

Phase 1 Heritage Impact Assessment Report

HERITAGE IMPACT ASSESSMENT FOR THE
PROPOSED NEW MODDER EXT 6 LIGHT INDUSTRIAL
DEVELOPMENT ON PART OF THE REMAINDER OF
PORTION 1 OF THE FARM MODDERFONTEIN 76 IR
NEAR BENONI, EKURHULENI METROPOLITAN
MUNICIPALITY, GAUTENG PROVINCE.

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Statement of Independence

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

SIGNED OFF BY: STEPHAN GAIGHER



MANAGEMENT SUMMARY

Site name and location: Proposed New Modder Ext 6 Light Industrial Development on Part of the Remainder of Portion 1 of the Farm Modderfontein 76 IR near Benoni, Ekurhuleni Metropolitan Municipality, Gauteng Province.

Municipal Area: Ekurhuleni Metropolitan Municipality, Gauteng Province.

Developer: James Ross Stewart – New Modder Township (Pty) Ltd

Consultant: G&A Heritage, PO Box 522, Louis Trichardt, 0920, South Africa.
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Date of Report: 11 December 2017

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 Proposed New Modder Ext 6 Light Industrial Development on Part of the Remainder of Portion 1 of the Farm Modderfontein 76 IR near Benoni, Ekurhuleni Metropolitan Municipality, Gauteng Province.

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

Scope of Work

A Heritage Impact Assessment (including Archaeological, Cultural heritage, Built Heritage and Paleontological Assessment) to determine the impacts on heritage resources within the study area.

The following are the required to perform the assessment:

- A desk-top investigation of the area;
- A site visit to the proposed development site;
- Identify possible archaeological, cultural, historic, built and paleontological sites within the proposed development area;
- Evaluate the potential impacts of construction and operation of the proposed development on archaeological, cultural, historical resources; built and paleontological resources; and
- Recommend mitigation measures to ameliorate any negative impacts on areas of archaeological, cultural, historical, built and paleontological importance.

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

Findings & Recommendations

The area was investigated during a field visit and through archival studies. It is not anticipated that the development will be bedrock intrusive and as such a paleontological deposits will not be affected.

The site was found to be devoid of any heritage sites with significance. It is recommended that obscured, subterranean sites be managed, if they are encountered.

Fatal Flaws

No fatal flaws were identified.

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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 NEW MODDER EXT 6 LIGHT INDUSTRIAL DEVELOPMENT ON PART OF THE REMAINDER OF PORTION 1 OF THE FARM MODDERFONTEIN 76 IR.

1. INTRODUCTION

Legislation and methodology

G&A Heritage was appointed by **Galago Environmental** to undertake a heritage impact assessment for the proposed New Modder Ext 6 Light Industrial Development on Part of the Remainder of Portion 1 of the Farm Modderfontein 76 IR near Benoni in the Ekurhuleni Metropolitan Municipality, Gauteng Province.

Section 38(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.

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

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

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

- (3) *The responsible heritage resources authority must specify the information to be provided in a report required in terms of subsection (2) (a): Provided that the following must be included:*
 - (a) *The identification and mapping of all heritage resources in the area affected;*
 - (b) *An assessment of the significance of such resources in terms of the heritage assessment criteria set out in section 6 (2) or prescribed under section 7;*

- (c) An assessment of the impact of the development on such heritage resources;*
- (d) An evaluation of the impact of the development on heritage resources relative to the sustainable social and economic benefits to be derived from the development;*
- (e) The results of consultation with communities affected by the proposed development and other interested parties regarding the impact of the development on heritage resources;*
- (f) If heritage resources will be adversely affected by the proposed development, the consideration of alternatives; and*
- (g) Plans for mitigation of any adverse effects during and after the completion of the proposed development.*
 - (1) Ancestral graves,
 - (2) Royal graves and graves of traditional leaders,
 - (3) Graves of victims of conflict (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;

- 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 **Galago Environmental** is accurate.
- We assumed that the public participation process performed as part of the 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	Yes	Management Guidelines
	35	Archaeological, paleontological and meteor sites	No impact	None
	36	Graves and burial sites	Possible Impact	Management Guidelines
	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.	No	N/A
Construction of a bridge or similar structure exceeding 50m in length.	No	N/A
Development exceeding 5000 m ²	Yes	Proposed New Modder Ext 6 Light Industrial Development on Part of the Remainder of Portion 1 of the Farm Modderfontein 76 IR
Development involving more than 3 erven or sub divisions	No	N/A
Development involving more than 3 erven or sub divisions that have been consolidated in the past 5 years	No	N/A
Re-zoning of site exceeding 10 000 m ²	No	N/A

Any other development category, public open space, squares, parks or recreational grounds	No	N/A
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2. BACKGROUND INFORMATION

2.1 PROJECT BACKGROUND

This study focuses on the proposed New Modder Ext 6 Light Industrial Development on Part of the Remainder of Portion 1 of the Farm Modderfontein 76 IR near Benoni in the Ekurhuleni Metropolitan Municipality, Gauteng Province.

2.2 PROJECT LOCATION

New Modder Ext 6 is located on Part of the Remainder of Portion 1 of the Farm Modderfontein 76 IR in the Ekurhuleni Metropolitan Municipality, Gauteng Province.

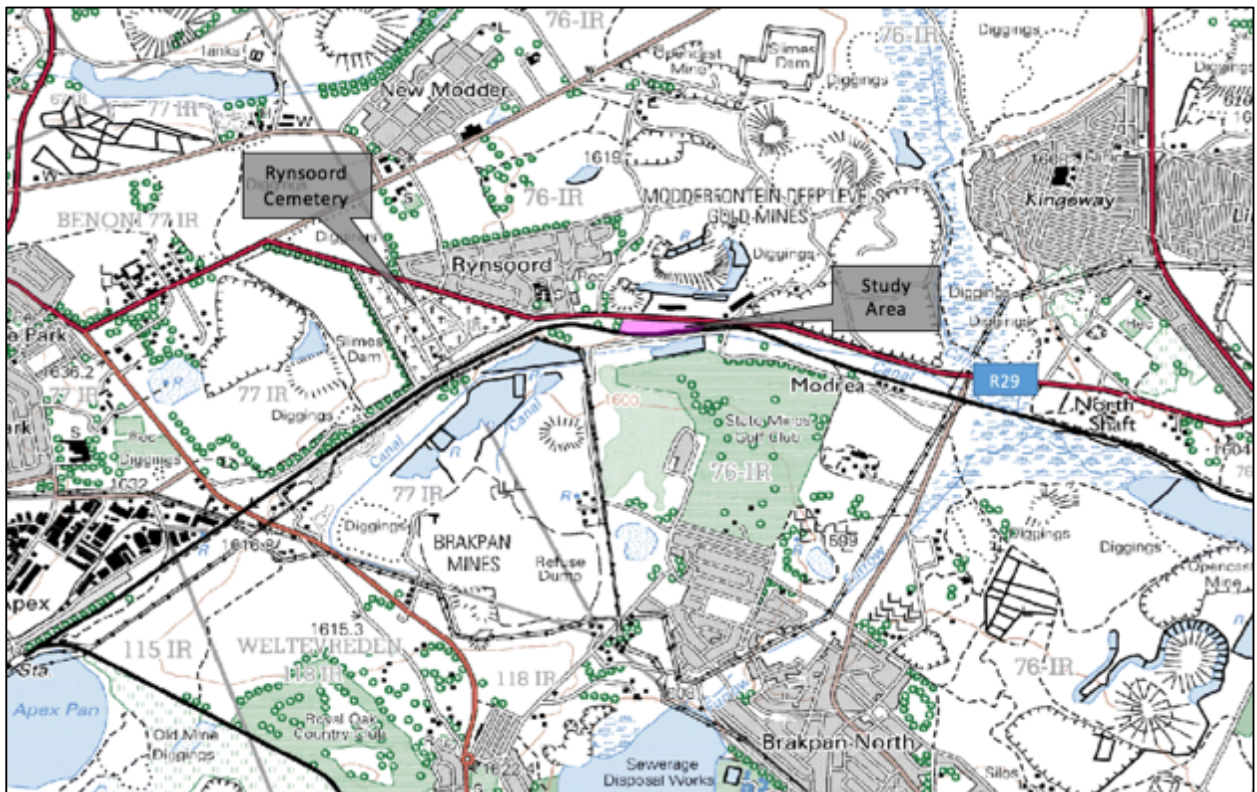


Figure 1. New Modder Ext 6 Location



Figure 2. Google Earth Image of the Study Area

2.3 GPS TRACK PATHS



Figure 3. Track path

HERITAGE INDICATORS WITHIN THE RECEIVING ENVIRONMENT

3. REGIONAL CULTURAL CONTEXT

3.1 PALEONTOLOGY

The palaeontology of Western Gauteng is well researched in areas. The discovery of the Sterkfontein skeletons put this area in the forefront of palaeontology worldwide. The rule of “absence of evidence is not evidence of absence” should be applied to this area. Taken the rich palaeontology of Western Gauteng it is conceivable that similar finds could be made in this area.

