

TO:
METAGO ENVIRONMENTAL ENGINEERS
TRANSVAAAL FERROCHROME

A CULTURAL HERITAGE IMPACT ASSESSMENT OF TWO
ALTERNATIVE RAILWAY LINE CORRIDORS FOR THE
TRANSVAAAL FERROCHROME SMELTER IN THE
MOOINOO/MARIKANA AREA OF THE CENTRAL BANKEVELD
IN THE NORTH-WEST PROVINCE.

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2 METHODOLOGY

2.1 The heritage impact assessment

This heritage impact assessment study was based on a literature survey, a study of the topographical map of the area in which the study areas are situated as well as an aerial photograph and a survey with a vehicle and on foot.

The survey of the literature included a brief review of literature on the pre-history and history of the Central Bankveld in general, and the pre-history and cultural history of the Marikana and the Mooinooi areas in particular (see Bibliography, Part 7).

Further data used was the 1:50 000 topographical map of Wolhuterskop (2527DA) which includes the study areas. An aerial photograph of the study areas (provided by Metago Environmental Engineers) also served as an invaluable source for detecting large stone walled complexes such as Site (complex) LIA05 and Site (complex) LIA06. (Single graves, small cemeteries and small archaeological sites are not visible on the aerial photograph, while historically significant structures cannot be identified as such).

The survey on foot focused on stretches of the railway line corridors where heritage resources and sensitive remains were expected to occur. Accessible routes in close proximity to the proposed corridors were used to facilitate the discovery and mapping of heritage resources and sensitive remains.

Large parts of the study area are covered by agricultural fields and abandoned and current mining activities. Given the fact that these areas have been disturbed by human activities in the past, a complete survey of the clearly altered areas on foot was not warranted.

The heritage resources discovered in and close to the proposed railway line corridors were mapped (Figure 1). The heritage resources and sensitive remains in and close to Alternative D of the railway line corridor were evaluated according to set criteria, as these remains may be affected by the planned development (Table 2). Mitigation measures for all types of heritage resources and sensitive remains are outlined in Table 2.

The term 'relatively recent past' refers to the 20th century. Remains from this period are not necessarily older than sixty years and therefore may not qualify as archaeological or historical remains. Some of these remains, however, may be close to sixty years of age and may, in the near future, qualify as heritage resources.

It is not always possible, based on observations alone, to distinguish clearly between archaeological remains and historical remains, or between historical remains and remains from the relatively recent past. Although certain criteria may help to make this distinction possible, these criteria are not always present, or, when they are present, they are not always clear enough to interpret with great accuracy. Criteria such as square floor plans (a historical feature) may serve as a guideline. However, circular and square floors may occur together on the same site.

The term 'sensitive remains' is sometimes used to distinguish graves and cemeteries as well as ideologically significant features such as holy mountains, initiation sites or other sacred places. Graves in particular are not necessarily heritage resources if they date from the recent past and do not have tombstones that are older than sixty years.

The term Stone Age refers to the prehistoric past, although Late Stone Age peoples lived in the area well into the historical period. The Stone Age is divided into an Earlier Stone Age (3 million years to 150 000 thousand years ago) the Middle Stone Age (150 000 years to 20 000 years ago) and the Late Stone Age (20 000 years to 200 years ago).

The term 'Late Iron Age' refers to the period between the 17th century and the 19th century and can therefore include the historical period.

The term 'proposed railway line corridor' refers to the two alternative corridors where Transvaal Ferrochrome Ltd. intends to build the railway line.

The 'peripheral area' refers to the area where Transvaal Ferrochrome Ltd. does not intend to focus any development activities with regard to the building of the railway line.

Phase I studies refer to surveys using various sources of data in order to establish the presence of all possible types of heritage resources in any given area.

Phase II studies include in-depth cultural heritage studies such as archaeological mapping and excavating, the documenting of rock art/engraving sites or of dwellings or other architectural features and structures, the sampling of archaeological sites or

3 THE HERITAGE IMPACT ASSESSMENT STUDY OF THE PROPOSED RAILWAY LINE CORRIDORS

Transvaal Ferrochrome Ltd. intends to establish a new chrome smelter on the farm Buffelsfontein 465JQ, north of the Magaliesberg in the North-West Province. The area falls under the Madibeng Local Municipality in the Brits District. The proposed new smelter will be located near the towns of Mooinooi and Marikana (in the west) and the towns of Modderspruit, Bapong and Majakaneng (in the east). A cultural heritage impact assessment has been done for the proposed new smelter (see Bibliography, Part 7). However, Transvaal Ferrochrome Ltd. also intends to establish a railway line along one of two alternative routes. These alternatives are the following:

- Alternative A runs from an existing railway line (on Turffontein 462JQ) southwards along the boundaries between Middelkraal 466JQ and Turffontein 462JQ and turns (on Buffelsfontein 465JQ) in a semi-circle (to the east), meeting Alternative D at the Transvaal Ferrochrome site.
- Alternative D runs from the junction of the Middelkraal road and tar road linking Western Platinum Mine with Eastern Platinum Mine (on Middelkraal 466JQ) southwards and then eastwards along the boundaries between Middelkraal 466JQ and Elandskraal 469JQ. When it nears Buffelsfontein 465JQ it turns in a semi-circle (to the west), meeting Alternative A at the Transvaal Ferrochrome site (Figure 1).

3.1 The developed nature of the study area not conducive to the conservation of heritage remains

Transvaal Ferrochrome Ltd's study area is situated on parts of the farms Middelkraal 466JQ, Elandskraal 469JQ, Turffontein 462JQ and Buffelsfontein 465JQ in the Brits and Rustenburg Districts of the North-West Province (see the 1:50 000 topographical map of Wolhuterskop 2527DA). The study area is situated on a level stretch of land between the Magaliesberg in the south and the prominent chain of granite hills further to the north (Figure 1).

Two modern towns near the study areas are Mooinooi to the south and Marikana to the north. Formal and informal settlements in the area include Wonderkopies to the north and Modderfontein to the south. Farmers and workers have occupied the Mooinooi and Marikana areas since the 19th century. Farmers and farm-workers have therefore occupied the area without interruption for more than a hundred and fifty years. Remains

dating from this historical (colonial and modern) period and from the relatively recent past therefore exist in or near the study area.

The study area is largely covered by agricultural fields and has also been scarred by abandoned (older) and current mining activities. Numerous other development activities, with a negative impact from a cultural heritage point of view, have also been undertaken in the study area. Earlier mining rehabilitation activities as well as secondary (dirt) roads, rock dumps, large barren (scarred) surfaces, overhead lines (telephone and power lines) have contributed to the disturbed nature of the study area.

3.2 The heritage impact assessment study

The heritage impact assessment study revealed the presence of an extensive range of heritage resources and sensitive remains (graveyards and graves) in and near the two alternatives proposed for the new railway line corridor. All these heritage resources and graves are discussed below and mapped in Figure 1. However, only the heritage resources and graves located in and close to the proposed two alternative corridors are evaluated and tabulated in Table 1.

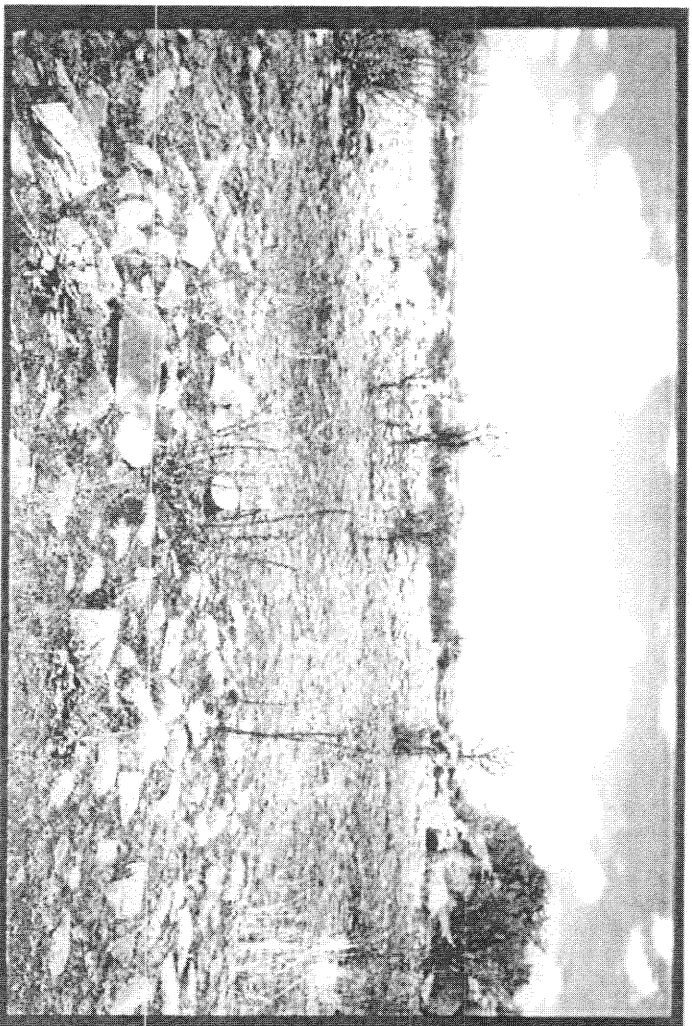
The range of heritage resources and graves occurring in and near the two proposed alternative corridors are now discussed and illustrated with photographs.

