
HERITAGE IMPACT ASSESSMENT, EIA REPORT

PROPOSED ALLDAYS PHOTOVOLTAIC (PV)/
CONCENTRATED PHOTOVOLTAIC (CPV) SOLAR ENERGY
FACILITY on the Farm Gotha 102 MS near Alldays in the
Limpopo Province.

Prepared By:



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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.

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 S. Gaigher

A handwritten signature in black ink, appearing to read 'S. Gaigher', with a period at the end. The signature is written in a cursive, slightly stylized font.

Site name and location: PROPOSED ALLDAYS PHOTOVOLTAIC (PV)/ CONCENTRATED PHOTOVOLTAIC (CPV) SOLAR ENERGY FACILITY on the farm Gotha 102 MS near Alldays, Limpopo Province.

Municipal Area: Capricorn District Municipality.

Developer: BioTherm Energy

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

Date of Report: October 2012

Management Summary

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 construction of a new - Photovoltaic (up to 75 MW) Power Generation Solar Plant on the Farm Gotha 102 MS (the "Farm") near Alldays, Limpopo Province. The site will impact on an area of approximately 175 ha of the Farm and is therefore subjected to an Environmental Impact Assessment (EIA).

The purpose of the HIA phase of the study is to determine the possible occurrence of sites with cultural heritage significance within the study area and the evaluation of the heritage significance of these sites as well as the possible impacts on such sites by the proposed development.

Findings

The area under investigation falls outside of the perimeter of the Mapungubwe World Heritage Site and Cultural Landscape. The areas investigated showed no indications of occupational sites and the area is also not geographically suitable for occupation. Although only 175 00 ha is proposed for the development, a significant buffer zone around this area was investigated to ensure that movements in the actual placement of the site would not affect any area of heritage significance.

Recommendations

No site specific recommendations are necessary.

Fatal Flaws

No fatal flaws were identified.

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List of Abbreviations

Bp	Before Present
PV	Photovoltaic
EIA	Early Iron Age
ESA	Early Stone Age
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
WHS	World Heritage Site

EIA Heritage Impact Report for the Proposed 90/100 MW Alldays Photovoltaic Array

Introduction

Legislation and methodology

G&A Heritage was appointed by Savannah Environmental cc to undertake a heritage impact assessment for the PROPOSED ALLDAYS PHOTOVOLTAIC (PV)/ CONCENTRATED PHOTOVOLTAIC (CPV) SOLAR ENERGY FACILITY (up to 75MW export) on the farm Gotha 102 MS in the Limpopo Province. Section 27(1) of the South African Heritage Resources Act (25 of 1999) 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.

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 as well as living heritage. 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 scoping study are as follows;

- Field investigations were hampered in areas with heavy plant growth.
- Sites were evaluated by means of description of the cultural landscape and analysis of written sources and available databases as well as field investigations.
- It was assumed that the site location as provided by Savannah Environmental cc is accurate.

- We assumed that the public participation process performed as part of the Scoping and Environmental Impact Reporting (S&EIR) process will be sufficiently encompassing not to be repeated in this 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	No impact	None
	35	Archaeological, paleontological and meteor sites	Possible Impact	HIA
	36	Graves and burial sites	Possible Impact	HIA
	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	Various distribution power lines and access roads
Construction of a bridge or similar structure exceeding 50m in length.	No	N/A
Development exceeding 5000 m ²	Yes	90/100 MW PV Solar Array
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	N/A
Any other development category, public open space, squares, parks or recreational grounds	No	N/A

Background Information Proposed Alldays PV Array

Project Description

The Alldays Solar Array is proposed on a section of the farm Gotha 102 near Alldays in the Limpopo Province. The project will entail the construction of up to 75 MW (export capacity) Concentrated Photovoltaic (CPV)/Photovoltaic (PV) Solar Array on approximately ~175 ha with associated infrastructure such as access roads and distribution lines. The electricity generated at this site will be integrated into the national grid via the Venetia Sub-Station to the north of the site, across the road on the Venetia diamond mine land.

Site Location

The proposed development site is located on a 175 ha portion of the farm Gotha 102 MS, near Alldays in the Limpopo Province. This farm is located directly south of the DeBeers Venetia Diamond mine.



Present Landscape



Figure 1. Aerial View of Study Area

The red opaque area indicates the study area including the buffer zone.

Alternatives Considered.

No alternatives were considered.