3.2 PREHISTORY

In 1929, archaeologists working in South Africa devised a system of dividing the Stone Age into 3 periods, namely the Early Stone Age, the Middle Stone Age and the Later Stone Age.

3.3 STONE AGE

No substantial number of Stone Age sites from any period of the Stone Age is known to exist in this area – primarily as a result of a lack of research and general ignorance amongst the layman in recognizing stone tools that often may occur. However, it is possible that the first humans in the Benoni 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 predecessors of *Homo erectus*, *Australopithecus*, which is considered to be the earliest ancestor of modern 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 (Mitchell 2002). Two Middle Stone Age sites at the Withoek Spruit (Brakpan) were researched 17 years ago, but no information on this discovery has been published.

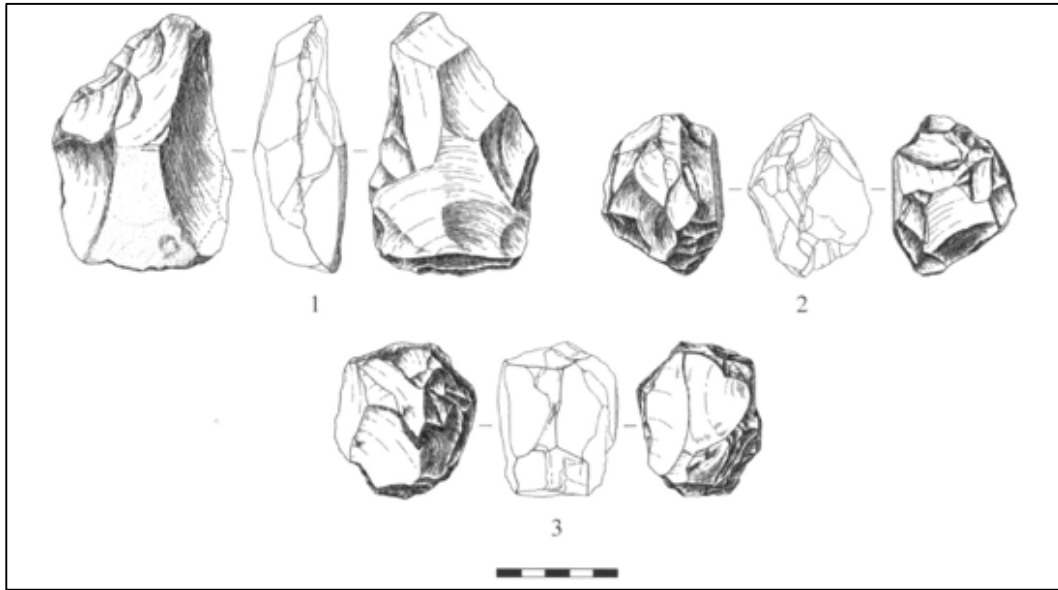


Figure 4. (1) handaxe on flake; (2) thick discoidal core; (3) polyhedral core (Pollarolo, Kuman, Bruxelles, 2010)

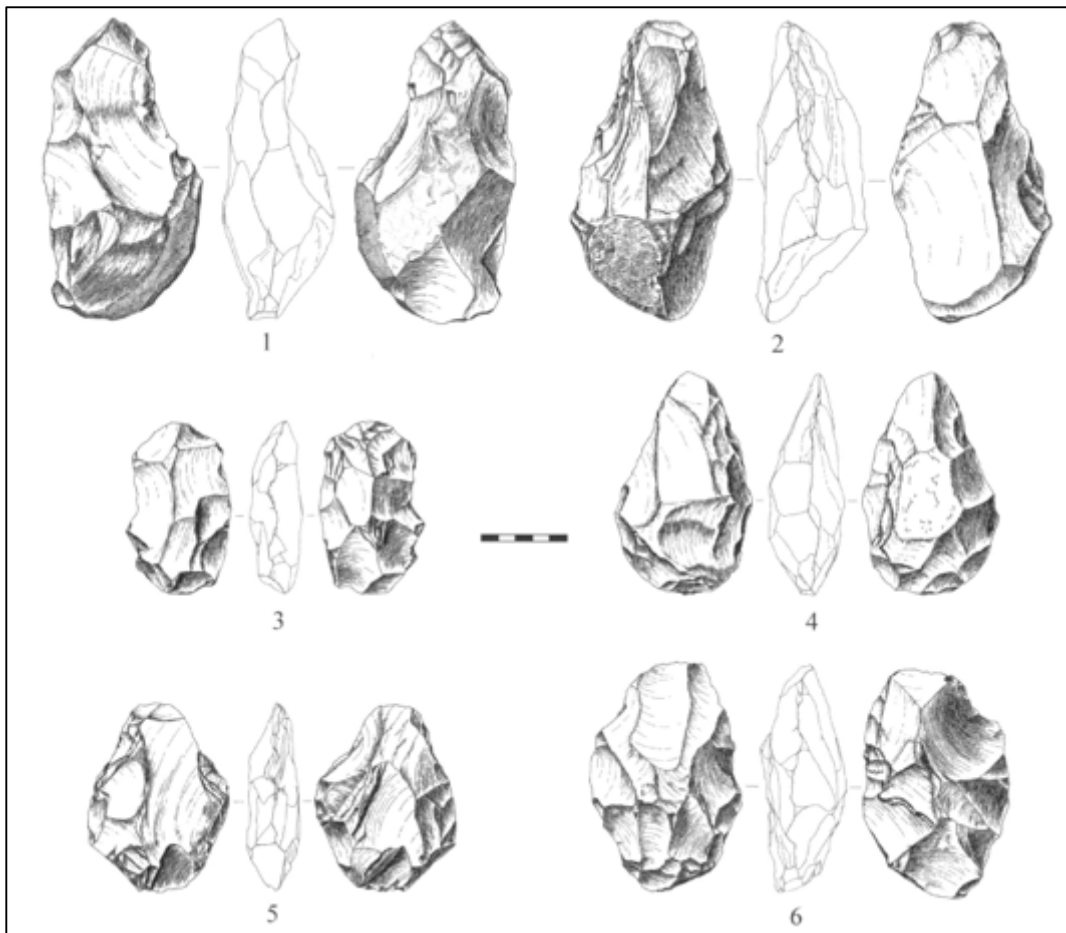


Figure 5. (1,2) Handaxes with large side removal; (3-6) handaxes (Pollarolo, Susino, Kuman, Bruxelles, 2010)

The Late Stone Age, considered to have started some 20 000 years ago, is associated with the predecessors of the San and Khoi Khoi. San hunter-gatherer bands with their small (microlithic) stone tools may have lived in Eastern Gauteng, as a magnificent engraving site near

Duncanville attests to their presence in Vereeniging, south of, but close to Ekurhuleni. Stone Age hunter-gatherers lived well into the 19th century in some places in SA, but may not have been present in Brakpan when the first European colonists crossed the Vaal River during the early part of the 19th century. Stone Age sites may occur all over the area where an unknown number may have been obliterated by mining activities, urbanization, industrialization, agriculture and other development activities during the past decades (Morris 2004).

Reverent Patterson discovered some Stone Age deposits in Benoni during 1933, close to the train station. These were probably from the Middle to Late Stone Age.

3.4 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 of the eastern part of the Klipriviersberg towards Alberton. 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).

The Late Iron Age sites within Ekurhuleni's south-eastern border are a 'spill-over' from a larger concentration which are located further towards the west, in the Witwatersrand, while large concentrations of stone walled sites are also located directly to the south of Johannesburg, in the mountainous area around the Suikerbosrand in Heidelberg. The 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 stocked 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 (Killick 2004).

Some 100 years earlier, African farmers in the Fokeng cluster built stonewalled settlements in the Tshwane area that emphasised the centre/side axis. From the air, these earlier settlements resemble a 'fried egg'; that is, a smooth outer ring about 60 metres across enclosed in a central cattle byre about 20 metres in diameter. This type has its origins among BaFokeng living near the hill Ntsuanatsatsi in the Free State (see pre history of Bloemfontein). When these early BaFokeng people moved north across the Vaal River, they met the ancestors of Southwest Sotho-Tswana, such as BaRolong and BaThlaping. Their interaction helped to create a new type of stonewalling called Klipriviersburg. Besides Johannesburg, Klipriviersburg walling is also found around Pretoria. All of these people were mixed farmers; that is, they herded cattle as well as sheep and goats, and they cultivated sorghums, millets and various beans and peas. They were also capable of making metal tools and jewellery.

The earliest evidence of metal working in the region comes from the site Broederstroom west of Pretoria. Archaeologists have uncovered the remains of at least two stratified villages there that date back to between AD 550 and 700, each with evidence of iron forging. Two major technological steps characterise ancient iron production: smelting and forging. Technically, iron ore is reduced in a furnace to create a bloom. During this smelting process, silica in the host rock melts, flowing off as slag leaving the bloom behind. The bloom has to be forged in an oxidised atmosphere, usually in an open hearth. In both smelting and forging, bellows attached to clay pipes help the operators reach the necessary high temperatures. Culturally, Bantu-speaking people in the recent past compared the smelting process to childbirth, a private and sacred affair. Consequently, the smelter was usually secluded outside the settlement. Forging, in contrast, was comparable to raising the child; and so the forge was located in a public area in the centre of the homestead. The forges at Broederstroom follow this pattern.