3.2.1 Stone Age sites

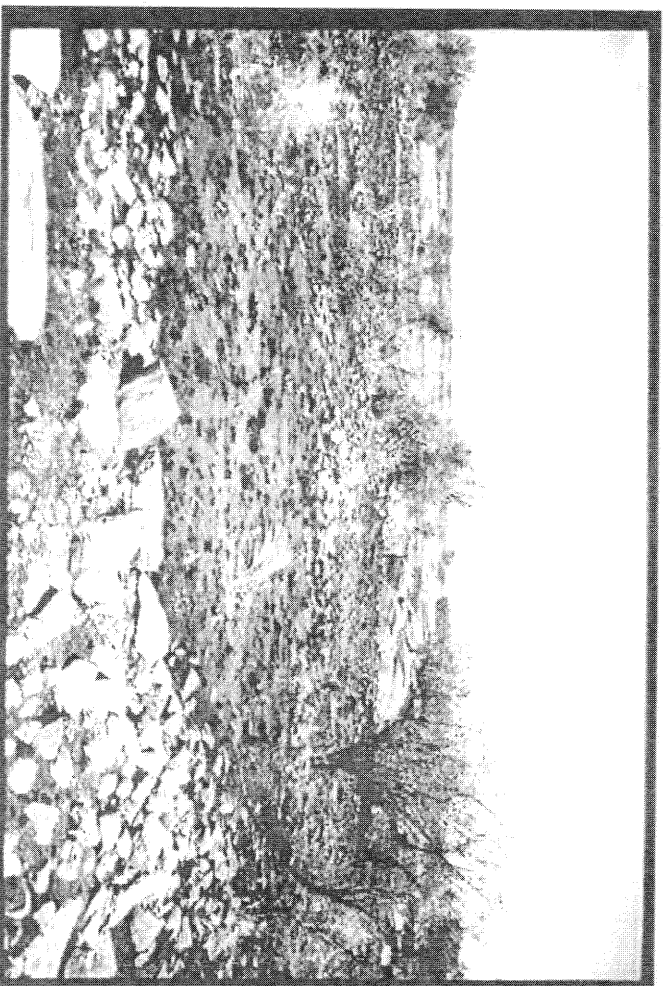
No Stone Age sites were detected in or near the railway line corridors. However, it can be expected that stone tools may occur in or near the two options for the proposed railway line corridors, as scattered ('out of context') stone tools are common especially in eroded or ploughed areas, such as agricultural fields. However, no significant numbers of stone tools or Stone Age sites were observed in or near the proposed railway line corridors.

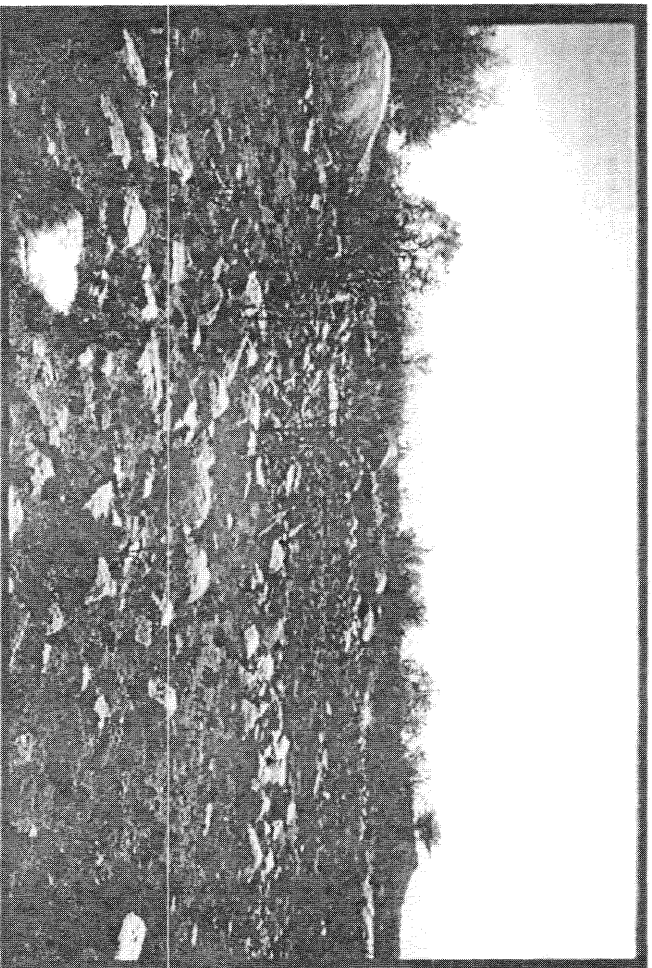
3.2.2 Late Iron Age sites

The chain of granite hills to the north of the study area contains large numbers of stone walled sites dating from the Late Iron Age. These sites are mostly confined to the bases and lower levels of these hills. Granite protrusions and dykes on farms such as Middelkraal, Elandskraal, Turfontein, Elandsdrift, Buffelsfontein and others south of the granite hills contain stone walled sites dating from the Late Iron Age. The few conspicuous granite kopjes on these farms (such as Mambakop, Wonderkop and

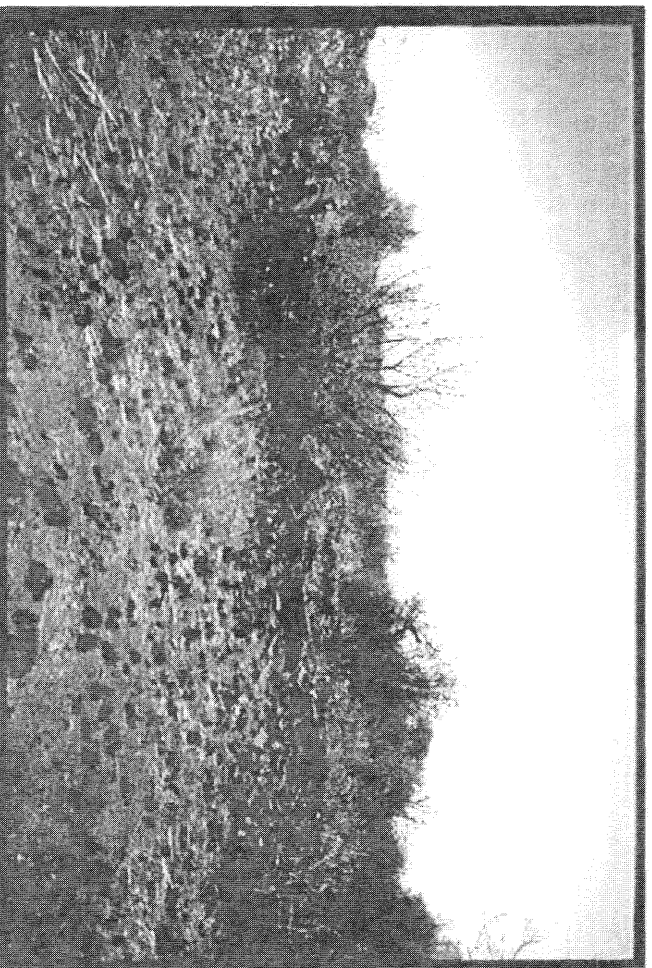


Site LIA01 (above) and Site LIA02 (below). The proposed new railway line corridor will not affect these sites.





Site LIA03 (above) and Site LIA04 (below). The proposed new railway line corridor will not affect these sites.



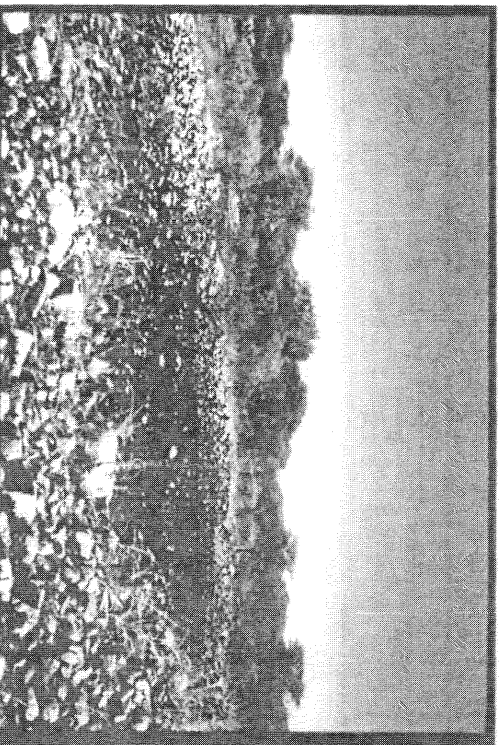
Site (complex) LIA06

This complex of stone walls covers a considerable surface area, approximately 800m x 800m. The complex is composed of several smaller sites grouped together in one large cluster. The site resembles other Late Iron Age complexes (such as Molokwane, although this site is not as large as Molokwane) that can be associated with the ancestors of the Tswana. These sites date from the 17th century and were abandoned during the pre-*difaqane* and *difaqane* wars fought during the first quarter of the 19th century.

