Probable	Improbable
Significance	High	High
Status	Negative	Positive
Reversibility	Irreversible	Irreversible
Irreplaceable loss of resource	Yes	No
Can impacts be mitigated	No	Yes
Mitigation	Alter alignment of water management canal.	
Cumulative impacts	None	
Residual impacts	Local negativity towards mining activities	

Boschmanskrans Extension to Wolvekrans Colliery

Nature of Impacts: The extension of the existing Boschmanskrans section of the Wolvekrans Colliery could negatively affect the graveyard sites located at WCB 006, 008 & 009 through open pit, strip mining activities.

Extent of Impacts: Localised damage to the site (see *Impact Statement* section for application).

Nature of Impact: Possible post-contact site could be damaged locally by excavation activities		
	Without Mitigation	With Mitigation
Extent	Local	Local
Duration	Long term	Long term
Magnitude	High	Low
Probability	Probable	Improbable
Significance	High	High
Status	Negative	Positive
Reversibility	Irreversible	Irreversible
Irreplaceable loss of resource	Yes	No
Can impacts be mitigated	No	Yes
Mitigation	Exhumation of graves and re-internment in official local cemetery	
Cumulative impacts	None	
Residual impacts	Local negativity towards mining activities	

IMPACT STATEMENT

PALEONTOLOGICAL SITES

No paleontological sites of high value could be identified. Paleontological sites could be affected if bedrock was to be disturbed during the trenching or strip mining activities.

Mitigation

Paleontological monitoring during excavation activities where bedrock is to be disturbed.

ARCHAEOLOGICAL SITES

No sites of archaeological importance were identified during the study. Please note that industrial archaeological sites will be discussed under the section – Built Environment.

Mitigation

N/A

BUILT ENVIRONMENT

Water Management System

The water management system and its associated attenuation dams linking the canals will possibly affect three areas of the built environment.

Nature of Impacts: The re-alignment of the Wolvekrans Colliery Water Management System could possibly effect the built environment at four sites nl, WCB 001, WCB 002, WCB 003 & WCB 004

Extent of Impacts: Total loss of site (see *Impact Statement* section for application).

Nature of Impact: Built environment sites could be damaged locally by excavation activities		
	Without Mitigation	With Mitigation
Extent	Local	Local
Duration	Long term	Long term
Magnitude	High	Low
Probability	Probable	Improbable
Significance	High	High
Status	Negative	Positive
Reversibility	Irreversible	Irreversible
Irreplaceable loss of resource	Yes	No
Can impacts be mitigated	No	Yes
Mitigation	Re-alignment of canal to avoid damage to these structures	
Cumulative impacts	None	
Residual impacts	Loss of architectural and historic building pattern information	

Mitigation

It is recommended that the alignment of the water run-off canal takes the position of these sites into consideration. A safety zone of 100m should be adhered to, to ensure that the excavation and construction activities of the canal does not impact directly on these structures, or indirectly by affecting the structural integrity of their foundations.

Boschmanskrans Extension of Wolvekrans Colliery Mining Activities

Nature of Impacts: The extension of the existing Wolvekrans Colliery into the Boschmanskrans section could negatively affect the built environment site located at WCB 007 through open pit, strip mining activities.

Extent of Impacts: Total loss of site (see *Impact Statement* section for application).

Nature of Impact: Possible post-contact site could be damaged locally by excavation activities		
	Without Mitigation	With Mitigation
Extent	Local	Local
Duration	Long term	Long term
Magnitude	High	Low
Probability	Probable	Improbable
Significance	High	High
Status	Negative	Positive
Reversibility	Irreversible	Irreversible

Irreplaceable loss of resource	Yes	No
Can impacts be mitigated	No	Yes
Mitigation	Second phase investigation into the cultural significance of the railway shed buildings at WCB 007	
Cumulative impacts	Loss of architectural identity for the area	
Residual impacts	Local negativity towards mining activities	

CULTURAL LANDSCAPE

The following landscape types were identified during the study.

Landscape Type	Description	Occurrence still possible?	Identified on site?
1 Paleontological	Mostly fossil remains. Remains include microbial fossils such as found in Baberton Greenstones	Yes, sub-surface	No
2 Archaeological	Evidence of human occupation associated with the following phases – Early-, Middle-, Late Stone Age, Early-, Late Iron Age, Pre-Contact Sites, Post-Contact Sites	Yes, sub-surface	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 	Yes	Yes, WCB 001, 002, 007
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. 	Yes	Yes, reservoirs, furrows, pathways and farm yard.
5 Historic rural town	<ul style="list-style-type: none"> - Historic mission settlements - Historic townscapes 	No	No
6 Pristine natural landscape	<ul style="list-style-type: none"> - Historical patterns of access to a natural amenity - Formally proclaimed nature reserves - Evidence of pre-colonial occupation - Scenic resources, e.g. view corridors, viewing sites, visual edges, visual linkages - Pre-colonial or historical burial sites - Geological sites of cultural significance. 	No	No
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, 	Yes	Yes, WCB 001, 002, 007
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) 	Yes	Yes, WCB 001, 002, 004, 006, 008, 009

	- Burial architecture (older than 60 years)		
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	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	No
11 Historic institutions	<ul style="list-style-type: none"> - Historical prisons - Hospital sites - Historical school/reformatory sites - Military bases 	No	No
12 Scenic visual	- Scenic routes	No	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	No

Mitigation

It is recommended that the development designs take into account the positive and negative characteristics of the existing cultural landscape types and that they endeavor to promote the positive aspects while at the same time mitigating the negative aspects.