<http://www.sahistory.org.za/topic/prehistory-pretoria>

3.5 THE HISTORIC ERA

The first inhabitants of this area were Stone Age hunter-gatherers who roamed here some 50 000 years ago. Remnants of their weapons were found in the Rynfield area and near Cranbourne Station many years ago.

The first Voortrekker parties crossed the Vaal River and started occupying the area in the 1830's. Farmers started moving into the area and declared farms for themselves, especially after the signing of the Sand River convention in 1852.

Benoni's inauspicious beginnings were in 1881 when then surveyor general, Johan Rissik, found it difficult to assign title deeds to all unclaimed state property. He named the area 'Benoni (Son of my Sorrows)' after the name given by Rachel to her son in the biblical book of Genesis.

"Brakpan" was named in 1886, due to the very brackish water from a small pan on the Farm "Weltevreden".

The evolution of the region *Southern Transvaal*, its industrial development, rate of urban development and settlement pattern were greatly influenced by geology and mining, following the discovery of gold deposits in 1886 and coal in 1888.

A gold mine in the Witwatersrand Reef on Rietfontein farm that started up in 1893.

Sir George Farrar, the chairman of a mining company, undertook the planning of the rapidly growing mining town of Benoni in 1904. A river was dammed to create a series of reservoirs for mine use. Benoni was declared a township in 1906.



Figure 6. Earliest known photograph of Benoni (1900 - 1910). Published in East Rand Annual in 1936

The *Brakpan Mines Company* sunk its first two gold mine shafts in 1905. Brakpan remained a suburb of Benoni until 1919 when it was granted the status of a municipality and proclaimed as a town.

The *Rand Rebellion* (or *Rand Revolt*) was an armed uprising of white miners in the Area in March 1922. Following a drop in gold prices, the companies tried to cut their costs by reducing wages and promoting more African miners to skilled and supervisory positions at lower rates.

The strike started on 28 December 1921 and became an open rebellion against the state. The workers armed themselves and took over Brakpan, Benoni and some suburbs of Johannesburg. The strike continued for three months, involving bloody clashes between the miners and the military workers. On 9 March, Prime Minister Smuts issued mobilization orders for the Active Citizens Force and declared martial law. The rebellion was crushed by considerable military power (20 000 troops, artillery, tanks and bomber aircraft) and as the cost of over 200 lives.

During the Apartheid Era (1948 to 1994), it was the discriminatory racial segregation (*apartheid*) legislation, enacted by the Nationalist Party (after coming to power in 1948) that extensively transformed the land-use. Citizens were separated into different townships according to their

race with buffer strips of at least 100m wide or by environmental buffer zones thus the Black South Africans in the area lived in the Brakpan Old Location.

During the Apartheid Era, designated townships for Blacks were established outside Benoni, namely Daveyton and Wattville. The township of Actonville was established for the habitation of Indians, whilst 'Benoni Proper' was reserved for 'whites only'. These various suburbs remain, although the City is today relatively well integrated and all race groups may live where they choose. Each of these suburbs have their own interesting histories.

The Brakpan Old Location was the backdrop to many anti-apartheid struggles. The people living in the location were actively trying to improve their living conditions and to challenge the laws that were suffocating them.

Mbulelo Vizikhungo Mzamane wrote "*Children of Paradise*" to detail the area and the events of the time, through his own eyes as a young boy living in Brakpan Old Location. It is a poignant story of the innocence and trust of a young, black South African, who does not understand the severity of the situation he is caught in. Although beautifully told, it does not provide specific historical references to events unfolding in the area. It does however mention events and places that can be researched through alternative methods.

Vosloorus was established in 1963 when Black Africans were removed from Stirtonville because it was considered by the government too close to a white town. Stirtonville, renamed Reiger Park, has since become home to Boksburg's coloured community. A local authority was established in 1983 when Vosloorus was given full municipal status.

It has been said that Former Pres. Nelson Mandela was hiding out in the Stirtonville area and surrounds.

The community of Brakpan Old Location were forcibly removed from their homes from 1974 to 1978 and had to re-establish themselves in Tskane approximately 15km South. The Old Location was razed.

In 1988, the town councils of Vosloorus and Reiger Park staged a consumer boycott in Boksburg on the East Rand. The boycott by black and coloured residents followed the reintroduction of petty apartheid measures of the Boksburg Town Council, which at the time was controlled by the Conservative Party (CP).

The boycott found enthusiastic corporate support. A number of multinational companies like Colgate-Palmolive, American Cyanamid and Unilever provided buses to ferry shoppers to shops in neighbouring towns, cancelled expansion plans and ran advertisements denouncing the racist Council. The economy of the town suffered and several businesses had to close down.

Since 1978, the recycling of the mine tailings at Brakpan (the largest such dump in the Witwatersrand) has resulted in the recovery of significant residual quantities of gold and uranium.

The Benoni and Brakpan Municipalities were incorporated into the Ekurhuleni metropolitan Municipality in 2001.

Over time gold mining in the area has decreased in importance. Today Benoni is focused more on industry and services, rather than mining, and is used as a service hub for other East Rand towns such as Brakpan, Nigel and Springs. Benoni is also the site of the Benoni Heliport, for the use of helicopters.

Sources:

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SA History Online/Consumer Boycotts

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SA Military History.org
Mbulelo Vizikhungo Mzamane, "Children of Paradise"

3.6 CULTURAL LANDSCAPE

The current superficial character of this specific cultural landscape is one of mixed use: industrial activates, undeveloped and unmanaged urban open areas, illegal dumping and previous mining activities (Modderfontein Deep Levels Gold Mine).

The Benoni / Rynsoord Cemetery is located just 800m west of the study area.



Figure 7. Benoni / Rynsoord Cemetery



Figure 8. Benoni / Rynsoord Cemetery



Figure 9. Undeveloped and unmanaged urban open areas



Figure 10. Undeveloped and unmanaged urban open areas



Figure 11. Undeveloped and unmanaged urban open areas



Figure 12. Undeveloped and unmanaged urban open areas

3.7 PREVIOUS STUDIES

An extensive research into the SAHRIS database resulted in the identification of the following heritage related studies that have been performed over the last decade in the study area. Only studies within a radius of 50km from the study area were considered.

- Pistorius, J.C.C. 2006. A Phase I Heritage Impact Assessment (HIA) Study for a Proposed New Residential Development on the Farm Modderfontein 761R in Benoni in the Gauteng Province, South Africa.

- Van Schalkwyk, J. 2014. Cultural Heritage Impact Assessment for the Proposed Residential Development, Portion 57, Benoni 771R, Ekurhuleni, Gauteng Province.
- Kusel, U. 2007. Cultural Heritage Resource Impact Assessment of the Farm Vlaklaagte 161 Tsakane Benoni Gauteng.
- Van der Walt, J. 2008. Archaeological Impact Assessment on Remainder of Portion 7 of the Farm Modderfontein East 72 IQ, Benoni, Gauteng.
- Van Schalkwyk, J. 2014. Cultural Heritage Impact Assessment for the proposed residential development, Vlakfontein Portion 50, Benoni, Ekurhuleni, Gauteng Province.
- Van der Walt, J. 2008 Cultural Heritage Impact Assessment: Portions 18, 65, 83 and 194 of the Farm Rietfontein 115 JR, Portion 23 and Remaining Extent of Portion 22 of the Farm Weltevreden 118 IR, Benoni, Gauteng Province.
- Van Der Walt, J. 2014. Archaeological Impact Assessment for the proposed Brakpan Memorial Park Development, Gauteng Province.
- Van Der Walt, J. 2009. Archaeological Impact Assessment: Helderwyk Township development on the reminder of Portion 62 of the Farm Witpoortjie 1171R, Brakpan, Ekurhuleni, Gauteng Province.
- Pelser, A. 2011. A Phase I Archaeological Impact Assessment for the rehabilitation of the Boksborg Lake Downstream Wetland in Boksborg, Gauteng Province.
- Van der Walt, J., Birkholtz, P. 2012, Phase 1 Heritage Impact Assessment for the Proposed Development of the ERPM Line Village, Boksborg, Gauteng.
- Birkholtz, P., Salomon, A. 2011. Phase 1 Heritage Impact Assessment: Proposed Development of Farrar Park, Ext. 1 Boksborg, Ekurhuleni Metropolitan Municipality, Gauteng Province.
- Birkholtz, P., Salomon, A. 2011. Phase 1 Heritage Impact Assessment: Proposed Development of Reiger Park Ext. 16 Boksborg, Ekurhuleni Metropolitan Municipality, Gauteng Province.
- Birkholtz, P., Salomon, A. 2011. Phase 1 Heritage Impact Assessment: Proposed Development of Reiger Park Ext. 18 Boksborg, Ekurhuleni Metropolitan Municipality, Gauteng Province.
- Van Schalkwyk, J., Terblanche, M. 2013. Cultural Heritage Impact Assessment for the Proposed Development on Portions 397 and 399 of the Farm Driefontein 851R, Boksborg, Gauteng Province.
- Birkholtz, P., Salomon, A. 2011. Phase 1 Heritage Impact Assessment: Proposed Development of Farrar Park Ext. 2, Boksborg, Ekurhuleni Metropolitan Municipality, Gauteng Province.
- Birkholtz, P. 2014. Heritage Impact Assessment for Proposed Township Development: Vosloorus Ext 24, Vosloorus Ext 61 and Vosloorus Ext 63, Boksborg Local Municipality, Ekurhuleni Metropolitan Municipality, Gauteng Province.
- Schoeman, MHA., Van Doornum, B. 2001. Archaeological Assessment of the Abrahamson Cemetery, Boksborg.
- Birkholtz, P. 2011. Phase 1 Heritage Impact Assessment: Proposed Comet Ext 14 Development Located on Portion 43 of the Farm Driefontein 85-1R, Boksborg, Ekurhuleni Metropolitan Municipality, Gauteng Province.
- Pelser, A. 2011. A Phase 1 Archaeological Impact Assessment for the Rehabilitation of the Libradene Wetland in Boksborg, Gauteng Province.
- Huffman, T. 2005. Archaeological Assessment of the Thubelisha Project, Boksborg.
- Birkholtz, P., Salomon, A. 2011. Phase 1 Heritage Impact Assessment: Proposed Leeuwpoort North Development located on the remainder of portion 51 and 52 as well as part of portion 22 of the Farm Leeuwpoort 113 IR, Boksborg, Ekurhuleni Metropolitan Municipality, Gauteng Province.
- Magoma, M., Salomon, A. 2013. Archaeological Investigation Study for the proposed Solar Power farm on Portion 12 & 13 of Farm Villa Liza 675 IR Mapleton, Ekurhuleni Metropolitan Municipality, Gauteng Province.
- Van Schalkwyk, J. 2007. Heritage Survey report for the proposed development on portions 43 and 52 of the farm Vlakplaats in the Boksborg Magisterial District, Gauteng.
- Prins, F., Zuma, M. 2010. Cultural Heritage Impact Assessment of the Boksborg Mining Belt Development. (Comet Extension 8 HIA).
- Gaigher, S. 2017. Heritage Impact Assessment for the Proposed Upgrade to Apex Bulk Outfall Sewer Line Phase 1 and Phase 2 near Benoni, Ekurhuleni Metropolitan Municipality, Gauteng Province.