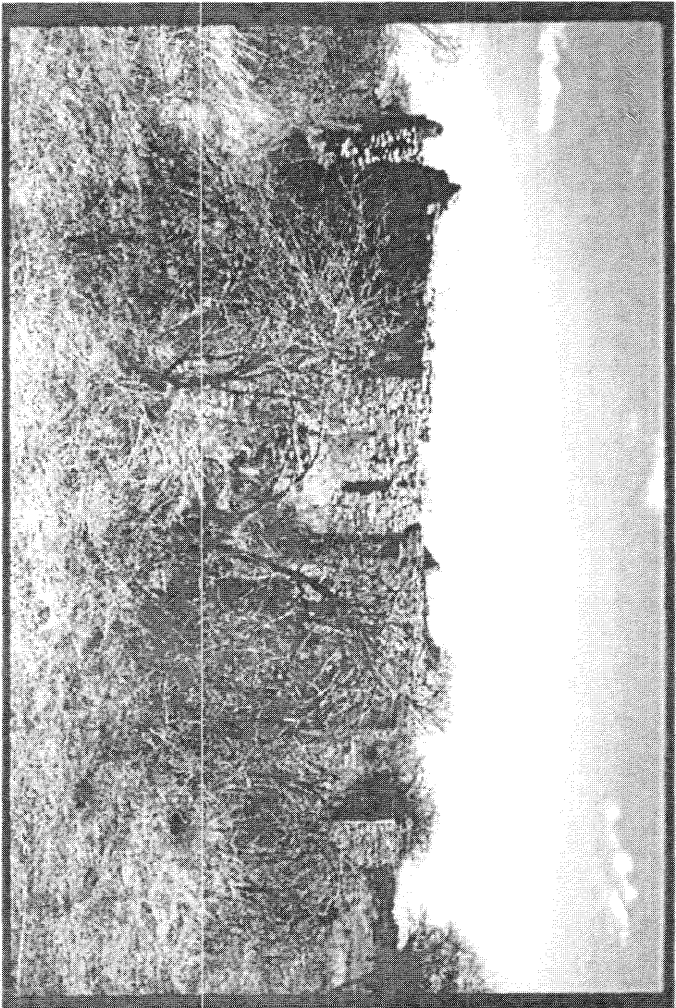
It seems as if the complex may be composed of three smaller clusters, each of which consists of several sites. If the complex does indeed have this composition, it may be possible to link the site with Kwenā origins. If it is composed of five units, it may have been associated with the Kgatla. However, this can only be established if the site is studied in more detail (see figure below).

The western and northern perimeters of the site have been damaged in the past. A dirt road was built through the western and southern part of the site. Borrowing pits were excavated near the northern border of the site.

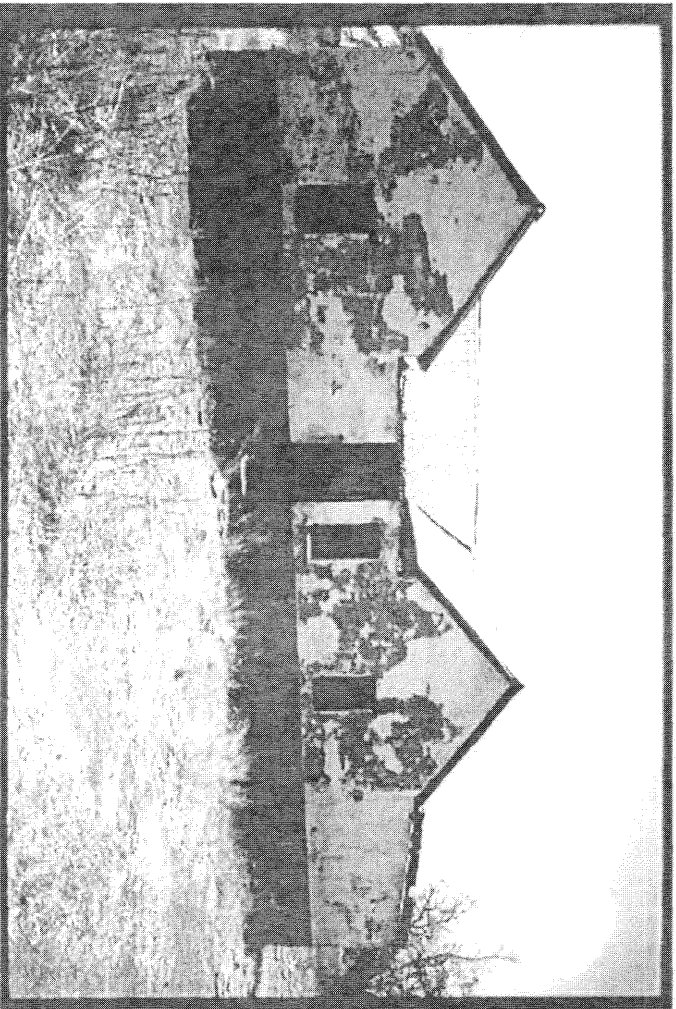
Site (complex) LIA06 has a high significance and should be conserved and protected by Transvaal Ferrochrome Ltd. Alternative A may damage this site if the loop is not well planned to miss this site.



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HH01 (above) and HH02 (below) respectively situated to the west and east of the dirt road that bisects Middelkraal. Alternative D of the proposed new railway line will affect HH02.



Graveyard 02 (GY02)

GY02 is a historical graveyard dating from the 19th century. This graveyard is located to the west of the bend in the Middelkraal dirt road close to HH001. The graveyard includes the graves of Christopher Parker (born 25 Dec. 1839 and died 20 Jan. 1892) and of Martinus Christoffel Barnard (1852 to 1937). Two other graves have tombstones, but these have no inscriptions (see figure below).

Alternative D will not affect GY02, as it is located to the west of the Middelkraal dirt road.



Graveyard 04 (GY04)

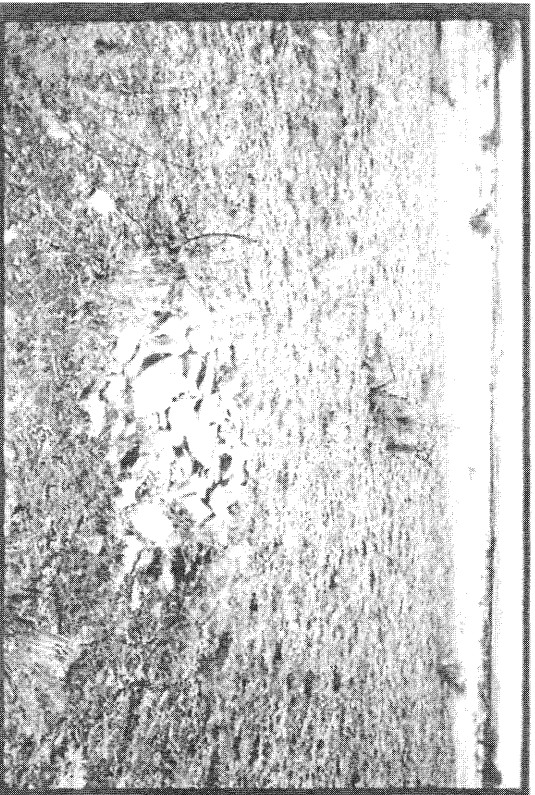
GY04 is the graveyard in which John Boloji and several other people, possibly black people, were interred. According to a spokesperson, Boloji was buried here around 1980.

This graveyard is located to the east of the Middelkraal dirt road and may be affected by Alternative D.

AB

Seven heaps of stones or individual graves (IG01 to IG07)

Seven heaps of stone occur to the south of Rooiheuvel (where Site LIA01 is located) on Turffontein 264JQ. These heaps of stones are spread over an area that covers a surface of roughly 70mx50m. The heaps of stones occur in a loosely arranged group of three, followed by a single heap of stones (further to the north), another two heaps of stones that are closely associated (still further north) and a scattered heap of stones (furthest to the north).



It is not sure whether these heaps of stones represent individual graves or whether they are merely the result of loose stones being collected in order to prepare the surface of the area to be tilled for use as an agricultural field (see figure above).

Alternative A will not affect these heaps of stones, as the railway line will follow the boundary between Turffontein and Middelkraal.