Methodology

This study defines the heritage component of Environmental Impact Assessment process being undertaken for the Proposed Alldays Photovoltaic Solar Array. It is described as a Heritage Impact Assessment. This report attempts to evaluate the accumulated heritage knowledge of the area as well as the heritage sensitivity of proposed development areas.

Evaluating Heritage Impacts

The 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
- SAHRA Database of Heritage Studies
- Mapungubwe World Heritage Visitors Centre
- Internet Search
- Historic Maps
- 1936 and 1952 Surveyor General Topographic Map series
- 1952 1:10 000 aerial photo survey
- Google Earth 2011 & 2003 imagery
- Published articles and books
- JSTOR Article Archive

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.

The main impact is considered to be on the Mapungubwe Cultural Landscape, however taken into account the fact that the study area is outside of the Mapungubwe WHS Buffer Zone (3km) and is obscured by the extensive visual impacts of the Venetia Diamond Mine dumps, the actual visual impact is anticipated to be low.

Assumptions and Restrictions

- It is assumed that the SAHRA database locations are correct
- It is assumed that the social impact assessment and public participation process of the EIA phase will result in the identification of any intangible sites of heritage potential.

Heritage Indicators within the Receiving Environment Regional Cultural Context

Stone Age

The Stone Age sites of this area fit within the later Earlier Stone Age and the Middle Stone Age periods, and this section therefore discusses the relevant industries, beginning with the Acheulean. The rate of change seen in the lithics of the Acheulean is slow (Klein 2000), but by the later Acheulean, knappers were familiar with a more extensive range of options which become more refined in the MSA, such as the prepared core technique and blade production (Barham 2000a, Beaumont & Vogel 2006). The transition from the end of the Acheulean to the MSA is complex and controversial and has been described as the most important event to occur in the later Middle Pleistocene (Tryon 2006). Traditionally the disappearance of handaxes and cleavers has defined the MSA in South Africa. In other

words, when the large cutting tools of the Acheulean seem to be replaced with points of bone or stone, industries are attributed to the MSA. However, early MSA sites are very rare and this paucity of information tends to exaggerate the differences between the Acheulean and the MSA.

In the past, a number of researchers have recognized industries that are 'transitional' between the ESA and MSA. At the 1955 Panafrican Congress the term 'First Intermediate Period' was adopted to describe this transition period between the ESA and MSA (McBrearty 1988). The term was then dropped at the Burg Wartenstein symposium of 1965 due to insufficient field evidence. However, a number of researchers still support the argument for transitional industries, and these are discussed in the sections below.

Therefore while the ESA with bifaces generally gives way to an MSA without bifaces, in some areas 'transitional' industries' defined as the Sangoan and Fauresmith have been recognized. This 'transitional' status has meant that the Sangoan is frequently referred to as a final ESA industry (Clark 1959), but some researchers consider it to represent the early MSA (Davies 1976, Van Peer *et al.* 2003). Van Riet Lowe (1947) placed the Fauresmith at the end of the ESA, while Beaumont & Vogel (2006) define the Fauresmith as the MSA, arguing that it is older than 500,000 years old. More recently a number of researchers have again been researching these industries (e.g., M. Chazan, F. Rheinhardt), and they argue that while they are problematic, they do in fact exist (McBrearty 1988). Although no good dates are available for the Sangoan, it seems to appear at approximately 300,000 years ago and is associated with the appearance of more evolved hominids (McBrearty 1988, White *et al.* 2003). The variation seen in artefacts at this time is complex and although the terms Sangoan and Fauresmith are the traditional industry names for this period, actually pigeonholing assemblages within these industries is difficult.

Iron Age

The Early Iron Age is the best represented in this area with several Late Iron Age to be found as well. The Mapungubwe and K2 sites are the best known of the Early Iron Age sites. Sites that are culturally related to K2 and Mapungubwe have been observed on Hamilton 41 MS, Samaria 28 MS and Den Staat 27 MS. Another site related to Mapungubwe was excavated by Van Ewyk (1987) on Skutwater to the east of Greefswald. Small Iron Age sites postdating Mapungubwe and K2 have been recorded on Greefswald, including some stone-walled sites on hilltops. All of these sites are more than 25km away from the proposed development. It seems likely that the occurrence of ridges or "koppies" is a limiting requirement for the development of such sites over time. None such structures were present in the study area.



Mapungubwe Hill

Some of these sites have been identified by T.N. Huffman as Khami type ruins. According to oral tradition, communities belonging to the Lea and Twamamba tribes, related to the Venda and the Shona-speaking people, settled in the Greefswald region in historical times.