- Gaigher, S. 2017. Heritage Impact Assessment for the Proposed New Modder Ext 4 Residential Development on Part of the Remainder of Portion 1 of the Farm Modderfontein 76 IR near Benoni, Ekurhuleni Metropolitan Municipality, Gauteng Province.

3.8 HISTORICAL MAPS

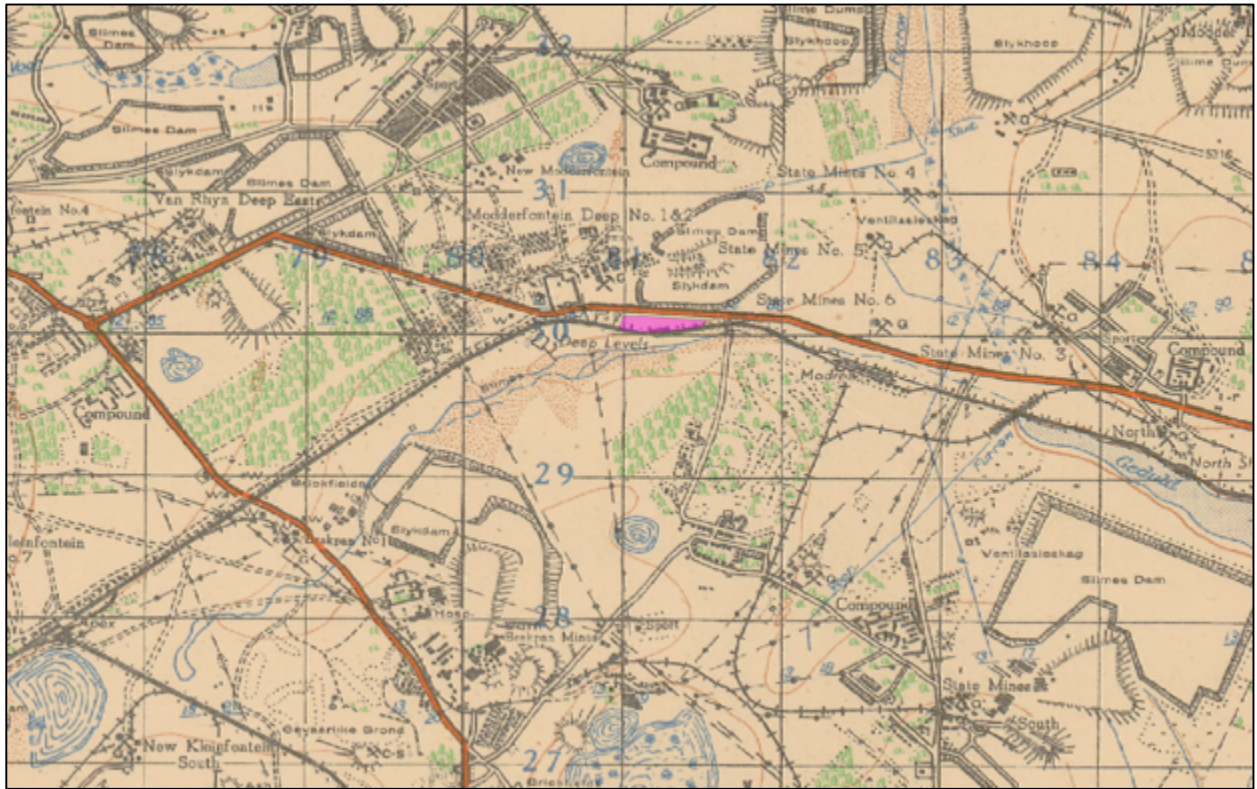


Figure 13. Topographical Map 2628 AB 1939

There are no structures present in the study area on the 1939 map.

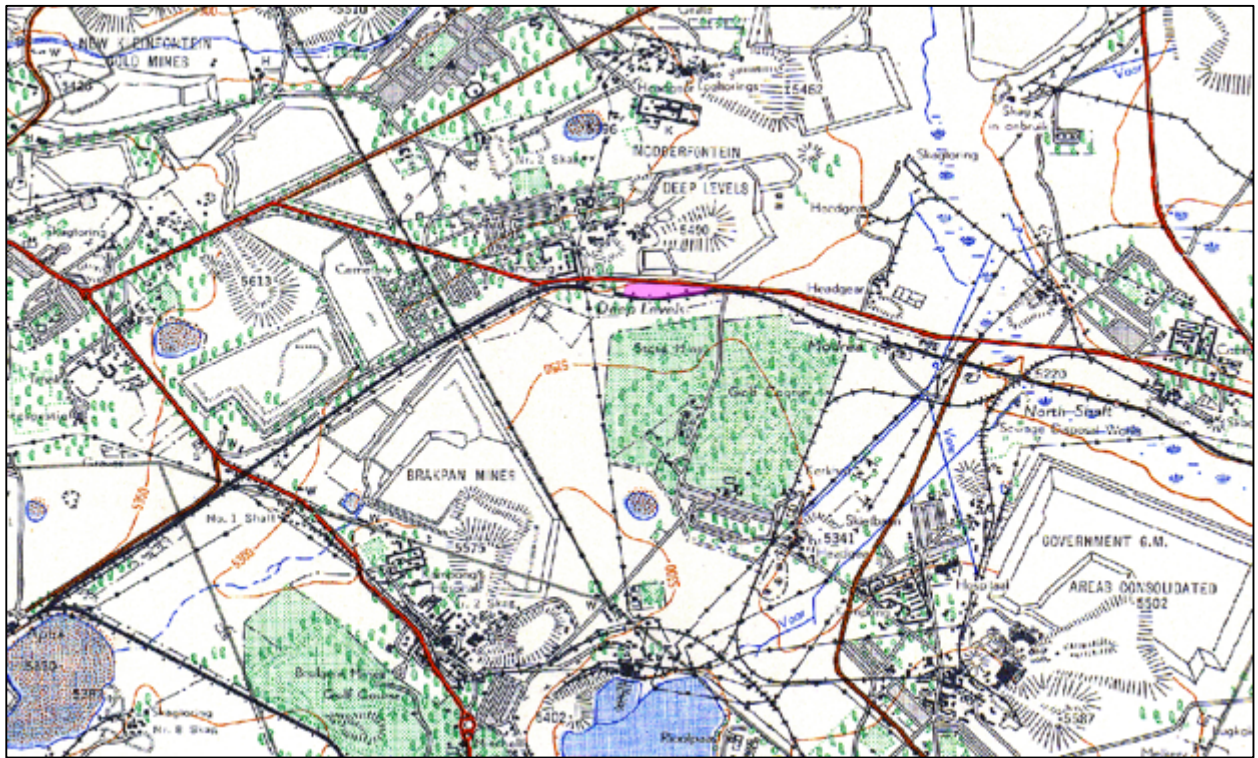


Figure 14. Topographical Map 2628 AB 1957

The Rynsoord / Benoni Cemetery as well as a few other cemeteries indicated on the 1957 map.