AB

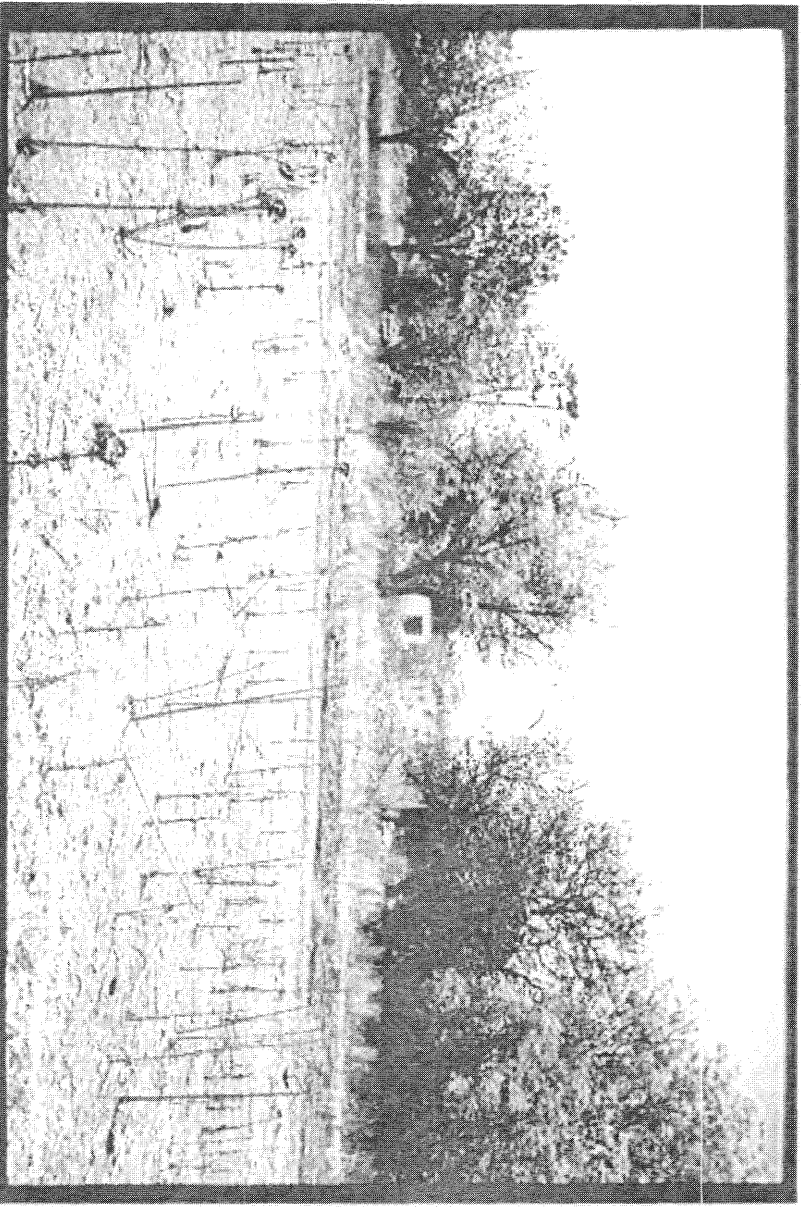
AB

Site RRP02

Site RRP02 consists of the ruins of a relatively modern house and two palm trees on Middelkraal. Site RRP02 is of little historical significance as this dwelling has been partly demolished. It is also a relatively new dwelling. (see figure below).

Handwritten signature/initials

Alternative D may affect Site RRP02



Alternative D will not affect this complex if the railway line is built to the north of the road leading to the Eastern Platinum Mine. However, measures must be taken to ensure that the loop in Alternative A does not affect Site (complex) LIA06 which is located near the proposed railway line corridor.

4.2 Rating the significance of the heritage resources and sensitive remains

A rating scheme was devised to determine the levels of significance of the historical house (HH01), the site dating from the relatively recent past (RRP01) and the two graveyards (GY01 and GY03) discovered in or close to Alternative D (Table 1). The ratings accorded to each of these categories varied between 1 (low significance), 2 (medium significance) and 3 (high significance). This scheme considers criteria such as the following:

Ideological (symbolic) significance

This category of significance refers to sites, structures or features that may have symbolic or ideological significance, e.g. cattle kraals that may have been used as burial grounds, or stone cairns in initiation schools that symbolise the regiments (of men) moulded during these puberty ceremonies, etc.

Burial grounds, individual graves, cemeteries and sites that are venerated would also score high on ideological significance.

Aesthetic significance

This category of significance refers to the beauty, craftsmanship or workmanship evident in sites, structures or features of historical and pre-historical sites. In this regard, one thinks of the spatial composition and layout of settlements, the spatial location of settlements on majestic or impressive mountains or kopjes, etc.

Other aesthetic aspects include architectural style and building features such as stone walls, stone platforms, the shape and size of enclosures, etc.

Uniqueness)

The uniqueness of sites, structures and features refers to the fact that such sites and the structures or features of these sites may be scarce and may not be repeated in other sites or at other places.

HERITAGE RESOURCES AND THEIR CO-ORDINATES	Ideological/symbolic significance	Aesthetic significance	Uniqueness	Cultural Historical significance	State of preservation	Research value
SITE RRP01 (REMAINS FROM THE RELATIVELY RECENT PAST) 25° 42' 45" S; 27° 33' 55"	1	1	1	1	1	1
SITE RRP02 (REMAINS FROM THE RELATIVELY RECENT PAST) 25° 43' 06" S; 27° 34' 10"	1	1	1	1	1	1
GRAVEYARD 01 (GY01) 25° 42' 50" S; 27° 34' 00"	3	3	1	1	2	1
GRAVEYARD 03 (GY03) 25° 42' 00" S; 27° 33' 24"	3	3	1	1	3	1
HISTORICAL HOUSE 01 (HH01) 25° 42' 01" S; 27° 33' 26"	2	2	3	3	1	3

Table 1. Different levels of significance distinguished for remains dating from the relatively recent past, graveyards and historical house discovered in or near to Alternative D.

1= low significance

2= medium significance

3= high significance

5.2 Graves, the exhumation and relocation of human remains

Different legislation applies to different categories of graves, namely:

5.2.1 Graves younger than 60 years

Graves younger than 60 years are protected by Section 2(1) of the Removal of Graves and Dead Bodies Ordinance (Ordinance no 7 of 1925) as well as the Human Tissues Act (Act 65 of 1983). These graves fall under the jurisdiction of the National Department of Health and the relevant Provincial Department of Health. Approval for the removal of graves and bodies must be directed to the Office of the relevant Provincial Minister. (This function is usually delegated to the Provincial MEC for Local Government and Planning, or, in some cases, the MEC for Housing and Welfare). Authorisation for exhumation and re-interment must also be obtained from the relevant local or regional council where the grave is situated, as well as the relevant local or regional council to where the grave is being relocated. All local and regional provisions, laws and by-laws must be adhered to. In order to handle and transport human remains, the institution conducting the relocation must have authorisation under Section 24 of Act 65 of 1983 (the Human Tissues Act).

5.2.2 Graves older than 60 years

Graves older than 60 years but younger than 100 years fall under Section 36 of Act 25 of 1999 (the National Heritage Resources Act) as well as the Human Tissues Act (Act 65 of 1983) and under the jurisdiction of the South African Heritage Resources Agency (SAHRA). The Procedure for Consultation Regarding Burial Grounds and Graves (Section 36[5] of Act 25 of 1999, National Heritage Resources Act) is applicable to graves older than 60 years which are situated outside a formal cemetery administered by a local authority. Graves in this category located inside a formal cemetery administered by a local authority also require the same authorisation as set out for graves younger than 60 years, over and above SAHRA authorisation. If the grave is not situated inside a formal cemetery but is to be relocated to one, permission from the local authority is required and all regulations, laws and by-laws set by the cemetery authorities must be adhered to. In order to handle and to transport human remains, the institution conducting the relocation needs authorisation under Section 24 of Act 65 of 1983 (the Human Tissues Act). Any alteration to a grave in this category or the relocation thereof must be supervised by an archaeologist accredited by SAHRA and the Cultural Resource Management Section of the South African Association for Archaeologists.

6 RECOMMENDATIONS

At least four ranges of heritage resources were identified in or near the two alternative railway line corridors, namely Late Iron Age sites, historical houses, historical and contemporary graveyards and remains dating from the relatively recent past. Only the remains tabulated in Table 1 that are located in or close to Alternative D for the railway line corridor are cause for concern, namely:

- Graveyard 01 (GY01) in or close to Alternative D;
- Remains from the relatively recent past (RRP01) in or close to Alternative D;
- Remains from the relatively recent past (RRP02) in or close to Alternative D;
- Graveyard 03 (GY03) in Alternative D; and
- Historical House (HH02) in Alternative D.

The two Late Iron Age complexes respectively associated with Alternative D (Site [complex] LIA05) and Alternative A (site [complex] LIA06) are highly significant. Alternative D will not affect this complex if the railway line is built to the north of the road leading to the Eastern Platinum Mine. However, measures must be taken to ensure that the loop in Alternative A does not affect Site (complex) LIA06. A clean (safe) buffer zone, perhaps covering forty metres but preferably more, must be kept between the stone walled complex and the railway line. The contractor building the railway line must be made aware of the importance of this complex. Transvaal Ferrochrome Ltd. must ensure that this complex is conserved during the construction, operation and closure of the railway line by maintaining the said buffer zone.

Legislation requires mitigation measures whenever heritage resources or sensitive remains such as graveyards are to be affected by development activities. The relevant legislation includes the National Heritage Resources Act (Act No 25 of 1999), the Ordinance on Exhumations (Ordinance No 12 of 1980) and the Human Tissues Act (Act No 65 of 1983 as amended).

Mitigation measures (or procedures) to be adopted with regard to graveyards, historical structures and Late Iron Age sites are outlined in Table 2. These mitigation measures and procedures also apply to other cultural resources (of the same range) which may be discovered or which may be affected during subsequent development phases. The recommended cultural historian [architect] and forensic archaeologist are acquainted

Table 2: Note the mitigation measures to be followed whenever any of the following heritage resources will be affected during the construction, operation or closure of the new railway line.