IMPACT ASSESSMENT MATRIX

NHRA Class	Identification		Significance	Impact	Recommendations
	Site	GPS			
Buildings and structures	WCB 001	26° 01' 10,5" S 29° 26' 25,1" E	High	Severe	Re-align canal
	WCB 002	26° 01' 39,8" S 29° 25' 55,0" E	Low	Severe	Re-align canal
	WCB 003	26° 02' 52,1" S 29° 25' 13,4" E	High	Severe	Re-align canal
	WCB 007	26° 02' 20,1" S 29° 23' 50,3" E	Medium	Severe	Second phase investigation of buildings
Graves and Burial Grounds	WCB 001	26° 01' 10,5" S 29° 26' 25,1" E	High	Severe	Re-align canal
	WCB 002	26° 01' 39,8" S 29° 25' 55,0" E	High	Severe	Exhume and re-intern graves
	WCB 004	26° 02' 52,1" S 29° 25' 13,4" E	High	Severe	Re-align canal
	WCB 006	26° 01' 38,7" S 29° 24' 51,8" E	High	Severe	Relocate graves

	WCB 008	26° 02' 42,1" S 29° 23' 59,7" E	High	Severe	Relocated graves
	WCB 009	26° 02' 58,2" S 29° 23' 44,4" E	High	Severe	Relocated graves

RESOURCE MANAGEMENT RECOMMENDATIONS

Although unlikely, sub-surface remains of heritage sites could still be encountered during the construction activities associated with the project. 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 as indicated above:

- 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.
- No media statements should be released until such time as the heritage practitioner has had sufficient time to analyze the finds.

CONCLUSION

Nine areas with heightened cultural significance were identified throughout the study areas. Several of the sites have a combination of heritage components. Sites WCB 001 and WCB 002 contained both aspects of protected built environment as well as grave sites. Their recommendations are therefore replicated in both sections.

The sites that are affected by the alignment of the water run-off canal can be easily mitigated by re-aligning the canal. The following sites will however be affected by the development of the Boschmanskrans section of the mine expansion – WCB 007, WCB 008 & WCB 009. The planned mining will be open cast strip mining and will therefore have a significant negative impact on these sites. It is therefore recommended that the grave sites be relocated and that the mining related buildings at WCB 007 undergo a second phase of investigation to determine its cultural significance.

HERITAGE SITES IDENTIFIED WITHIN THE STUDY AREA

SITE BCW 001

GPS Coordinates 26° 01' 10,5" S
 29° 26' 25,1" E



Figure 2. Sandstone building remains

The first part of this site consists of a collection of formal building structure located under a Eucalyptus grove. The first and most prominent structure consists of the remains of a sandstone and ferrecreet homestead. Much of the building has fallen down, although enough of the structure remains to classify the architecture as typical Highveld rural vernacular sandstone.

Combined with the remains of the homestead are the remains of stone walled livestock enclosures. These enclosures or "kraals" were built by dry stone walling methods meaning that the rocks were placed on each other without the benefit of concrete. This type of building style was derived from the Iron Age building techniques native to the area.

The second part of the site consists of two formal graves located approximately 50 meters to the north of the stone enclosure. These carry the names of *Jacoba Johanna Harmse, 1931*, & *Erasmus Albertus Harmse, 1939*. These were most likely the occupants of the farmstead as the headstones indicate that they were buried there by their children.

It is unsure if the canal alignment will affect this site.



Figure 3. Stone Kraal



Figure 4. Graves at WCB 001

SITE BCW 001

GPS Coordinates 26° 01' 39,8" S
 29° 25' 55,0" E

This site is located to the south of the site at WCB 001. Although the main feature of the site is a graveyard with around 20 graves it also contained some formal structures. These structures were unfortunately all demolished quite recently, although it is unsure by whom.

The graveyard carries the following names on the headstones that were legible; *Holtzhauzen, van Essen, Loots & Joubert*. The graves date from 1912 – 1981. This places them within the protection of the NHRA and a permit from SAHRA is needed for their excavation. Although the impact on the site by the canal can be mitigated by re-alignment thereof it is important to note that the site is very close (100m) from the overburden dumps of the existing and expanding Boschmanskrans section of the Wolvekrans Colliery. It might therefore be prudent to consider relocating the graveyard before it is damaged by further mining activities.



Figure 5. Graveyard at WCB 002

SITE BCW 003

GPS Coordinates 26° 02' 52,1" S
 29° 25' 13,4" E

A single formal farmstead with associated outbuildings is located at this site. The building is typical of the sandstone vernacular building style of the area and is in fact an excellent example of this architecture. The building will be well over 60 years of age and is therefore protected under the NHRA. It is

recommended that a buffer zone of at least 100m around it is observed with the construction of the water run-off canal.



Figure 6. Sandstone farmstead at WCB 003

SITE BCW 004

GPS Coordinates 26° 02' 46,0" S
 29° 25' 11,6" E

This is another graveyard site located close to the building at site WCB 003. It is also located to the south of an old railway embankment and the site can be accessed through a culvert running beneath this embankment. It is believed that the railway line remains were those of a dedicated coal shunting line employed by the old Douglas Colliery before the introduction of continuous haulage.

The majority of the graves at this site seem to be from one family and is marked Ntuli. There are approximately 40 – 50 graves and these vary from modern gravestones of granite to mere earthen mounds for the older graves. As many of the graves date from before 1960, this graveyard is also protected under the NHRA and falls under the jurisdiction of the SAHRA.