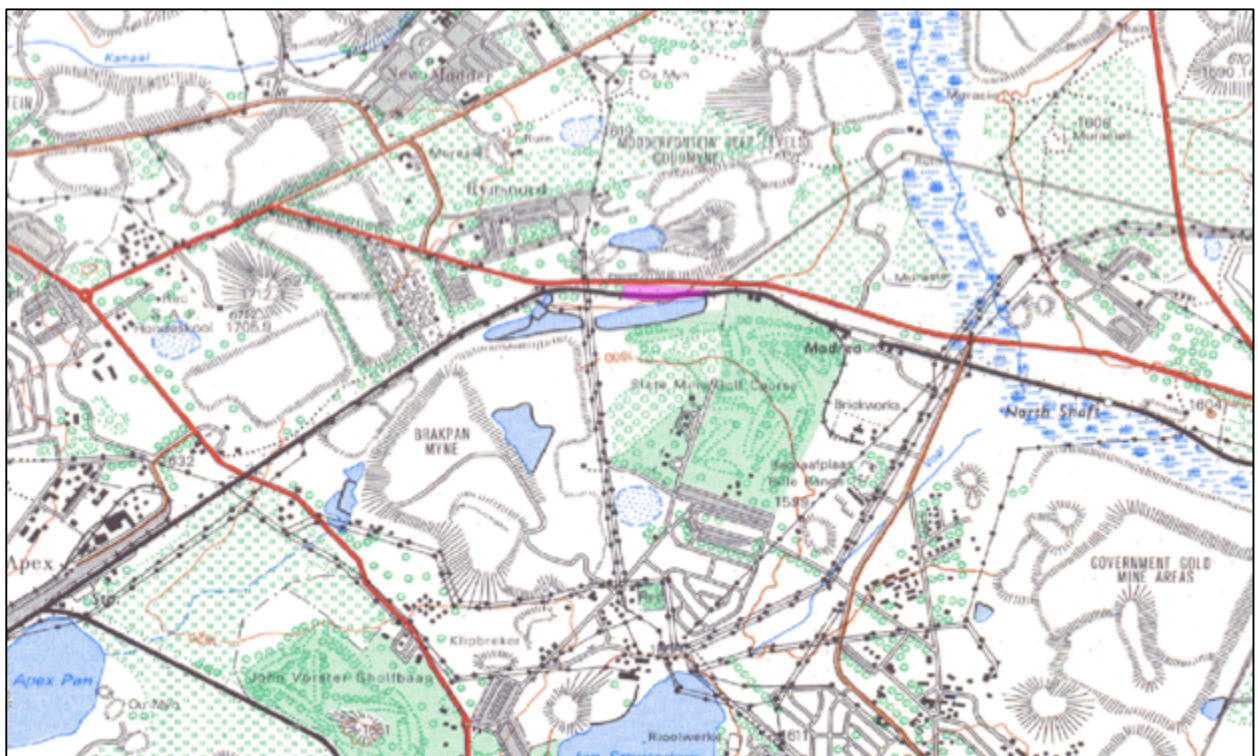


Figure 15. Topographical Map 2628 AB 1976

A fair amount of ruins and cemeteries within a 5km radius indicated on the 1976 map. Most notably, the ruins and Old Mine shaft within the study area and just outside. These are associated with the mining history of the East Rand and should be investigated further.