HERITAGE RESOURCES	MITIGATION MEASURES	PROCEDURES	GENERAL REMARKS
Stone Age sites and scatterings of stone tools	<ul style="list-style-type: none"> Collection from surface and donation to a local museum Test excavations if unique Extended excavations if exceptionally unique 	<ul style="list-style-type: none"> Permit from SAHRA and collaboration with archaeologist 	No Stone Age sites were observed in the critical area.
Early Iron Age sites	<ul style="list-style-type: none"> Surveys and test excavations Extended excavations if unique 	<ul style="list-style-type: none"> Permit from SAHRA and collaboration with archaeologist 	It is highly unlikely that there are Early Iron Age sites in the critical area
Late Iron Age sites	<ul style="list-style-type: none"> Survey and test excavations Extended excavations if unique 	<ul style="list-style-type: none"> Permit from SAHRA and collaboration with archaeologist 	A number of Late Iron Age sites and complexes exist in the peripheral area.
Historical sites and structures (houses, farm homesteads, etc.)	<ul style="list-style-type: none"> Documentation before destruction Restoration and utilisation Incorporation into new development schemes 	<ul style="list-style-type: none"> Permit from SAHRA and collaboration with historical architect 	Dwellings and homesteads dating from the relatively recent past and the historical period occur in the study area. These remains are considered to be significant. Mitigation measures are recommended for HH02.
Graves and graveyards	<ul style="list-style-type: none"> Incorporation of graveyards in development schemes Relocation of graves and graveyards 	<ul style="list-style-type: none"> Permits from SAHRA, national and provincial health departments. Community consultation. Collaboration with forensic archaeologist. 	Graves and cemeteries exist in the critical area and in the peripheral area.

ECOLOGICAL ASSESSMENT

Executive summary

Mr Tony de Castro approached EkoInfo cc to do a vegetation survey on his behalf for Metago Environmental Engineers along two proposed railway line routes in the Markara – Bapong area, Northwest Province. The two proposed routes cover a distance of approximately 15 km, and require servitude of 300 m. This represents approximately 550 hectares of some cultivated land and natural vegetation.

Nine plots were surveyed along the two routes in stands of natural vegetation. The scope of the project requested that a species list be compiled and an assessment made of the presence of rare and endangered species along the two routes and the conservation status of the vegetation along the two routes.

The results from the literature reviews and field survey confirmed that the vegetation along the two routes belongs to the regional vegetation type no. 14 Clay Thorn Bushveld of Low & Rebelo, 1998. The Clay Thorn Bushveld covers approximately 16 302 km², is more than 60% transformed and less than one percent (1%) conserved (Low & Rebelo, 1998). The mosaic of remaining natural vegetation is generally over utilised, this trend was confirmed during the current survey.

The floristic data from the survey confirmed the presence of three plant communities. The wide spread Plains Community which covers the majority of the routes, and two localised communities, namely the Riparian Wetland Community and Outcrop Community associated with drainage lines and outcrops respectively. Two variations occur within each of these two communities, based on hydrology and lithology respectively.

No Red Data listed flora species or related species were encountered along any of the two proposed routes or had been recorded historically in the area. In terms of the overall survey, the timing of the survey was less than optimal, as very little rain had fallen, large areas were over grazed or still recovering from recent fires and very few species were flowering. Therefore the species list should not be considered as being comprehensive or conclusive.

No plants are listed as flagship species in the Savanna biome but six animals species are of which the Starbust Horned Baboon Spider (*Ceratogyrus bechuanicus*) is a common inhabitant and commercially threatened.

The ecological status of stands of natural vegetation along both routes is poor due to over utilisation and neglect. Declared weeds and invaders are common and bush encroachment is prevalent.

In comparison with the regional distribution of similar vegetation, these two proposed railways will have a negative impact on a very small area.

Four national environmental acts govern the conservation and protection of natural habitat along the proposed routes. The non-perennial and perennial drainages lines would require special attention in terms of the National Water Act.

Both proposed railway routes will have the largest impact on the terrestrial vegetation. The overall conservation status of the vegetation in consideration of the above-mentioned factors is low. It should be considered that all though the conservation status is considered to be low, most of the factors, which has a negative impact on the vegetation, could be improved through management.

The following recommendations are made that the impact of construction vehicles and construction activities be restricted to the 300 m servitude, that special attention should be given to the design and construction of the railway when crossing or approaching any of the drainage lines along the proposed route and that the spread of declared weeds and invaders be controlled during and after the construction of the railway.

Assessment managed and compiled by

W.H. de Frey

(MSc Wildlife Management, Pr. Sci. Nat)

Signature: 

Date: 2002/11/29

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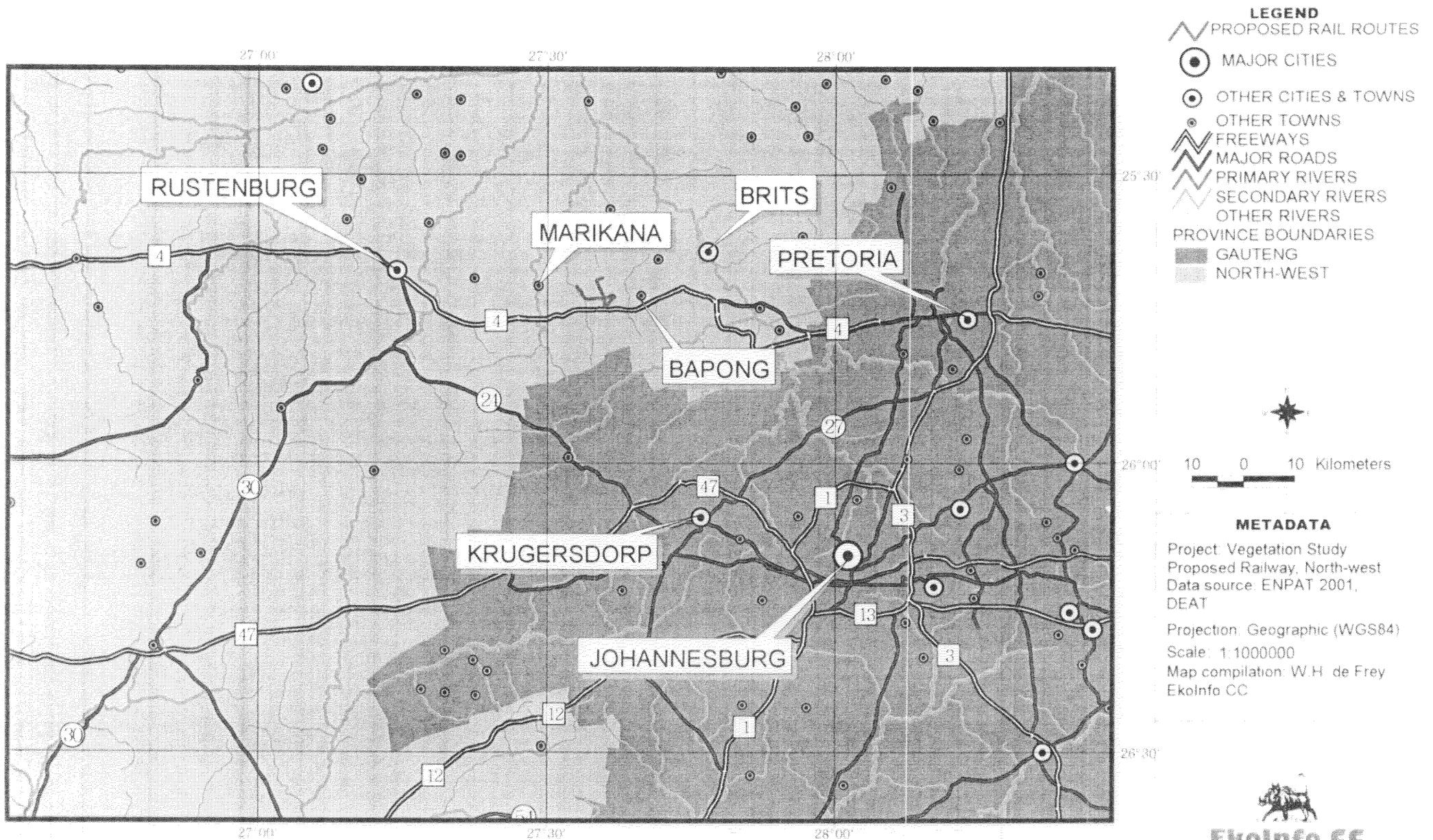
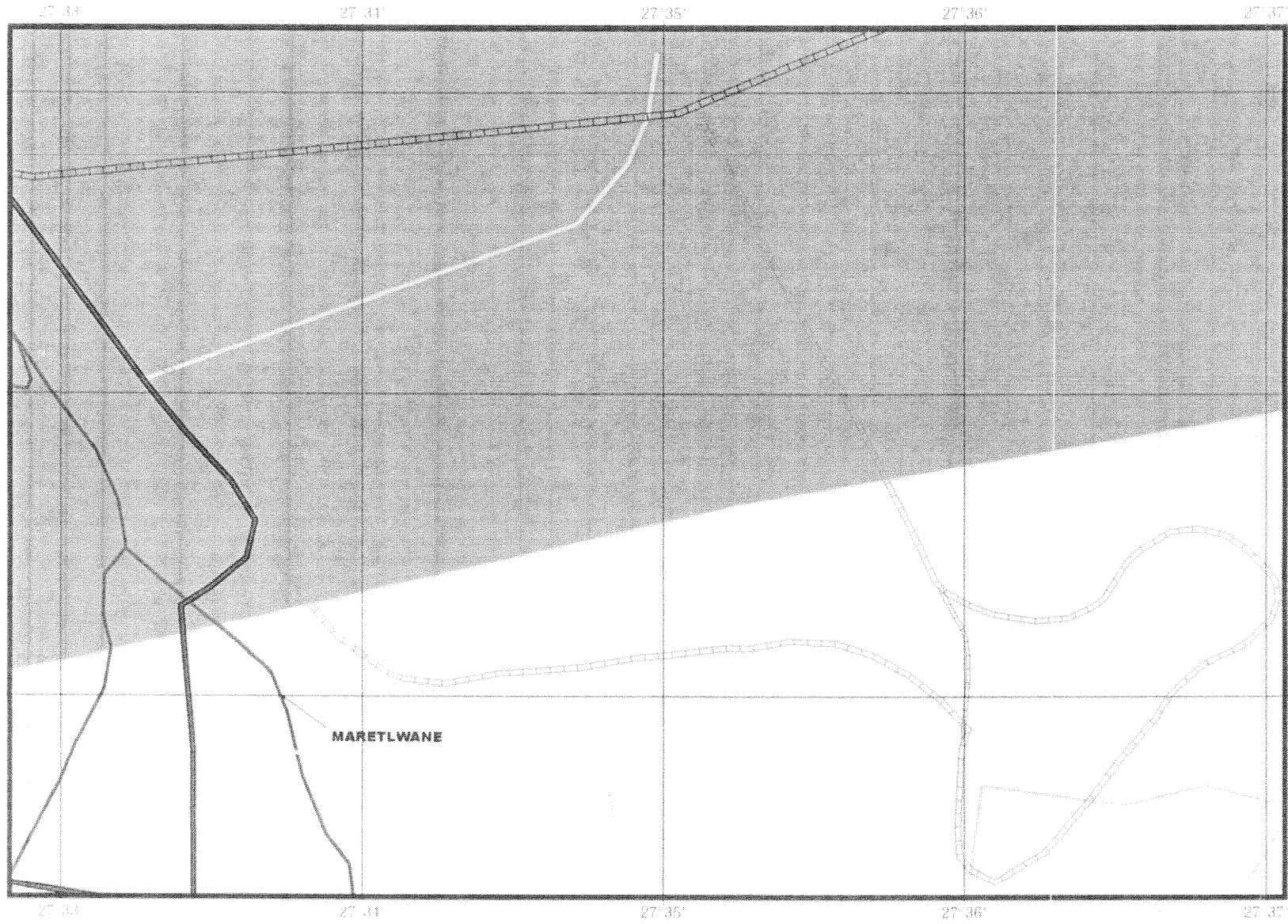