The graveyard is currently close to the indicated alignment of the water management run-off canal. While the canal can still be moved to stay at least 50 meters away from the burial site it is recommended that the client considers relocating this graveyard as it seems imminent that the site will be within the mining area.



Figure 7. Graveyard at WCB 004

SITE WCB 005

GPS Coordinates 26° 02' 59,3" S
 29° 26' 12,4" E

This is a modern building with little heritage value.



Figure 8. Modern structure at WCB 005

SITE WCB 006

GPS Coordinates 26° 01' 38,7" S
 29° 24' 51,8" E

This site consists of three graves lying deep within the existing mining area of the Boschmanskrans section of the Wolvekrans Colliery. The graves are marked with stone outlines, concrete castings and metal boards. It is important that these graves be moved as a matter of urgency as the mining activities is fast encroaching on them.

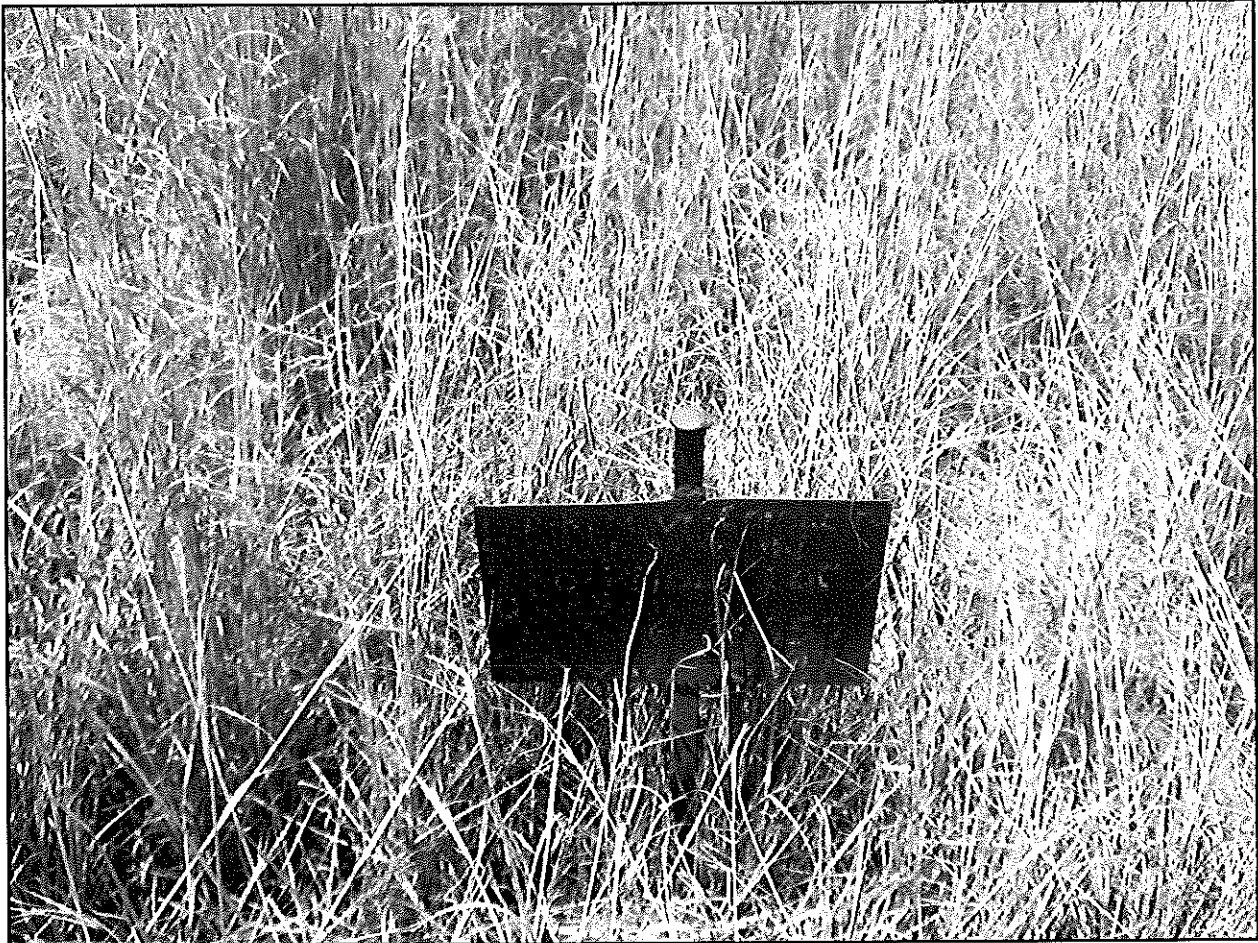


Figure 9. Metal board indicating grave at WCB 006.

SITE WCB 007

GPS Coordinates 26° 02' 20,1" S
 29° 23' 50,3" E

Located at this site is the outbuilding of the decommissioned old Douglas Colliery. Several buildings are found here, however not all of them are of heritage significance. The Douglas Colliery was started in 1896, however it is unsure if any of the existing buildings date from this early date. Archive resources seem to indicate that the train haulage sheds under investigation was built in 1949. This places them within the protection parameters of the NHRA based on their age. Of more importance than their age, however is the architecture of the buildings themselves. As previously indicated the cultural landscape of this area is strongly associated with the mining industry. These buildings are classic examples of the early industrial mining activities associated with the area.

Due to the representativeness of these buildings it is recommended that the mine try and preserve them in situ or if that is not possible that they be documented fully before destruction. Whichever option is decided on, a permit for destruction will be needed from the SAHRA.