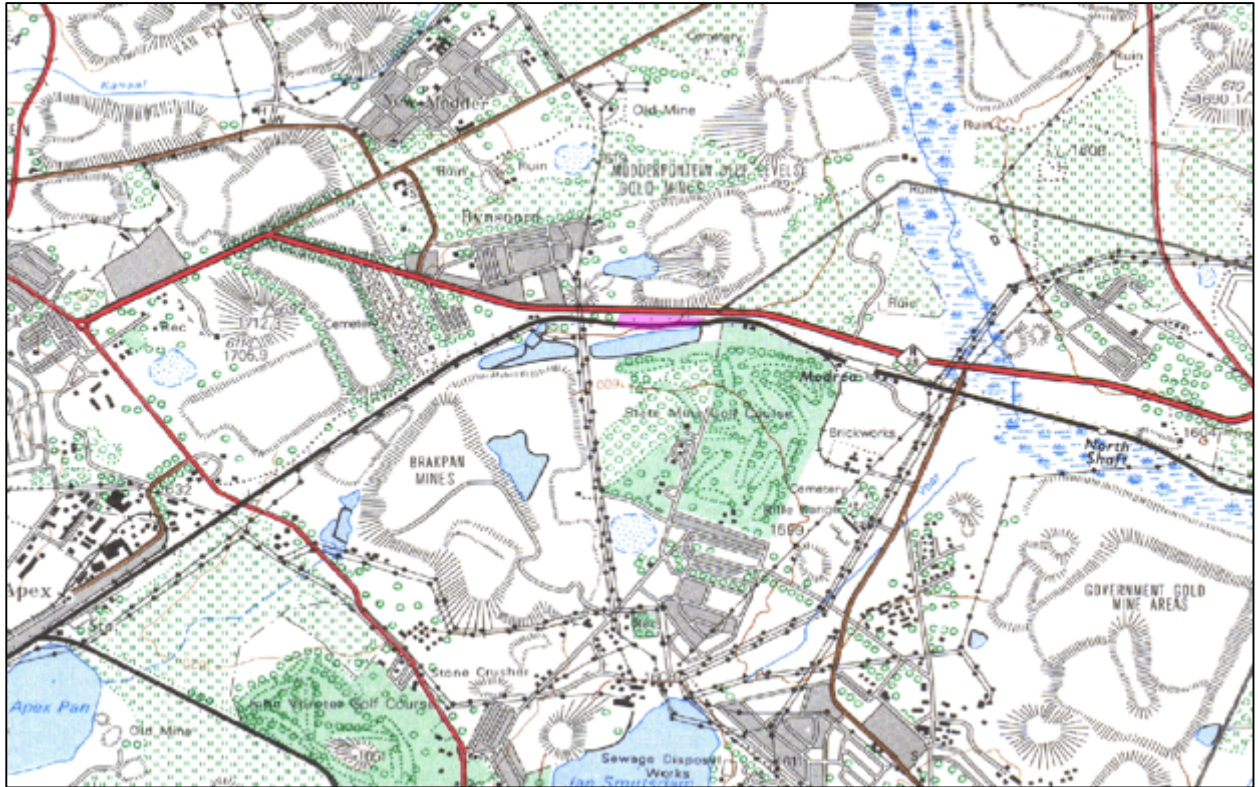


Figure 16. Topographical Map 2628 AB 1983

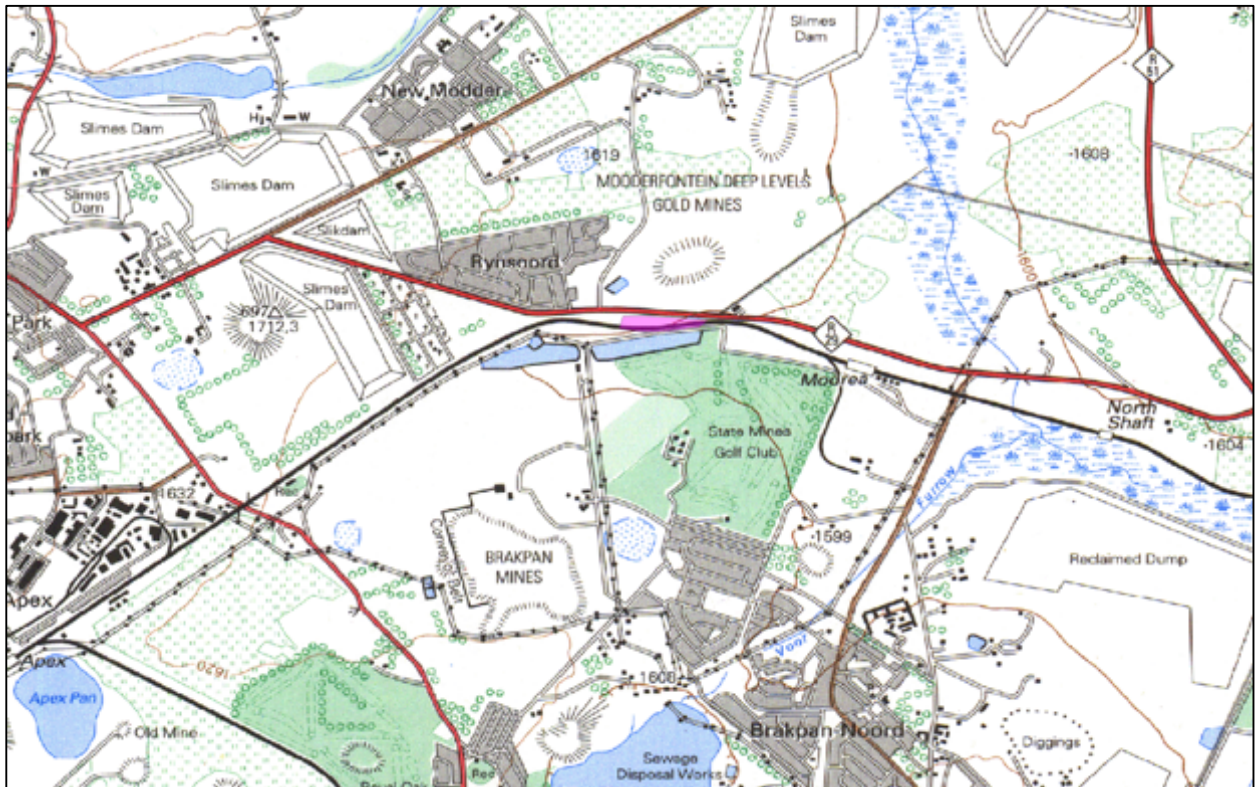


Figure 17. Topographical Map 2628 AB 1995

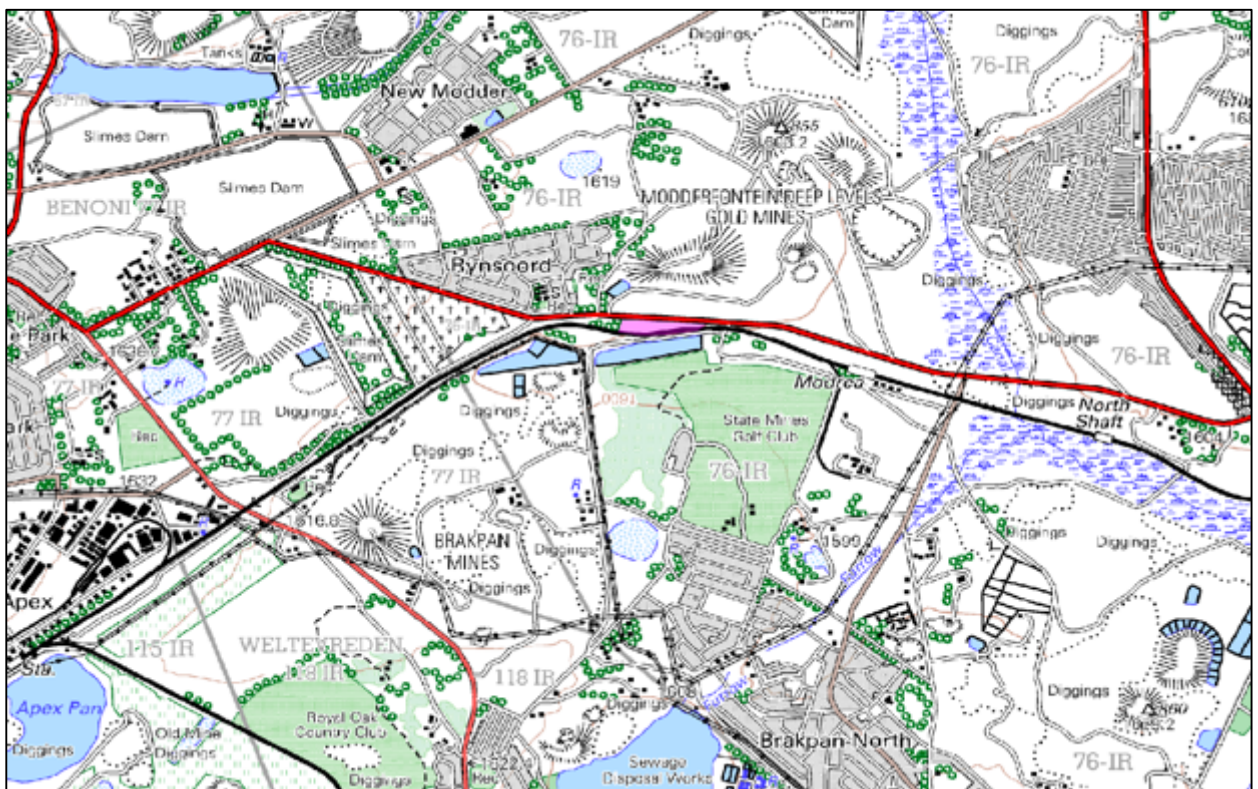


Figure 18. Topographical Map 2628 AB 2002

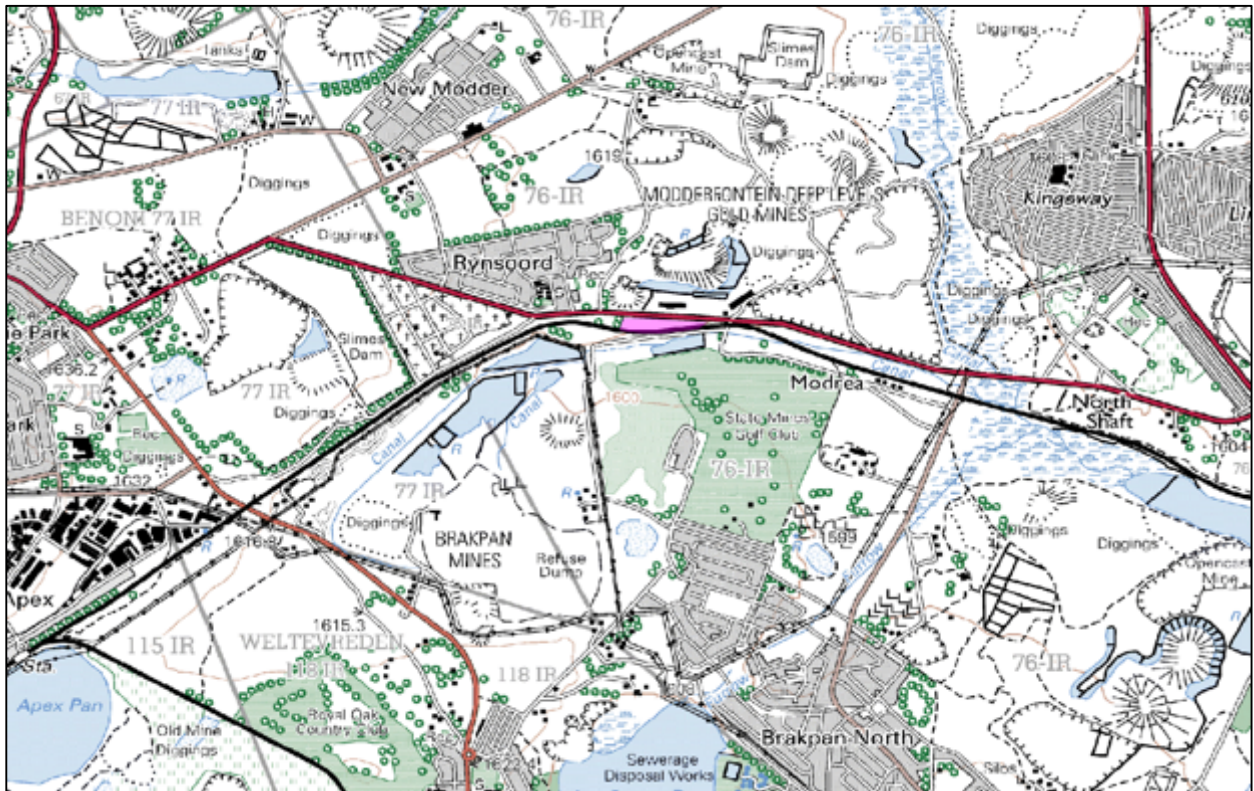


Figure 19. Topographical Map 2628 AB 2010

4. FINDINGS

The area is characterized by the remains of historic mining structures, but the site was found to be devoid of any heritage sites with significance. It is recommended that obscured, subterranean sites be managed, if they are encountered. The site is adjacent to an old Transnet Railway, of which the steel has been removed.

Benoni / Rynsoord Cemetery should be noted. It is located approximately 800m from the study area and will thus not be affected by the proposed development.



Figure 20. Benoni / Rynsoord Cemetery



Figure 21. Benoni / Rynsoord Cemetery

5. METHODOLOGY

This study defines the heritage component of the EIA process being undertaken for the proposed New Modder Ext 6 Light Industrial Development on Part of the Remainder of Portion 1 of the Farm Modderfontein 76 IR. 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.

5.1 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 several 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*).

5.2 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.

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 (South African Heritage Resource Agency) provincial databases.

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

The following documents were consulted in this study;

- South African National Archive Documents
- SAHRIS (South African Heritage Resources Information System) Database of Heritage Studies
- Internet Search
- Historic Maps
- 1939, 1957, 1976, 1983, 1995, 2002 and 2010 Surveyor General Topographic Map series
- 1952 1:10 000 aerial photo survey
- Google Earth 2017 imagery
- Published articles and books
- JSTOR Article Archive

5.3 FIELDWORK

Fieldwork for this study was performed on the 4th of December 2017. Most of the areas were found to be accessible by vehicle and on foot. The survey was tracked using GPS and a track file in GPX format is available on request.