Figure 1: Regional location of the two proposed railway routes (study area)



LEGEND

-  EXISTING RAILWAY
-  PROPOSED RAIL ROUTES
-  SECONDARY ROADS
-  OTHER ROADS
-  RIVERS
- STRATIGRAPHIC UNITS**
-  Pyramid Gabbro
-  Schilpadnest



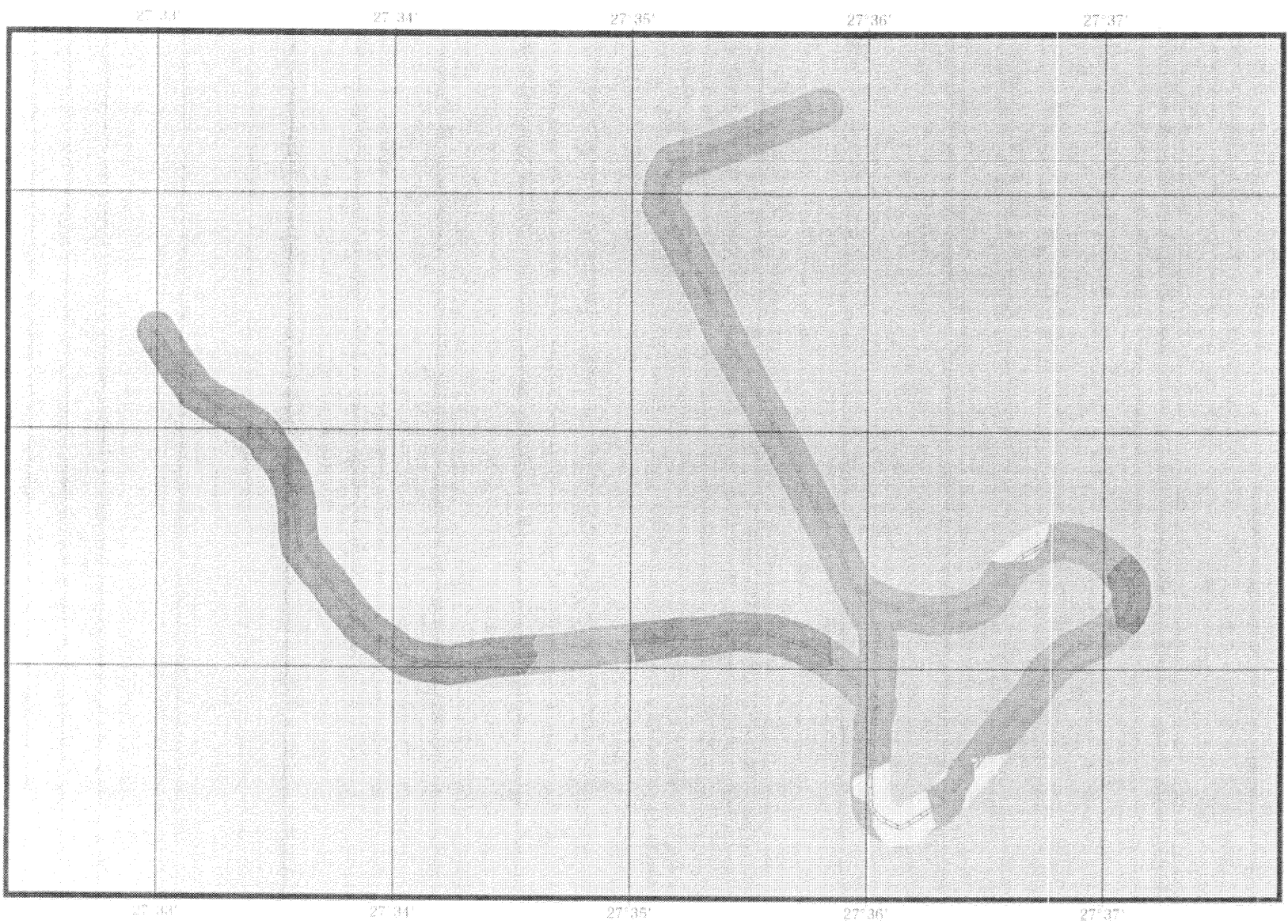
500 0 500 Meters

METADATA





Project: Vegetation Study
 Proposed Railway, Northwest
 Data source: ENPAT 2002,
 DEAT
 Projection: Geographic (WGS84)
 Scale: 1:36016
 Map compilation: W.H. de Frey
 EkoInfo CC



Figure 3: Geological attributes across the study area



LEGEND
PROPOSED RAILWAY ROUTES

- CURRENT LANDCOVER
-  CULTIVATED LAND;
 -  COMMERCIAL MINES AND QUARRIES
 -  THICKET AND BUSHLAND
- REGIONAL VEGETATION UNIT
-  Clay Thorn Bushveld

25°41'

25°42'

25°43'



500 0 500 Meters



METADATA

Project: Vegetation Study
Proposed Railway, North-west
Data source: ENPAT 2001,
DEAT

Projection: Geographic (WGS84)
Scale: 1:44901
Map compilation: W.H. de Frey
EkoInfo CC



EkoInfo CC

www.ekoinfo.co.za

Figure 4: Regional vegetation and expected land cover along the study area

Methodology

A literature, Internet and Geographic Information System (GIS) review were completed to obtain a broad environmental overview of the area.

The PRECIS database of the National Botanical Institute was queried to determine whether any red data species had been recorded within the quarter degree grid of the proposed route and adjacent grids. Additionally a list of possible species was generated from the Southern African Plant Red Data List publication (Golding 2002).

Plots were placed within the 300 m footprint of the proposed route, with the aid of a Geographic Information System (GIS)¹. The co-ordinates of the plots were then exported to FUGAWI² and downloaded to a GARMIN MAP76 Global Positioning System (GPS) receiver for navigation in the field. Actual location in the field was recorded within a 5 m accuracy interval.

At each plot, the following abiotic attributes were documented:

1. Topography – altitude, terrain unit, percentage slope
2. Soil – soil form, soil depth (mm), erosion, estimated percentage clay of A horizon
3. Estimated percentage rock cover – gravel, small, medium, large

The following overall vegetation characteristics were documented:

1. Vegetation cover – total, trees, shrubs, herbs, open water, rock
2. Estimated average height of trees, shrubs and herbs – highest and lowest categories

A list of all species within an approximate 200m² area was recorded in the following growth form categories: grasses, forbs and woody species. Cover abundance values were estimated for each species within the plot. Unknown species or potential red data species were identified using field guides (Van Oudshoorn 1991, Van Wyk & Malan 1988, Smit, N 1999), the University of Pretoria's herbarium and specialists from the National Botanical Institute when in doubt or when confirmation of potential red data species was required.