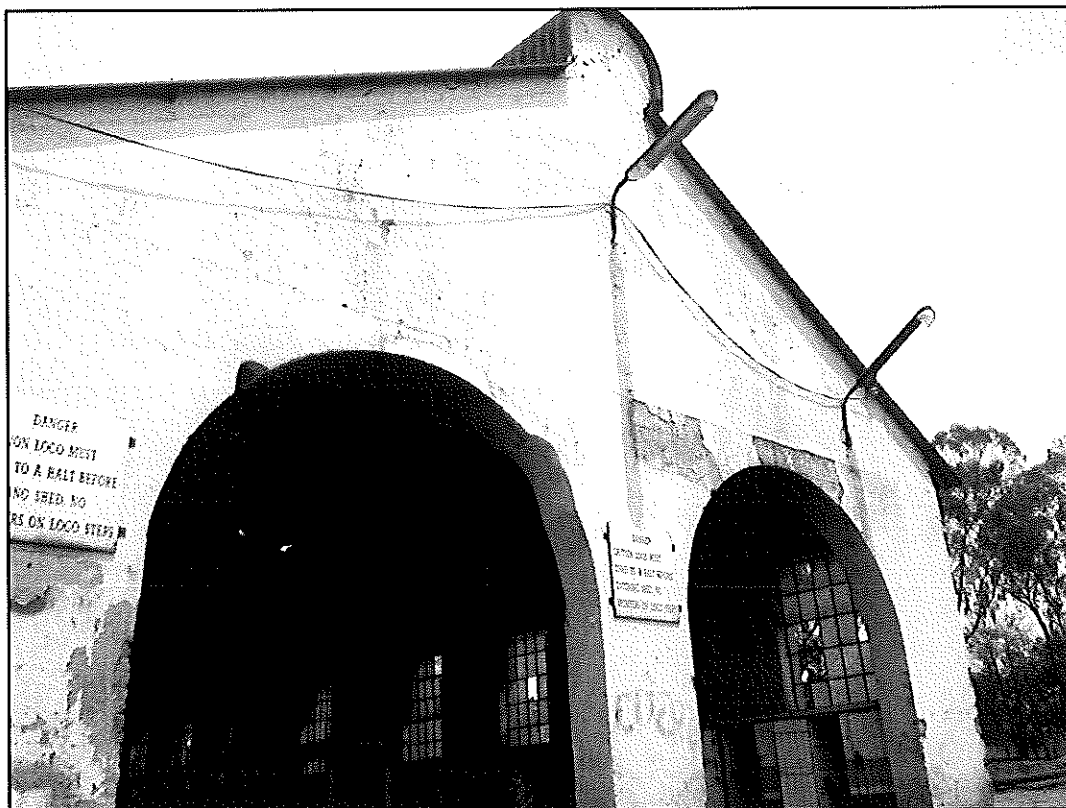


Figure 10. Face of Loco Haulage Building at WCB 007



Figure 11. Interior

SITE WCB 008

GPS Coordinates 26° 02' 42,5" S
 29° 23' 59,7" E

This site is within the proposed expansion area of the Boschmanskrans section of the colliery. Up to eight graves are located here. Some of the graves have concrete dressings and two graves seem to be infant graves based on their size.



Figure 12. Graves at site WCB 008

Foot

SITE WCB 009

GPS Coordinates 26° 02' 58,2" S
 29° 23' 44,4" E

Located here is the remains of a once formal cemetery. Several hundred graves are located here with dates from as early as 1912. The site lies within a heavily altered agricultural field and is surrounded by large eucalyptus trees.

The site seems to have been an official graveyard at some stage as the graves are arranged in organized rows with most of the later graves having metal number indicators at the feet of the graves as found in modern graveyards. The largest number on a grave was found in the north of the site with a grave indicating no 243. This suggests that there is at least 243 graves within this cemetery. This number might be even higher when it is considered that many of the older graves did not carry numbered markers.

At present no indication could be found on the previous managing authority of this cemetery. It is clear that the cemetery has not been maintained for at least several years. This places the graveyard within the authority of the SAHRA. Due to the presence of archaeological graves (100 years and older) as well as Section 36 graves, a permit will be required from the SAHRA and other relevant bodies before these graves could be exhumed.

The site lies within the center of the proposed strip mining area and for this reason it is recommended that the whole cemetery be moved to a officially administered cemetery.