They were followed, after c. AD 1700, by Sotho-speaking people. The seasonal presence of tsetse fly in the Lowveld during the 19th century made cattle herding difficult for the Iron Age communities (Fuller 1923). Malaria made living conditions still worse. As a result, the Greefswald area was used only for hunting from around 1900 until after the 1920s. When gold was discovered in stone-walled sites north of the Limpopo River, prospectors and treasure hunters began to search for similar sites south of the Limpopo River.

The Historic Era

Mapungubwe (+/- 30km north of the proposed development) was the largest settlement in the subcontinent in the 13th century AD before it was abandoned. Various communities settled in the vicinity over the next 600 years. Legends and rumours about the place were passed on from generation to generation. Karel Moerschell, a local German farmer, knew about the gold by 1911, but it was not until the 1930s that the significance of Mapungubwe became more widely known.

On 31 December 1932, a local informant, Mowena, led E.S.J. van Graan, and four others to Greefswald farm on Mapungubwe Hill where they saw stone walls and recovered gold and iron artefacts, pottery and glass beads. The finds, which received wide publicity in the media, were reported to the head of the Department of History at the University of Pretoria, Professor Leo Fouché. As a result of his intervention, the University negotiated with the owner of the property, E.E. Collins.

In a legal agreement the University took ownership of the gold and other artefacts and secured an option and contract for excavation rights. The University also successfully requested a postponement of prospecting, mining and related activities on Greefswald. In June 1933, Greefswald was bought by the Government and excavation rights were granted to the University of Pretoria.

The University established an Archaeological Committee, which from 1933 to 1947 oversaw research and excavations. Rev. Neville Jones from Zimbabwe and J.F. Schofield were appointed to undertake the first fieldwork in 1934 and 1935 and they were advised by Professor C van Riet Lowe, Director of the Bureau of Archaeology. Their work focused on Mapungubwe Hill, the southern terrace and the midden there. They briefly surveyed other similar sites in the vicinity.

From 1935-1940 six excavation seasons at K2 and Mapungubwe Hill were directed by Guy A. Gardner. The results of his work were published nearly 25 years later. Meyer (1998) describes the excavations on Greefswald between 1933 and 1940 as 'rapid, large scale excavations resulting in the recovery of valuable artefacts'. Research was hampered by 'the lack of professional archaeologists in South Africa, the lack of full-time supervision of the excavations by efficient, trained staff, the fact that adequate scientific methods for Iron Age research had not yet been developed and that the Iron Age in South Africa was virtually unknown to archaeologists. Consequently, many of the deposits on the sites were removed without the meticulous excavation and recording required. These problems inevitably resulted in a loss of irreplaceable deposits and eventually also of excavated materials [and] a lack of scientific data.'

The next phase of archaeological investigation, in 1953- 1954 and in 1968-1970, under the direction initially of the Department of Anthropology, and then of Professor J F Eloff who was appointed as Head of the newly-formed Department of Archaeology at the University of Pretoria in 1970, was more systematic and focused mainly on the southern terrace.

Over the next 25 years from 1970 to 1995, the Department of Archaeology at the University of Pretoria recognised that their first priority was to establish a firm data base by testing, correcting and supplementing the earlier research, and concentrating on reconstructing the way of life of the site inhabitants. Between 1979 and 2002 reports have been published on the human and faunal remains, Chinese porcelain, gold objects, glass beads and radiocarbon dating.

In addition, sites on neighbouring farms have been investigated by students of the University of Pretoria during the 1970s and 1980s.

Greefswald has remained the property of the State since the 1930s. Management of the farm was taken over by the provincial Department of Nature Conservation in 1992, and control was transferred to SANParks in 1999.

The proposed boundaries of the world heritage site coincide with the boundaries of the proposed Vhembe- Dongala National Park - which is still in the process of formation. It is being inscribed sequentially - with three areas properties already gazetted. These are Den Staat, Geefswald and Reidal which are areas of 'natural' landscape in which are many of the principal archaeological sites.