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

Areas with less development impact was investigated closer to determine whether any sites of heritage value could still occur sub-surface, however no indications of such sites were evident (such as graves, shell middens, disposed pot sherd etc.).

Where sites were identified, it was documented photographically and plotted using GPS with the WGS 84 datum point as reference. GPX files are available on request from G&A Heritage.

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).

6. MEASURING IMPACTS

In 2003, the SAHRA (South African Heritage Resources Agency) compiled the following guidelines to evaluate the cultural significance of individual heritage resources:

6.1 TYPE OF RESOURCE

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

6.2 TYPE OF SIGNIFICANCE

6.2.1 HISTORIC VALUE

It is important in the community, or pattern of history

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

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

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

It has significance relating to the history of slavery

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

6.2.2 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.

6.2.3 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.

(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?

6.2.4 SOCIAL VALUE / PUBLIC SIGNIFICANCE

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

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

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

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

- legal and jurisdictional status
- local community attitude toward development

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

6.2.5 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

6.2.6 ECONOMIC SIGNIFICANCE

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

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

6.2.7 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?

6.2.8 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?

6.2.9 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?

6.2.10 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?

6.3 DEGREES OF SIGNIFICANCE

6.3.1 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*).

6.3.2 RARITY

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

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

6.3.3 REPRESENTIVITY

- It is important in demonstrating the principal characteristics of a 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			

7 ASSESSMENT OF HERITAGE POTENTIAL

7.1 ASSESSMENT MATRIX: DETERMINING ARCHAEOLOGICAL SIGNIFICANCE

In addition to guidelines provided by the National Heritage Resources Act (Act No. 25 of 1999), a set of criteria based on Deacon (J) and Whitelaw (1997) for assessing archaeological significance has been developed for Eastern Cape settings (Morris 2007a). These criteria include estimation of landform potential (in terms of its capacity to contain archaeological traces) and assessing the value to any archaeological traces (in terms of their attributes or their capacity to be construed as evidence, given that evidence is not given but constructed by the investigator).

Estimating site potential

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

Table 1: Classification of landforms and visible archaeological traces for estimating the potential for archaeological sites (after J. Deaon, NMC as used in Morris)

Class	Landform	Type 1	Type 2	Type 3
L1	Rocky Surface	Bedrock exposed	Some soil patches	Sandy/grassy patches
L2	Ploughed land	Far from water	In floodplain	On old river terrace
L3	Sandy ground, inland	Far from water	In floodplain or near features such as hill/dune	On old river terrace
L4	Sandy ground, coastal	>1 km from sea	Inland of dune cordon	Near rocky shore
L5	Water-logged deposit	Heavily vegetated	Running water	Sedimentary basin
L6	Developed urban	Heavily built-up with no known record of early settlement	Known early settlement, but buildings have basements	Buildings without extensive basements over known historical sites
L7	Lime/dolomite	>5 myrs	<5000 yrs	Between 5000 yrs and 5 myrs
L8	Rock shelter	Rocky floor	Loping floor or small area	Flat floor, high ceiling
Class	Archaeological traces	Type 1	Type 2	Type 3
A1	Area previously excavated	Little deposit remaining	More than half deposit remaining	High profile site
A2	Shell of bones visible	Dispersed scatter	Deposit <0.5 m thick	Deposit >0.5 m thick; shell and bone dense
A3	Stone artefacts or stone walling or other feature visible	Dispersed scatter	Deposit <0.5m thick	Deposit >0.5 m thick

Table 2: Site attributes and value assessment (adopted from Whitelaw 1997 as used in Morris)

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

7.2 ASSESSING SITE VALUE BY ATTRIBUTE

Table 2 is adapted from Whitelaw (1997), who developed an approach for selecting sites meriting heritage recognition status in KwaZulu-Natal. It is a means of judging a site's archaeological value by ranking the relative strengths of a range of attributes (given in the second column of the table). While aspects of this matrix remain qualitative, attribute assessment is a good indicator of the general archaeological significance of a site, with Type 3 attributes being those of highest significance.

7.3 IMPACT STATEMENT

7.3.1 ASSESSMENT OF 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 below:

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

7.3.2 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.

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*).

7.3.4 POST-CONTACT SITES

No sites associated with the post-contact era will be affected by the proposed development.

7.3.5 BUILT ENVIRONMENT

Due to the importance of mining in the evolution of the East Rand urban landscape these structures have significant historic value. Due to their importance, it is recommended that they undergo a second phase of investigation and documentation. A permit for destruction should be applied for from the GPHRA Built Environment Committee before they are altered in any way. This holds true for the mining dump as well.

7.3.6 HISTORIC SIGNIFICANCE

Built Environment within the Study Area.

No	Criteria	Significance Rating
1	Are any of the identified sites or buildings associated with a historical person or group? No	N/A
2	Are any of the buildings or identified sites associated with a historical event? No	N/A
3	Are any of the identified sites or buildings associated with a religious, economic social or political or educational activity? No	N/A
4	Are any of the identified sites or buildings of archaeological significance? No	N/A
5	Are any of the identified buildings or structures older than 60 years? No	N/A

7.3.7 ARCHITECTURAL SIGNIFICANCE

No	Criteria	Rating
1	Are any of the buildings or structures an important example of a building type? No	N/A
2	Are any of the buildings outstanding examples of a particular style or period? No	N/A
3	Do any of the buildings contain fine architectural details and reflect exceptional craftsmanship? No	N/A
4	Are any of the buildings an example of an industrial, engineering or technological development? No	N/A
5	What is the state of the architectural and structural integrity of the building? No	N/A
6	Is the building's current and future use in sympathy with its original use (for which the building was designed)? N/A	-
7	Were the alterations done in sympathy with the original design? N/A	-
8	Were the additions and extensions done in sympathy with the original design? N/A	-
9	Are any of the buildings or structures the work of a major architect, engineer or builder? No	-

7.3.8 SPATIAL SIGNIFICANCE

Even though each building needs to be evaluated as a single artefact the site still needs to be evaluated in terms of its significance in its geographic area, city, town, village, neighbourhood or precinct. This set of criteria determines the spatial significance.

No	Criteria	Rating
1	Can any of the identified buildings or structures be considered a landmark in the town or city? No	-
2	Do any of the buildings contribute to the character of the neighborhood? No	-
3	Do any of the buildings contribute to the character of the square or streetscape? No	-
4	Do any of the buildings form part of an important group of buildings? No	-

8 IMPACT EVALUATION

This HIA Methodology assists in evaluating the overall effect of a proposed activity on the heritage environment. The determination of the effect of a heritage impact on a heritage parameter is determined through a systematic analysis of the various components of the impact. This is undertaken using

information that is available to the heritage practitioner through the process of heritage impact assessment. The impact evaluation of predicted impacts was undertaken through an assessment of the significance of the impacts.

8.1 DETERMINATION OF SIGNIFICANCE OF IMPACTS

Significance is determined through a synthesis of impact characteristics, which include context and intensity of an impact. Context refers to the geographical scale i.e. site, local, national or global whereas intensity is defined by the severity of the impact e.g. the magnitude of deviation from background conditions, the size of the area affected, the duration of the impact and the overall probability of occurrence.

Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. The total number of points scored for each impact indicates the level of significance of the impact.

8.2 IMPACT RATING SYSTEM

Impact assessment must take account of the nature, scale and duration of effects on the heritage environment whether such effects are positive (beneficial) or negative (detrimental). Each issue / impact is also assessed according to the project stages:

- planning
- construction
- operation
- decommissioning

Where necessary, the proposal for mitigation or optimisation of an impact will be detailed. A brief discussion of the impact and the rationale behind the assessment of its significance has also been included.

8.3 RATING SYSTEM USED TO CLASSIFY IMPACTS

The rating system is applied to the potential impact on the receiving environment and includes an objective evaluation of the mitigation of the impact. Impacts have been consolidated into one rating. In assessing the significance of each issue the following criteria (including an allocated point system) is used:

NATURE		
Including a brief description of the impact of the heritage parameter being assessed in the context of the project. This criterion includes a brief written statement of the heritage aspect being impacted upon by a particular action or activity.		
GEOGRAPHICAL EXTENT		
This is defined as the area over which the impact will be expressed. Typically, the severity and significance of an impact have different scales and as such bracketing ranges are often required. This is often useful during the detailed assessment of a project in terms of further defining the determined.		
1	Site	The impact will only affect the site.
2	Local/district	Will affect the local area or district.
3	Province/region	Will affect the entire province or region.
4	International and National	Will affect the entire country.
PROBABILITY		
This describes the chance of occurrence of an impact		