A



Figure 13. Part of cemetery at WCB 009

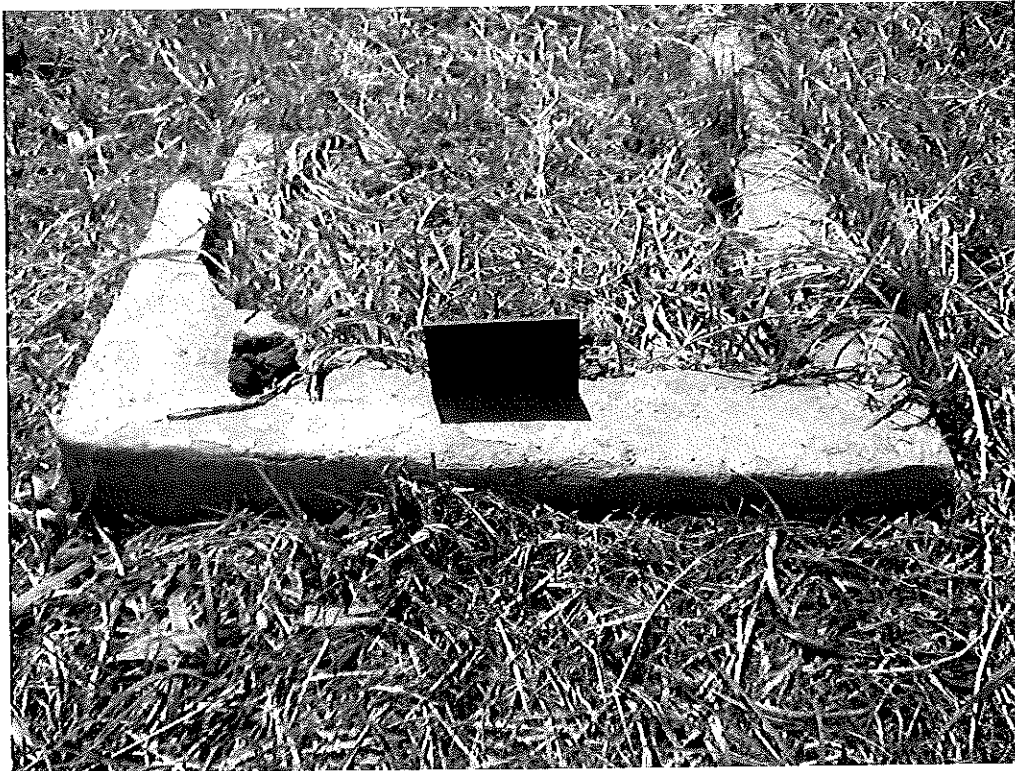


Figure 14. Numbered Metal Indicator showing No 242

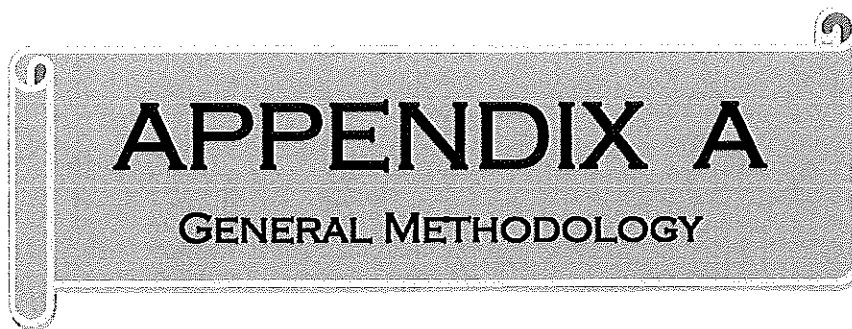
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APPENDIX A

GENERAL METHODOLOGY

METHODOLOGY

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*).

SITE SURVEYING

Site surveying is the process by which archaeological sites are located and identified on the ground. Archaeological site surveys often involve both surface inspection and subsurface testing. For the purposes of heritage investigations, *archaeological sites* refer to any site with heritage potential (i.e. historic sites, cultural sites, rock art sites etc.).

A systematic surface inspection involves a foot traverse along pre-defined linear transects which are spaced at systematic intervals across the survey area. This approach is designed to achieve representative area coverage. Alternatively, an archaeological site survey may involve a non-systematic or random walk across the survey area. Subsurface testing is an integral part of archaeological site survey. The purpose of subsurface testing, commonly called "shovel testing", is to:

(a) assist in the location of archaeological sites which are buried or obscured from the surveyor's view, and

(b) help determine the horizontal and vertical dimensions and internal structure of a site.

In this respect, subsurface testing should not be confused with evaluative testing, which is a considerably more intensive method of assessing site significance (*King, Thomas F., 1978*).

Once a site is located, subsurface testing is conducted to record horizontal extent, depth of the cultural matrix, and degree of internal stratification. Because subsurface testing, like any form of site excavation, is destructive it should be conducted only when necessary and in moderation.

Subsurface testing is usually accomplished by shovel, although augers and core samplers are also used where conditions are suitable. Shovel test units averaging 40 square cm are generally appropriate, and are excavated to a sterile stratum (i.e. C Horizon, alluvial till, etc.).

Depending on the site survey strategy, subsurface testing is conducted systematically or randomly across the survey area. Other considerations such as test unit location, frequency, depth and interval spacing will also depend on the survey design as well as various biophysical factors. (*Lightfoot, Keng G. 1989*).

SURVEY SAMPLING

Site survey involves the complete or partial inspection of a proposed project area for the purpose of locating archaeological or other heritage sites. Since there are many possible approaches to field survey, it is important to consider the biophysical conditions and archaeological site potential of the survey area in designing the survey strategy.

Ideally, the archaeological site inventory should be based on intensive survey of every portion of the impact area, as maximum area coverage will provide the most comprehensive understanding of archaeological and other heritage resource density and distribution. However, in many cases the size of the project area may render a complete survey impractical because of time and cost considerations.

In some situations it may be practical to intensively survey only a sample of the entire project area. Sample selection is approached systematically, based on accepted statistical sampling procedures, or judgementally, relying primarily on subjective criteria (*Butler, W., 1984*).

SYSTEMATIC SURVEY SAMPLING

A systematic sample survey is designed to locate a representative sample of archaeological or heritage resources within the project area. A statistically valid sample will allow predictions to be made regarding total resource density, distribution and variability. In systematic sample surveys it may be necessary to exempt certain areas from intensive inspection owing to excessive slope, water bodies, landslides, land ownership, land use or other factors. These areas must be explicitly defined. Areas characterized by an absence of road access or dense vegetation should not be exempted. (*Dunnell, R.C., Dancy W.S. 1983*).