The survey results were entered into a relational database³ for record purposes and analysis of the abiotic and vegetation characteristics. The species data was entered into Microsoft Access and manipulated in Microsoft Excel. Due to the nature and scale of the project, no attempt was made to map the vegetation.

Limitations

The Braun-Blanquet method was developed to record ninety-five percent (95%) of the species within a specific plot size, therefore the more plots surveyed the more comprehensive the species list will be.

At a scale of 1:50 000, the 300 m servitude is 6 millimetre wide, therefore it is impossible to map the vegetation units along the two proposed routes.

At a scale of 1:10 000 or larger, the servitude will be approximately 30 mm wide and stretch across two 1:10 000 aerial photographs, and therefore could not be include in this report.

Alternatively digital photographs were taken at each plot in opposite directions along the proposed route.

In the absence of a geotechnical report, plots within the terrestrial vegetation were placed at random or to reflect obvious physiognomic and/ or species differences.

Fire, overgrazing and the time of season (late spring/early summer) prevented the positive identification of non-flowering species.

¹ Arc-View 3.2a

² Interface software between personal computer and GPS receiver

³ MS Office 2000 Access

Results and discussion

Nine plots were surveyed along the two proposed routes (study area). These plots were placed within areas of natural vegetation between the mosaic of cultivated fields, pastures and man-made infrastructure along both routes. A census was done of all the perennial and non-perennial drainage lines along both proposed routes within the 300 m impact zone. The sample size (number of plots) within the terrestrial vegetation depended on the size of the remaining natural vegetation within the area and/or obvious physiognomic or species differences.

Regional relevance

The survey confirmed that the vegetation along both proposed routes belongs the Clay Thorn Bushveld of Low & Rebelo, 1998.

This statement is based on the characteristics of the abiotic component and the presence of the key species within more than forty percent (40 %) of the plots surveyed along the route.

Typical black turf dominates the area, which was derived from the underlying igneous substrate (Table 1). This soil form is known as an Arcadia. The absence of scarps within the landscape and the dominance of crests and midslopes confirm that the study area occurs with a plain (Table 2).

Eleven of the seventeen key species listed (Low & Rebelo, 1998) as being dominant within the Clay Thorn Bushveld vegetation unit had been recorded during the survey. The species are (Appendix A), *Acacia tortilis*, *A. nilotica*, *A. karroo*, *Ziziphus mucronata*, *Dichrostachys cinerea*, *Ischaemum afrum*, *Panicum coloratum*, *Bothriochloa insculpta*, *Grewia flava* and *Aristida bipartita*. Those absent species are usually associated with red clayey areas or the more sandstone derived soils present at mountain footslopes.

Vegetation along the proposed route

It had been confirmed that the vegetation within the study area is representative of the Clay Thorn Bushveld Vegetation Unit on a regional scale. Based on the composition of the floristic data from the field survey, the vegetation within the study area was classified into three broad vegetation communities. These communities most probably represent variations within a larger community/s of the Clay Thorn Bushveld Vegetation Unit.

The variations are based on a small sample size, and therefore probably reflect gradients in the vegetation rather than distinctive communities. The overlap between the different Species Groups in the Braun-Blanquet table (Appendix A) supports this statement.

The three communities are:

1. The Riparian Wetland Community
2. The Outcrop Community
3. The Plains Community

Two variations occur within the Riparian Wetland Community, one associated with a non-perennial drainage lines (Section 1, Plot 2) and one with a perennial drainage line (Section 2, Plot 9). Due to the timing of the survey and limited rain, which had fallen, the non-perennial drainage line (Photo 1) is difficult to distinguish from the surrounding plains vegetation (Photo 2 & 4). The drainage line and its surrounding floodplain are dominated by *Acacia karroo*, *Bothriochloa insculpta* and *Ischaemum afrum*. It is distinguished from the adjacent plains vegetation on the presence of the following species: *Hypoxis*

indifolia, *Scabiosa columbaria*, *Sutera* spp. and an unknown plant⁴ (Photograph 3). The plains vegetation is very similar in dominant species, but the strong presence of *Acacia nilotica*, as well as *Heteropogon contortus* and *Aristida bipartita*, *Bothriochloa insculpta* and *Eragrostis curvula* points towards the drier clays, where the lime layer is closer to the surface and the soil is rockier. *Acacia sieberiana* is an infrequent dominant on the higher lying habitats (Photo 5). Plots one to five (Section 1) occur within stands of the Plains Community.

Where boulders/ outcrops occur, elements of the Mixed Bushveld are found. The following species represent these elements: *Rhus lancea*, *Ziziphus mucronata*, *Pappia capensis* and *Digitaria eriantha*. Sample points six; seven and eight were sampled within stands of the Outcrop Community. Based on the difference in the lithology of the outcrops sampled, two variations occur. One variation is associated with an outcrop of the Schilpadnest sub-suite (Plot 6, Photo 7) in section one. The most abundant/dominant species on the outcrop of the Schilpadnest sub-suite are *Melinis repens*, *Hyphantenia hirta*, *Heteropogon contortus*, and *Dichrostachys cinerea*. Other less prominent or dominant species occurring on the outcrop are *Sclerocarya birrea*, *Albucca setosa*, *Scilla nervosa* (Photo 8) and *Vangueria infausta*. The other variation is associated with outcrops of the Pyramid Gabbro-Nortite layer (Plots 7 & 8, Photo 9) in section two.

The flow of water in the perennial drainage line exposed outcrops within the riparian vegetation (Photo 10). Therefore similar plants occur in this variation of the Riparian Wetland Community than in the Outcrop Community. *Rhus lancea*, *Euclea crispa* and *Imperata cylindrical* dominate this variation. Species, which distinguish this variation from the Outcrop Community and its variations, are the ferns *Pellaea calomelanos* and *Cheilanthes viridis*, the wetland invaders *Arundo donax*, *Cestrum laevigatum* and *Meiba azedarach*, as well as the wetland natural *Typha capensis*. *Cyrtanthus* species and other lilies are less common species within this variation.

Observed Fauna

A detailed faunal survey was beyond the scope of this study, but several animals, or signs of them, were spotted. The riverine community (Section 2, Plot 9) has rock pools, which may house pythons and terrapins. A slender mongoose (*Galerella sanguinea*) was spotted. The droppings of *Genetta tigrina* (Large spotted genet) and a rabbit species were seen on the Schilpadnest sub-suite outcrop (Section 1, plot 6). A white-tailed rabbit (*Lepus capensis*) and a Grey heron (*Ardea cinerea*) were spotted. Some insect species were observed – notably the sub-family Scarabaeinae and Longicorninae. Two black-shouldered kite (*Elanus cereus*) were spotted along with a fiscal shrike (*Lanius collaris*). In the riverine habitat Cape white-eye (*Zosterops pallidus*) were spotted. These few observations do not represent a significant sample size, but alludes to the current viability of the natural habitat as nesting ground or forage space for the local fauna.

⁴ Photos of the species had been sent to the National Botanical Institute for identification

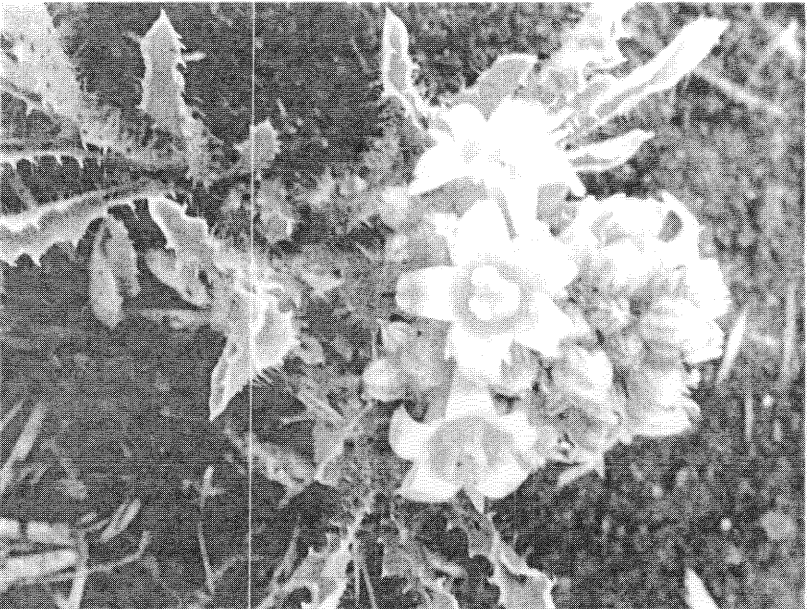


Photo 3: Unknown plant from non-perennial drainage line variation of the Riparian Wetland Community, cf *Jatropha schlechteri*