The aim is for SANParks eventually to acquire all the land within the proposed park or to have contractual agreement with the owners. This will allow the land to be taken out of agriculture and revert to 'natural' landscape. A chart of the current progress with land negotiations is included in the nomination. Currently there are 'in principle' agreements for 11 of the remaining 29 land units, but the timetable is missing. These are currently used for different purposes: some are being cultivated using irrigation agricultural techniques based on water extracted from the Limpopo river, some are managed as game reserves, and others are owned by the De Beers Corporation and are used to ensure water extraction, storage, and provision for that organization's diamond mining activities, which are

estimated to have a maximum working life of twenty years.- *Source – Advisory Body Evaluation*

Cultural Landscape

The most prominent cultural landscape identified is the Mapungubwe World Heritage Site and Cultural Landscape. The study area lies on the southern edge of the buffer zone for this area; however it is still recommended that the possible impacts on it be evaluated. The current National buffer zone is defined by the Venetia Mine access road and this places the development just outside of the buffer zone by approximately 1km, while the UNESCO buffer zone is another 7-8km further north from the proposed development. As per the March 2012 Draft of the Mapungubwe WHS Management Plan, the UNESCO buffer zone will be used as the active buffer.

The following landscape types could possibly be present in the study area.

Landscape Type	Description	Occurrence still possible?	Likely occurrence?
1 Paleontological	Mostly fossil remains. Remains include microbial fossils such as found in Baberton Greenstones	Yes, sub-surface	Unlikely
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	Unlikely
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	No
4 Historic Farmland	These possess distinctive patterns of settlement and historical features such as: <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	No
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 - Historical structures/settlements older 	Yes	Likely

	<ul style="list-style-type: none"> - 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	Unlikely
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,	Unlikely
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 	Yes	No
11 Historic institutions	<ul style="list-style-type: none"> - Historical prisons - Hospital sites - Historical school/reformatory sites - Military bases 	No	Unlikely
12 Scenic visual	<ul style="list-style-type: none"> - Scenic routes 	Yes	Mapungubwe Cultural Landscape
13 Amenity landscape	<ul style="list-style-type: none"> - View sheds - View points - Views to and from - Gateway conditions - Distinctive representative landscape 	No	No

	conditions - Scenic corridors		
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The Mapungubwe Cultural Landscape in Terms of this Project

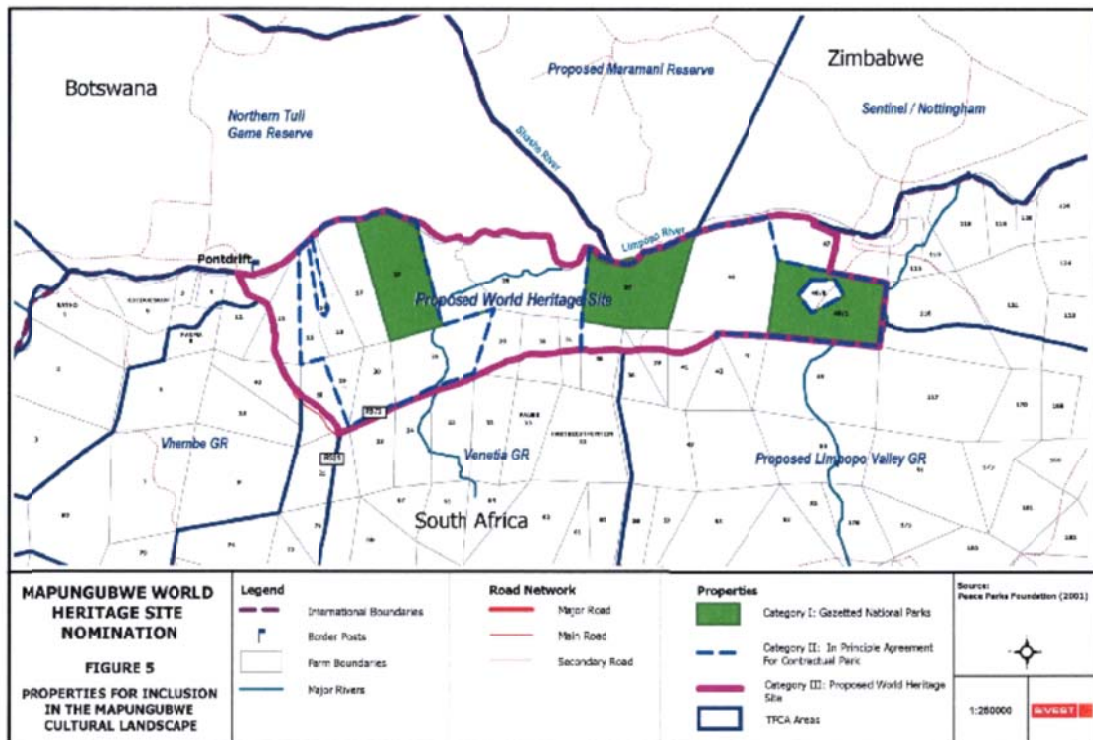
The Mapungubwe Conservation Area includes the areas under the administration of the Venetia Mine and especially its nature reserve. Much of the areas now included in the Mapungubwe National Park were once under the management and protection of the Venetia Conservation Society. These areas are being managed as natural areas around the central mining area of the Venetia mine itself. In itself it serves as a buffer zone for the industrial activities at the mine and the recently formed Mapungubwe National Park. This buffer zone lies approximately 3km north of the site.