1	Unlikely	The chance of the impact occurring is extremely low (Less than a 25% chance of occurrence).
2	Possible	The impact may occur (Between a 25% to 50% chance of occurrence).
3	Probable	The impact will likely occur (Between a 50% to 75% chance of occurrence).
4	Definite	Impact will certainly occur (Greater than a 75% chance of occurrence).
REVERSIBILITY		
This describes the degree to which an impact on a heritage parameter can be successfully reversed upon completion of the proposed activity.		
1	Completely reversible	The impact is reversible with implementation of minor mitigation measures.
2	Partly reversible	The impact is partly reversible but more intense mitigation measures are required.
3	Barely reversible	The impact is unlikely to be reversed even with intense mitigation measures.
4	Irreversible	The impact is irreversible and no mitigation measures exist.
IRREPLACEABLE LOSS OF RESOURCES		
This describes the degree to which heritage resources will be irreplaceably lost as a result of a proposed activity.		
1	No loss of resource.	The impact will not result in the loss of any resources.
2	Marginal loss of resource	The impact will result in marginal loss of resources.
3	Significant loss of resources	The impact will result in significant loss of resources.
4	Complete loss of resources	The impact is result in a complete loss of all resources.
DURATION		
This describes the duration of the impacts on the heritage parameter. Duration indicates the lifetime of the impact as a result of the proposed activity.		
1	Short term	The impact and its effects will either disappear with mitigation or will be mitigated through natural process in a span shorter than the construction phase (0 – 1 years), or the impact and its effects will last for the period of a relatively short construction period and a limited recovery time after construction, thereafter it will be entirely negated (0 – 2 years).
2	Medium term	The impact and its effects will continue or last for some time after the construction phase but will be mitigated by direct human action or by natural processes thereafter (2 – 10 years).
3	Long term	The impact and its effects will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter (10

		– 50 years).
4	Permanent	The only class of impact that will be non-transitory. Mitigation either by man or natural process will not occur in such a way or such a time span that the impact can be considered transient (Indefinite).
CUMULATIVE EFFECT		
This describes the cumulative effect of the impacts on the heritage parameter. A cumulative effect/impact is an effect, which in itself may not be significant but may become significant if added to other existing or potential impacts emanating from other similar or diverse activities as a result of the project activity in question.		
1	Negligible Cumulative Impact	The impact would result in negligible to no cumulative effects.
2	Low Cumulative Impact	The impact would result in insignificant cumulative effects.
3	Medium Cumulative impact	The impact would result in minor cumulative effects.
4	High Cumulative Impact	The impact would result in significant cumulative effects.
INTENSITY / MAGNITUDE		
Describes the severity of an impact.		
1	Low	Impact affects the quality, use and integrity of the system/component in a way that is barely perceptible.
2	Medium	Impact alters the quality, use and integrity of the system/component but system/ component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).
3	High	Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component is severely impaired and may temporarily cease. High costs of rehabilitation and remediation.
4	Very high	Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component permanently ceases and is irreversibly impaired (system collapse). Rehabilitation and remediation often impossible. If possible rehabilitation and remediation often unfeasible due to extremely high costs of rehabilitation and remediation.
SIGNIFICANCE		
Significance is determined through a synthesis of impact characteristics. Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. This describes the significance of the impact on the heritage parameter. The calculation of the significance of an impact uses the following formula:		
(Extent + probability + reversibility + irreplaceability + duration + cumulative effect) x magnitude/intensity.		

The summation of the different criteria will produce a non-weighted value. By multiplying this value with the magnitude/intensity, the resultant value acquires a weighted characteristic which can be measured and assigned a significance rating.

Points	Impact Significance Rating	Description
6 to 28	Negative Low impact	The anticipated impact will have negligible negative effects and will require little to no mitigation.
6 to 28	Positive Low impact	The anticipated impact will have minor positive effects.
29 to 50	Negative Medium impact	The anticipated impact will have moderate negative effects and will require moderate mitigation measures.
29 to 50	Positive Medium impact	The anticipated impact will have moderate positive effects.
51 to 73	Negative High impact	The anticipated impact will have significant effects and will require significant mitigation measures to achieve an acceptable level of impact.
51 to 73	Positive High impact	The anticipated impact will have significant positive effects.
74 to 96	Negative Very high impact	The anticipated impact will have highly significant effects and are unlikely to be able to be mitigated adequately. These impacts could be considered "fatal flaws".
74 to 96	Positive Very high impact	The anticipated impact will have highly significant positive effects.

9 ANTICIPATED IMPACT OF THE DEVELOPMENT

BENONI / RYNSOORD CEMETERY

IMPACT TABLE FORMAT		
Heritage component	<i>Formal Cemetery</i>	
Issue/Impact/Heritage Impact/Nature	<i>Proposed New Modder Ext 6 Light Industrial Development on Part of the Remainder of Portion 1 of the Farm Modderfontein 76 IR near Benoni, Ekurhuleni Metropolitan Municipality, Gauteng Province.</i>	
<i>Extent</i>	<i>Local</i>	
<i>Probability</i>	<i>Unlikely</i>	
<i>Reversibility</i>	<i>Totally Reversible</i>	
<i>Irreplaceable loss of resources</i>	<i>Insignificant loss of resources</i>	
<i>Duration</i>	<i>Medium term</i>	
<i>Cumulative effect</i>	<i>Low cumulative effect</i>	
<i>Intensity/magnitude</i>	<i>Low</i>	
<i>Significance Rating of Potential Impact</i>	<i>8 points. The impact will have a low negative impact rating.</i>	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	2	2

Probability	1	1
Reversibility	2	2
Irreplaceable loss	1	1
Duration	2	2
Cumulative effect	1	1
Intensity/magnitude	1	1
Significance rating	8 (low negative)	8 (low negative)
Mitigation measure	<i>Avoid the formal cemetery – due to proximity, the cemetery is mentioned, but it would not be impacted upon.</i>	

OLD TRANSNET RAILWAY ASSOCIATED INFRASTRUCTURE

IMPACT TABLE FORMAT		
Heritage component	<i>Old Transnet Railway and Associated Infrastructure</i>	
Issue/Impact/Heritage Impact/Nature	<i>Proposed New Modder Ext 6 Light Industrial Development on Part of the Remainder of Portion 1 of the Farm Modderfontein 76 IR</i>	
<i>Extent</i>	<i>Local (2)</i>	
<i>Probability</i>	<i>Probable (3)</i>	
<i>Reversibility</i>	<i>Irreversible (4)</i>	
<i>Irreplaceable loss of resources</i>	<i>Partial loss of resources (3)</i>	
<i>Duration</i>	<i>Medium term (2)</i>	
<i>Cumulative effect</i>	<i>Medium cumulative effect (3)</i>	
<i>Intensity/magnitude</i>	<i>Very high (4)</i>	
<i>Significance Rating of Potential Impact</i>	<i>68 points. The impact will have a high negative effect rating.</i>	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	2	2
Probability	1	1
Reversibility	1	1
Irreplaceable loss	1	1
Duration	2	2
Cumulative effect	1	1
Intensity/magnitude	1	1
Significance rating	8 (low negative)	8 (low negative)
Mitigation measure	<i>Old Transnet Railway and Associated Infrastructure is no longer present on the site.</i>	

9.4 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.

Due to the fact that the project will mainly involve sub-surface infrastructure it is not anticipated that any visual impacts will be encountered. Pump stations will also be of low profile and will therefore have a minimum of impact.

9.5 ASSUMPTIONS AND RESTRICTIONS

- It is assumed that the South African Heritage Resources Information System (SAHRIS) 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 Basic Assessment will result in the identification of any intangible sites of heritage potential.

10 ASSESSMENT OF IMPACTS (IMPACT STATEMENTS)

10.2 BUILT ENVIRONMENT

Some structures associated with rural living were identified;

- Brick outbuildings (modern and historic)
- Mine Shaft
- Barb-wire fences (modern)
- Dirt roads (modern)
- Footpaths
- Tarred roads

Mitigation

None of the structures will be affected by the construction activities.

10.3 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 Barberton 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
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 	No	No

	<ul style="list-style-type: none"> - Distinctive architecture of cultivation e.g. planting blocks, trellising, terracing, ornamental planting. 		
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 than 60 years - 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, 	No	No
8 Burial grounds and grave sites	<ul style="list-style-type: none"> - Pre-colonial burials (marked or unmarked, known or unknown) - Historical graves (marked or unmarked, known or unknown) - Graves of victims of conflict - Human remains (older than 100 years) - Associated burial goods (older than 100 years) - Burial architecture (older than 60 years) 	Yes	No
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	<ul style="list-style-type: none"> - Scenic routes 	No	No
13 Amenity landscape	<ul style="list-style-type: none"> - View sheds - View points - Views to and from 	No	No

	<ul style="list-style-type: none"> - Gateway conditions - Distinctive representative landscape conditions - Scenic corridors 		
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Mitigation

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

1 1 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 the heritage practitioner has had sufficient time to analyze the finds.

1 2 CONCLUSION

Proposed New Modder Ext 6 Light Industrial Development on Part of the Remainder of Portion 1 of the Farm Modderfontein 76 IR near Benoni, Ekurhuleni Metropolitan Municipality, Gauteng Province was investigated and it was found to be devoid of sites of heritage significance. This area has undergone severe alterations to the landscape over the years and for this reason very little or no evidence of heritage sites of significance remains today.

The old Transnet Railway Infrastructure is no longer present on the site.

Provided the recommendations in this report is followed there is no reason, from a heritage point of view, why this development cannot continue.

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