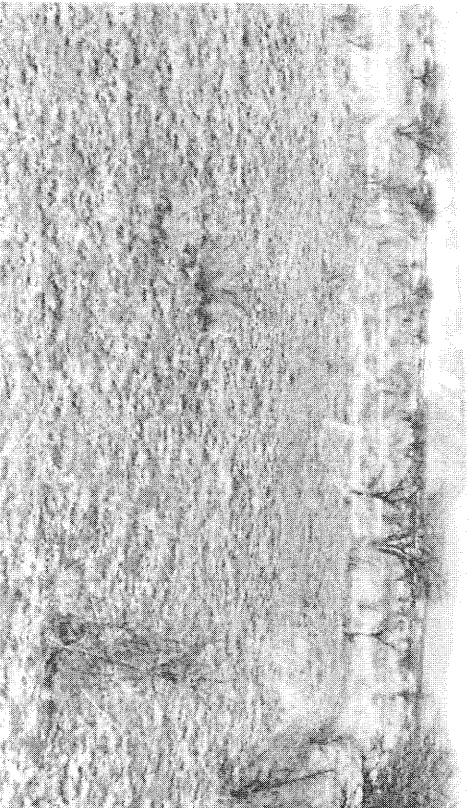


Photo 4: Vegetation of the Plains Community (Section 1, Plot 3)

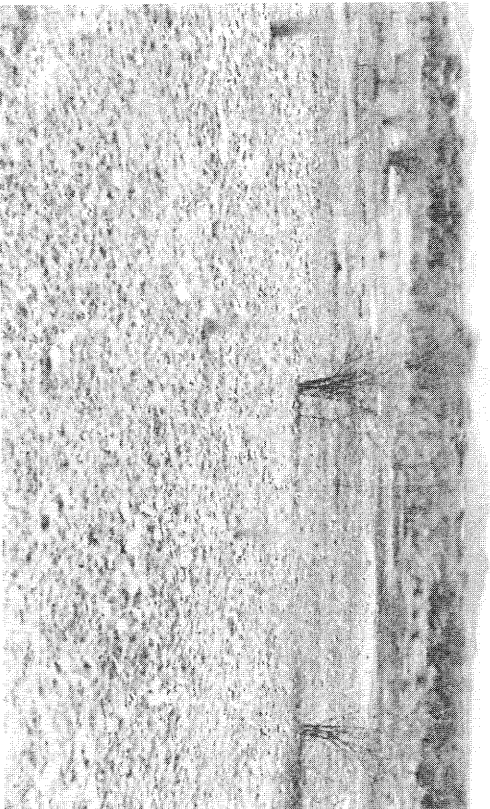


Photo 7: Vegetation within the Schilpadnest sub-suite outcrop, a variation of the Outcrop Community



Photo 8: *Albuca* species on outcrop of the Schilpadnest sub-suite (*cf. Albuca setosa*)

Rare or endangered species

A verbal query of the PRECIS data indicated that no rare or endangered flora species had been recorded in the quarter degree grid of study area or its adjacent grids. This does not mean that no rare or endangered species occur in these grids, as the level of sampling⁵ or intensity of sampling⁶ is unknown. Therefore a preliminary list was compiled from the latest publication on red data flora species, "Southern African Plant Red Data Lists" (Golding 2002).

Table 3 contains these species representing the rare and endangered species that occur in the North-West Province. Only one species almost certainly occur in the area, namely the clay specialist species *Brachystelma glenense*, it is in the **Lower Risk, near threatened** category. One other species likely to occur on the black turf, would be *Brachystelma discoideum* it falls in the **Vulnerable with a fragmented and declining habitat** category. Little is known about the latter, but the type location is currently under threat from an informal settlement (Golding 2002).

Species from the same genus seems to flower from as early as October and therefore if present these species would have been noticed. The only species from the same family observed during the survey was *Asclepias fruticosa* a pioneer of disturbed areas.

No floral species are listed as flagship species for the Savanna biome (Le Roux 2002), but the following fauna species are:

1. Starbust Horned Baboon Spider (*Ceratogyrus bechuanicus*)
2. Ground Hornbill (*Bucorvus leadbeateri*)
3. Cape Griffon (*Gyps coprotheres*)
4. Wild dog (*Lycan pictus*)
5. Short-Eared Trident Bat (*Clootis percivali*)
6. White Rhinoceros (*Ceratotherium simum*)

Of the six species the only species possibly present would be the Starbust Horned Baboon Spider, a common inhabitant of the savanna biome (Le Roux 2002). They are commercially threatened as pets. The habitat requirements of the other five species do not qualify for the area surveyed but it should be considered that the two birds (Ground Hornbill, Cape Griffon) and the bat could roost in one area and forage in another.

Conservation status

Both proposed routes run in or alongside stands of natural vegetation. Vegetation strips such as these present both fauna and flora with the last vestiges of a connection between larger natural habitats. In the increasingly fragmented environment, corridors such as these are increasingly important for survival of both animal and plant populations.

Of the 198 species listed as declared weeds or invaders within the Conservation of Agricultural Resource Act 43 of 1983 – amended 2001, several species were found in, or near the servitude: *Melia azedarach* (1), *Arundo donax* (1), *Sesbania punicea* (1), *Opuntia ficus-indica* (1), *Agave sisalana* (2), *Nerium oleander* (1), *Sorghum halepense* (2), *Tithonia diversifolia* (3), *Cestrum laevigatum* (1), *Cirsium vulgare* (1) and *Detura stramonium* (1) was found during the field survey. This indicates a notable level of disturbance low frequency and can be attributed to the fact that the survey included natural, semi-natural and transformed vegetation patches.

⁵Which families or genera

⁶How many times these grid had been sampled

According to the latest legislation Category 1 (denoted in brackets after plant name) are prohibited and must be controlled. Category 2 may be utilised under special permits. Category 3 may no longer be planted and reasonable steps should be taken to ensure that it does not spread.

A subjective assessment of the conservation status of the stands of natural vegetation within the study area, would consider:

- ✓ The ecological status of the vegetation based on species composition, rare or endangered species observed and the presence of declared weeds and invaders
- ✓ The size of the areas to be affected
- ✓ The environmental legislation governing the conservation and management of the areas

The overall ecological status of the vegetation is considered to be poor as many declared weeds and invaders occur in the area, bush encroachment is prevalent, no rare or endangered species or species related to rare and/ or endangered species had been observed or occur in large enough stands to make them obvious during a survey of this nature.

It was beyond the scope of the report to calculate the exact size of the stands of natural vegetation to be affected by two proposed railway routes, but it is small compared to the regional distribution of the vegetation.

At least four environmental acts are applicable to the area, they are:

1. The National Environmental Management Act
2. The Environmental Conservation Act
3. The Conservation of Agricultural Resources Act
4. The National Water Act

These are all national acts and exclude provincial legislation. It is therefore evident that the conservation and protection of natural resource as a high priority in society today, especially water resources, as it is the only resource, which has an act dedicated only to its management.

The study area traverse two non-perennial drainage lines and border on one perennial drainage line, therefore most of the impact will occur in terrestrial habitats which are governed by three instead of four acts. Therefore the conservation status of the vegetation along the proposed railway route is considered to be low and specific attention should be given to the protection of the drainage lines, especially the perennial stream.

The area surveyed represents two alternative routes (Figure 2): alternative A (blue line) in the east and alternative D (red line) in the west.

The alternative, which would affect the least environmental variables, is alternative A. Alternative A has no perennial drainage lines associated with it, traverse already over utilised or transformed areas. Alternative D is adjacent to a perennial drainage line, and the remaining vegetation along this section of proposed route is in a better condition with a higher number of species per plots (Table 4 – plots 8 and 9). Alternative D also covers a longer distance than alternative A and would therefore affect a larger area of natural vegetation. Two major ecosystems meet within alternative D, which implies that the construction activities will impact on more plant and animal species than would be the case along alternative A.

If the two alternatives are compared in terms of the expected impact, then the extent of alternative D is larger than that of alternative A, the construction of a railway will have an higher negative impact on the vegetation and animals along alternative D than along alternative A but for both alternatives the impacts will be long term.

Neither of the two proposed routes qualify for a “No go” option in terms of the flora and fauna but alternative A would be the most suitable as construction of the railway will have a lower expected negative impact than when compared to alternative D.

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Vernonia natalensis	+					
Peltoporum africanum	+					
Bracharia eruciformis	+					
Aristida stipitata	1					
Peltoporum africanum	+					
Eragrostis rigidior	2A					+
Andropogon schirensis	+					
Hypoxis iridifolia	+					
Scabiosa columbaria	+					
Sutera sp.	+					
Gnidia spp.	+					
Elephantorrhiza elephanthina	+					
Thesium utile	+					
Indigofera sp.	r					
Acacia sieberiana						1
Rhynchosia niens						+
Polygala hottentotta						+
Tithonia diversifolia						+
Foto6.7	r					r
Acacia caffra						+
Maytenus polycantha						+
Lippia javanica						+
Ehretia rigida						+
Solanum panduriforme						+
Celtis africana						+
Arjia setifera						+
Digitaria eriantha						1
Rhus leptodictya						+
Pappia capensis						1
Oxygonum spp.						+
Panicum natalense						1
Panicum maximum						1
Kalanchoe sp.						+
Melilotus spp.						+
Asclepias fruticosa						r
Arundo donax						+
Inkweed						1
Berkheya radula						+
Carissa bispinosa						+
Cestrum laevigatum						+
Cheilanthes viridis						+
Grewia flava						+
Helichrysum sp.						+
Inkweed						+
Inkweed						+
Flaveria bidentis						+
Kalanchoe sp.						+
Paspalum urvillei						+
Palaea calomelanos						+
Phyllanthus parvulus						+