JUDGEMENTAL SURVEY SAMPLING

Under certain circumstances, it is appropriate to survey a sample of the project area based entirely on professional judgement regarding the location of sites. Only those areas which can reasonably be expected to contain archaeological or heritage sites are surveyed.

However, a sufficient understanding of the cultural and biophysical factors which influenced or accounted for the distribution of these sites over the landscape is essential. Careful consideration must be given to ethnographic patterns of settlement, land use and resource exploitation; the kinds and distribution of aboriginal food sources; and restrictions on site location imposed by physical terrain, climatic regimes, soil chemistry or other factors. A judgemental sample survey is not desirable if statistically valid estimates of total heritage resource density and variability are required (*McManamon F.P. 1984*).

ASSESSMENT

Assessment studies are only required where conflicts have been identified between heritage resources and a proposed development. These studies require an evaluation of the heritage resource to be impacted, as well as an assessment of project impacts. The purpose of the assessment is to provide recommendations as to the most appropriate manner in which the resource may be managed in light of the identified impacts. Management options may include alteration of proposed development plans to avoid resource impact, mitigative studies directed at retrieving resource values prior to impact, or compensation for the unavoidable loss of resource values.

It is especially important to utilize specialists at this stage of assessment. The evaluation of any archaeological resource should be performed by professionally qualified individuals.

SITE EVALUATION

Techniques utilized in evaluating the significance of a heritage site include systematic surface collecting and evaluative testing. Systematic surface collection is employed wherever archaeological remains are evident on the ground surface. However, where these sites contain buried deposits, some degree of evaluative testing is also required.

Systematic surface collection from archaeological sites should be limited, insofar as possible, to a representative sample of materials. Unless a site is exceptionally small and limited to the surface, no attempt should be made at this stage to collect all or even a major portion of the materials. Intensive surface collecting should be reserved for full scale data recovery if mitigative studies are required.

Site significance is determined following an analysis of the surface collected and/or excavated materials (*Miller, C.L. II, 1989*).

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. Checklists of criteria for evaluating pre-contact and post-contact archaeological sites are provided in Appendix B and Appendix C. 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*).

ASSESSING IMPACTS

A heritage resource impact may be broadly defined as the net change between the integrity of a heritage site with and without the proposed development. This change may be either beneficial or adverse.

Beneficial impacts occur wherever a proposed development actively protects, preserves or enhances a heritage resource. For example, development may have a beneficial effect by preventing or lessening natural site erosion. Similarly, an action may serve to preserve a site for future investigation by covering it with a protective layer of fill. In other cases, the public or economic significance of an archaeological site may be enhanced by actions which facilitate non-destructive public use. Although beneficial impacts are unlikely to occur frequently, they should be included in the assessment.

More commonly, the effects of a project on heritage sites are of an adverse nature. Adverse impacts occur under conditions that include:

- (a) destruction or alteration of all or part of a heritage site;
- (b) isolation of a site from its natural setting; and
- (c) introduction of physical, chemical or visual elements that are out-of-character with the heritage resource and its setting.

Adverse effects can be more specifically defined as direct or indirect impacts. Direct impacts are the immediately demonstrable effects of a project which can be attributed to particular land modifying actions. They are directly caused by a project or its ancillary facilities and occur at the same time and place. The immediate consequences of a project action, such as slope failure following reservoir inundation, are also considered direct impacts.

Indirect impacts result from activities other than actual project actions. Nevertheless, they are clearly induced by a project and would not occur without it. For example, project development may induce changes in land use or population density, such as increased urban and recreational development, which may indirectly impact upon heritage sites. Increased vandalism of heritage sites, resulting from improved or newly introduced access, is also considered an indirect impact. Indirect impacts are much more difficult to assess and quantify than impacts of a direct nature.

Once all project related impacts are identified, it is necessary to determine their individual level-of-effect on heritage resources. This assessment is aimed at determining the extent or degree to which future opportunities for scientific research, preservation, or public appreciation are foreclosed or otherwise adversely affected by a proposed action. Therefore, the assessment provides a reasonable indication of the relative significance or importance of a particular impact. Normally, the assessment should follow site evaluation since it is important to know what heritage values may be adversely affected.

The assessment should include careful consideration of the following level-of-effect indicators, which are defined in Appendix D:

- magnitude
- severity
- duration
- range
- frequency
- diversity
- cumulative effect
- rate of change

The level-of-effect assessment should be conducted and reported in a quantitative and objective fashion. The methodological approach, particularly the system of ranking level-of-effect indicators, must be rigorously documented and recommendations should be made with respect to managing uncertainties in the assessment. (*Zubrow, Ezra B.A., 1984*).

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 proven to result in the maximum coverage of an area. This action is defined as;

'an archaeologist being present in the course of the carrying-out of the development works (which may include conservation works), so as to identify and protect archaeological deposits, features or objects which may be uncovered or otherwise affected by the works' (DAHGI 1999a, 28).

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).

Indicators such as surface finds, plant growth anomalies, local information and topography were used in identifying sites of possible archaeological importance. Test probes were done at intervals to determine sub-surface occurrence of archaeological material. The importance of sites was assessed by comparisons with published information as well as comparative collections.

Test excavation is that form of archaeological excavation where the purpose is to establish the nature and extent of archaeological deposits and features present in a location which it is proposed to develop (though not normally to fully investigate those deposits or features) and allow an assessment to be made of the archaeological impact of the proposed development. It may also be referred to as archaeological testing' (DAHGI 1999a, 27).