A buffer zone serves to provide an additional layer of protection to a World Heritage property. The concept of a buffer zone was first included in the Operational Guidelines for the implementation of the World Heritage Convention in 1977. In the most current version of the Operational Guidelines of 2005 the inclusion of a buffer zone into a nomination of a site to the World Heritage List is strongly recommended but not mandatory.

Many World Heritage properties face problems that directly or indirectly derive from the situation of their buffer zone. New constructions within a buffer zone may have an impact on the World Heritage property and could threaten its Outstanding Universal Value; a different legal status of a buffer zone could also impact the conservation, the protection or management plan of a site.

The activities described in this report is concentrated and limited to areas outside of the proposed buffer zone of the Mapungubwe World Heritage Site. This means that the boundaries of the Mapungubwe Cultural Node (as defined in the World Heritage Site application) are around 30km away from the proposed activity. Secondary impacts such as visual, dust and noise impacts will be mitigated by the Environmental Management Plan

Report as well as the distance from these sites from the proposed activities.



The purple line in the above map shows the extent of the Mapungubwe WHS.

Impacts Anticipated

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

- 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.

2. 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.

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?

Impact Statement

Assessment of Impacts

Heritage Environments that will be affected

Archaeological Sites - Pre-Contact Heritage (Stone Age Sites)

Proposed 90/100 MW site and associated infrastructure (roads and power lines)

Nature of Impacts: All the proposed development activities could negatively affect sites associated with the Stone Age.

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

Nature of Impact: Possible post-contact site could be damaged locally by excavation activities and associated activities		
	Without Mitigation	With Mitigation
Extent	Local (2)	Local (2)
Duration	Long term (5)	Long term (5)
Magnitude	Medium (4)	Low (1)
Probability	Probable (3)	Improbable (1)
Significance	Medium (33)	Low (8)
Status	Negative	Positive
Reversibility	Irreversible	Irreversible
Irreplaceable loss of resource	Yes	No
Can impacts be mitigated	No	Yes
Mitigation	Excavation activities should be monitored by a qualified heritage practitioner	
Cumulative impacts	None	
Residual impacts	Loss of heritage related information	

Paleontological sites

Nature of Impacts: No paleontological sites of high value could be identified. Paleontological sites could be affected if bedrock was to be disturbed during the excavation activities associated with the construction of the pylon foundations. It was however determined that the ground intrusion of the development would be limited and that base rock would not be affected. A paleontological study for this general area was commissioned, however and can be made available should it be found necessary.

Extent of Impact: Localised damage to possible paleontological sites where bedrock is close to the surface or exposed.

Nature of Impact: Paleontological sites could be affected if bedrock was to be disturbed during the excavation activities associated with the construction.		
	Without Mitigation	With Mitigation
Extent	Local (2)	Local (2)
Duration	Short term (2)	Long term (5)
Magnitude	Low (2)	Low (1)
Probability	Improbable (2)	Improbable (1)
Significance	Low (12)	Low (8)
Status	Negative	Positive
Reversibility	Irreversible	Reversible
Irreplaceable loss of resource	Yes	No
Can impacts be mitigated	No	Yes
Mitigation	No further mitigation is recommended provided bedrock is not to be disturbed	
Cumulative impacts	None	
Residual impacts	None	

Mitigation

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

Built Environment

Although some built structures were noted, none will be affected by the proposed development.

Nature of Impacts: No built environment sites were located within the study area.

Extent of Impact: No damage is anticipated as no sites were identified.

Nature of Impact: No sites falling within the Built Environment were identified within the study.		
	Without Mitigation	With Mitigation
Extent	Local (1)	Local (1)
Duration	Short term (1)	Long term (1)
Magnitude	Low (1)	Low (1)
Probability	Improbable (1)	Improbable (1)
Significance	Low (3)	Low (3)
Status	Positive	Positive
Reversibility	Reversible	Reversible
Irreplaceable loss of resource	No	No
Can impacts be mitigated	Yes	Yes
Mitigation	No further mitigation is recommended	
Cumulative impacts	None	
Residual impacts	None	

Mitigation

No sites were identified and therefore no mitigation is recommended.