'Test excavation should not be confused with, or referred to as, archaeological assessment which is the overall process of assessing the archaeological impact of development. Test excavation is one of the techniques in carrying out archaeological assessment which may also include, as appropriate, documentary research, field walking, examination of upstanding or visible features or structures, examination of aerial photographs, satellite or other remote sensing imagery, geophysical survey, and topographical assessment' (DAHGI 1999b, 18).

Scientific Significance

(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 paleoenvironmental 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?

Public Significance

(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?

Ethnic Significance

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

Economic Significance

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

- visitors' willingness-to-pay
- visitors' travel costs
- Integrity and Condition

(a) Does the site occupy its original location?

(b) Has the site undergone structural alterations? If so, to what degree has the site maintained its original structure?

(c) Does the original site retain most of its original materials?

(d) Has the site been disturbed by either natural or artificial means?

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?

Indicators of Impact Severity

Magnitude

The amount of physical alteration or destruction which can be expected. The resultant loss of heritage value is measured either in amount or degree of disturbance.

Severity

The irreversibility of an impact. Adverse impacts which result in a totally irreversible and irretrievable loss of heritage value are of the highest severity.

Duration

The length of time an adverse impact persists. Impacts may have short-term or

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temporary effects, or conversely, more persistent, long-term effects on heritage sites.

Range

The spatial distribution, whether widespread or site-specific, of an adverse impact.

Frequency

The number of times an impact can be expected. For example, an adverse impact of variable magnitude and severity may occur only once. An impact such as that resulting from cultivation may be of recurring or on-going nature.

Diversity

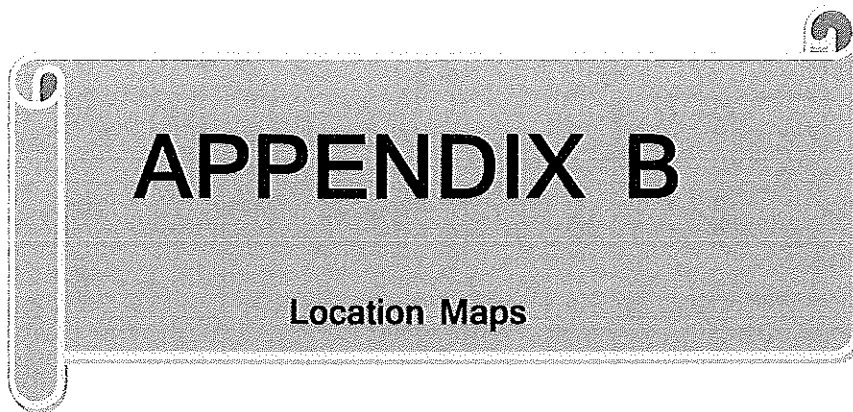
The number of different kinds of project-related actions expected to affect a heritage site.

Cumulative Effect

A progressive alteration or destruction of a site owing to the repetitive nature of one or more impacts.

Rate of Change

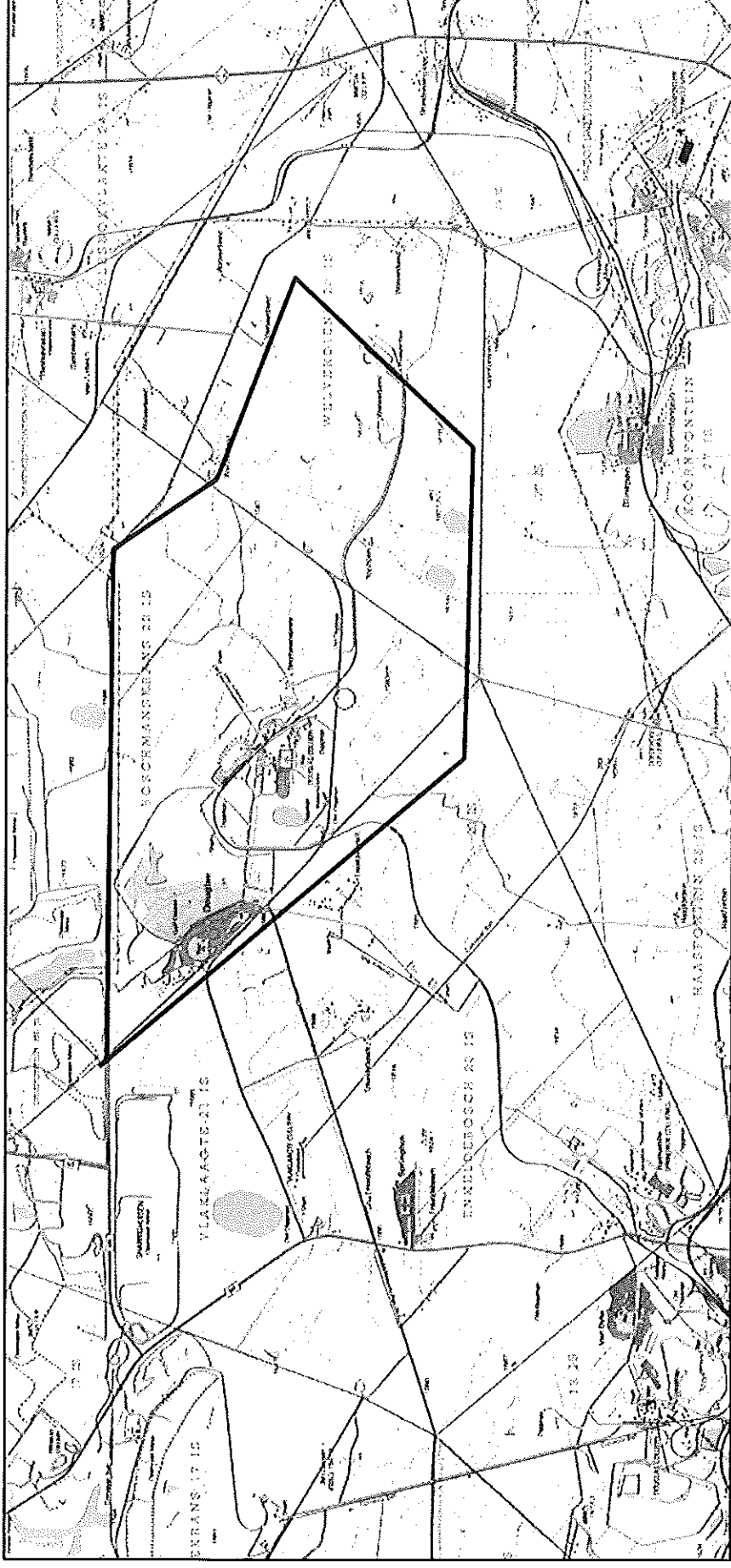
The rate at which an impact will effectively alter the integrity or physical condition of a heritage site. Although an important level-of-effect indicator, it is often difficult to estimate. Rate of change is normally assessed during or following project construction.



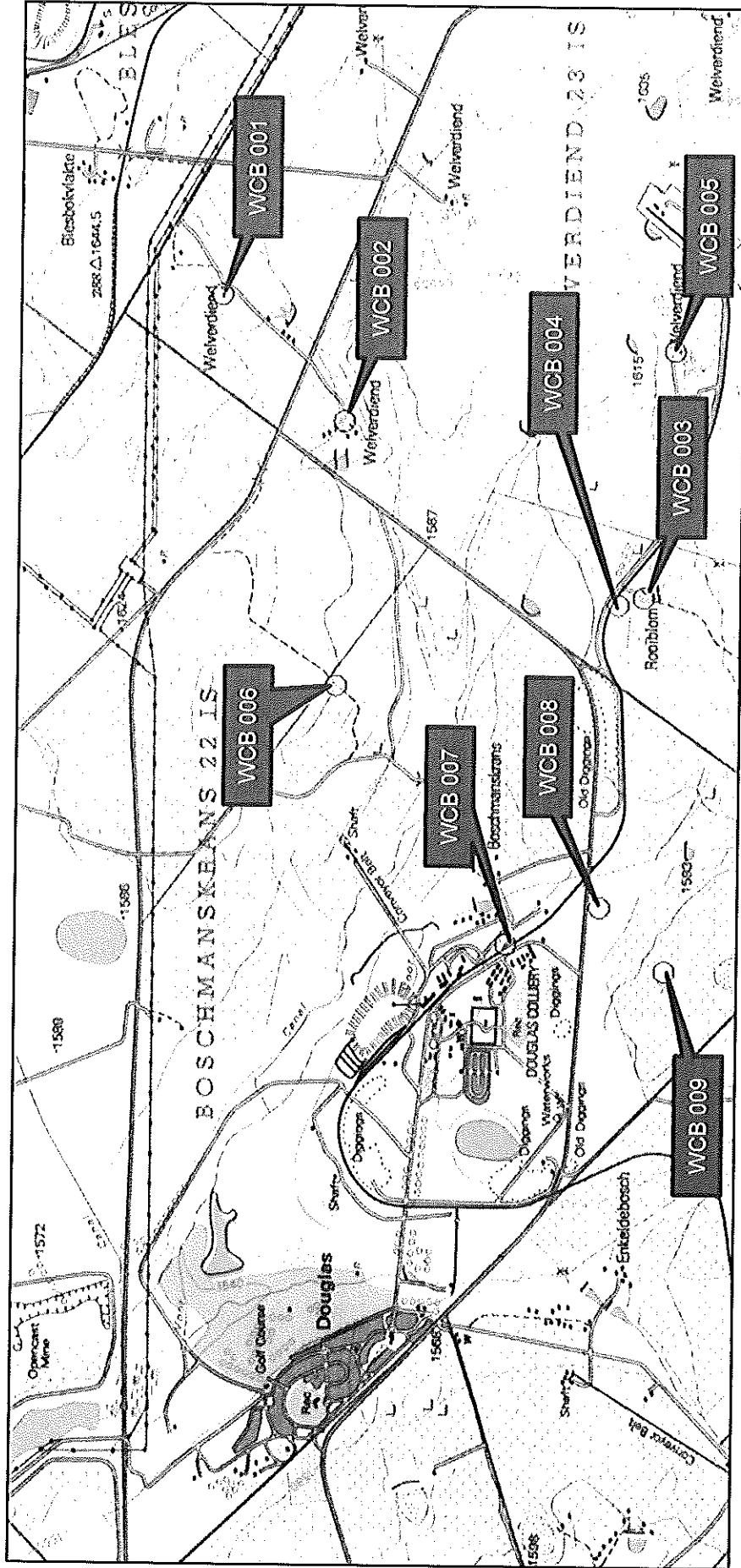
APPENDIX B

Location Maps

Location of the study area for the project – red outline



Location of identified sites
located in the study area



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Aerial photograph showing heritage sites



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Proposed buffer zone for the burial ground located at WCB 004



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Proposed buffer zone for the structure located at WCB 003