Cultural Landscape

Several possible cultural landscape components were identified especially associated with the Mapungubwe WHS Cultural Landscape.

Nature of Impacts: The construction of the PV/CPV Site could result in alterations to the cultural characteristics of the landscape.

Extent of Impact: Limited impacts on the cultural landscape are anticipated.

Nature of Impact: Limited impacts on the cultural landscape are anticipated.		
	Without Mitigation	With Mitigation
Extent	Local (2)	Local (2)
Duration	Short term (2)	Long term (2)
Magnitude	Low (1)	Low (1)
Probability	Improbable (3)	Improbable (3)
Significance	Low (15)	Low (15)
Status	Positive	Positive
Reversibility	Reversible	Reversible
Irreplaceable loss of resource	No	No
Can impacts be mitigated	Yes	Yes
Mitigation	No further mitigation is recommended	
Cumulative impacts	None	
Residual impacts	None	

Mitigation

No further mitigation is recommended.

Selection of alternatives

No alternatives were indicated.

Conclusion

The of up to 75 MW export capacity site could be constructed in any part of the study area as no culturally sensitive sites were identified. The site lies 3km south of the boundary of the Mapungubwe WHS and Cultural Landscape, however no impacts on this aspect is anticipated.

Heritage Management Planning

Minimising the impact on Archaeological Sites (as per the NHRA)

Objective 1: Minimising the impact on archaeological sites
The construction of the PV/CPV array could impact on unidentified sites of archaeological importance.

Project Component	PV/CPV Array, power lines, roads and construction camps
Potential Impact	Destruction of sub-surface archaeological sites
Activity/Risk source	Foundations, power lines and roads
Mitigation Target	Conserve archaeological sites

Mitigation: Action	Responsibility	Time Frame
Monitoring of any excavation activities during the construction phase of the project.	Contracting of a qualified heritage practitioner to monitor excavations	During excavations associated with the construction phase

Performance Indicator	No destruction of archaeological sites
Monitoring	Monitoring during excavation phase

Minimising the impact on the cultural landscape (as per the NHRA)

Objective 1: Minimising the impact on the cultural landscape
The proposed site lies outside of the southern boundary of the buffer zone for the Mapungubwe WHS and Cultural Landscape. The possible impact on this landscape type should be avoided.

Project Component	PV/CPV Array, power lines, roads and construction camps
Potential Impact	Negative impacts on the cultural landscape
Activity/Risk source	PV/CPV Array, power lines and roads
Mitigation Target	Preservation of cultural landscape components

Mitigation: Action	Responsibility	Time Frame
Mapungubwe WHS management should be informed of the development and any changes in the buffer zone should be re-evaluated.	Environmental Manager	Continuous

Performance Indicator	No impact on Mapungubwe WHS and Cultural Landscape
Monitoring	Throughout construction phase

Minimising the impact on Unidentified Sites (as per the NHRA)

Objective 1: Minimising the impact on unidentified sites
Unidentified or sub-surface sites could still be encountered during the construction phase

Project Component	PV/CPV Array, power lines, roads and construction camps
Potential Impact	Destruction of unidentified sites
Activity/Risk source	Foundations, power lines and roads
Mitigation Target	Minimize impact on unidentified sites

Mitigation: Action	Responsibility	Time Frame
Monitoring of excavation activities during the construction phase of the project.	Contracted heritage practitioner	During construction phase

Performance Indicator	No destruction of archaeological sites
Monitoring	Monitoring during construction phase

Minimising the impact on Burial and Grave Sites (as per the NHRA)

Objective 1: Minimising the impact on burial and grave sites
The placement of the PV/CPV Array and associated infrastructure could impact on unidentified burial or grave sites

Project Component	PV/CPV Array, power lines, roads and construction camps
Potential Impact	Destruction of grave and burial sites
Activity/Risk source	PV/CPV Array foundations, power lines and roads

Mitigation Target	Mitigate impacts on burial or grave sites
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Mitigation: Action	Responsibility	Time Frame
On uncovering a possible grave or burial site it is imperative that construction be ceased immediately. The area should be marked and a heritage practitioner be informed immediately.	Environmental control officer	Immediately

Performance Indicator	Mitigation of burial and grave sites
Monitoring	No monitoring is required

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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*).

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 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

1:50 000 Map Location
Map Reference 2229 DA

