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**Appendix H: Cultural heritage assessment – Phase 1**

Zwartfontein South Open Pit EMPR PPRust

**TO:**

**SRK CONSULTING ENGINEERS AND SCIENTISTS  
POTGIETERSRUST PLATINUMS MINE**

**A CULTURAL HERITAGE IMPACT ASSESSMENT FOR THE  
PROPOSED NEW OPEN PIT FOR PPRust ON THE FARM  
ZWARTFONTEIN 818LR IN THE NORTHERN PROVINCE OF  
SOUTH AFRICA. AMENDMENT TO THE PPRust  
ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT  
(EMPR)**

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## EXECUTIVE SUMMARY

PPRust plans to develop a new open pit on the southern part of the farm Zwartfontein 818 LR, near Potgietersrust (Mokopane). The Zwartfontein South Project is part of PPRust's programme to expand its current open cast mining activities on the farms Vaalkop 819LR and Sandsloot 236KR in the Langa Ndebele tribal area (Ga Mapela) in the Potgietersrust (Mokopane) District of the Northern Province of South Africa. The Mokopane area is known for its rich and diverse range of heritage resources that cover the prehistoric period from the Stone Age to the Iron Age and the historical (colonial) period.

Heritage resources consisting of the ruins of dwellings and old abandoned mines were discovered in and near the proposed new open pit area on the southern part of Zwartfontein 818 LR. The early platinum mining dates from the 1920's but was not economically viable, and mining was soon abandoned. Approximately six sites with graves and the ruins of dwellings dating from the relatively recent past also occur in and near the open pit area. The status of some of the graves is in dispute. There may be other graves that may never be found. The graves were tabulated (Table 1).

The levels of significance of the graves, the ruins of the dwellings and the abandoned mining activities have been determined. The graves are highly significant, while the ruins of the dwellings have little (low) significance. The abandoned mining areas are historically significant in that they represent the origins of the PPRust Platinum Mine.

All these remains will be affected (destroyed) by the development of the open pit and associated infrastructure. Mitigation measures are recommended, namely that the graves be exhumed and relocated and that the abandoned mines be thoroughly documented before they are destroyed. Mitigation measures are also outlined for heritage resources not yet discovered during this investigation, but which may be uncovered during the construction and operation of the open pit and associated infrastructure (Table 2).

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## 1 TERMS OF REFERENCE

This document contains the report on the results of a cultural heritage impact assessment study done for SRK in the Northern Province of South Africa. Parts of the Northern Province, such as Pietersburg, Potgietersrus, Phalaborwa, the Blouberg Mountains, Louis Trichardt, the Steelpoort valley and areas to the north and south of the Soutpansberg have been explored for cultural heritage remains in the past. These explorations have shown that the Northern Province has a rich archaeological heritage, comprising remains dating from the prehistoric and the historical past. Prehistoric and historical remains in the Northern Province reflect the cultural heritage of most groups living in South Africa today.

PPRust intends to establish a new open pit on the southern part of the farm Zwartfontein 818LR in the Northern Province of South Africa. In order to comply with legislation, PPRust requires knowledge of the presence and the significance of any heritage resources that may occur in or near the open pit. The mine needs this information in order to take pro-active measures with regard to any heritage resources that may be affected by the new development, as such remains may be affected, damaged or destroyed by the new development. SRK therefore contracted the author to undertake a cultural heritage impact assessment study of the open pit area, with the aims

- to establish whether any heritage resources occur in or near to the open pit area and, if so, what the nature, the extent and the significance of these remains are;
- to determine whether such remains will be affected by the proposed development of the open pit; and
- to evaluate appropriate actions that could be taken to reduce the impact of development activities on such remains.

This report therefore provides an overview of the heritage resources and graves that were discovered in and near the proposed open pit and the level of significance of these remains. The report indicates that these remains will be affected by the development of the open pit and recommends mitigation measures that can be implemented to minimise the effects of the proposed development on the graves and remains of old mining activities. The mitigation measures proposed also apply to heritage resources not discovered during this survey, but which may be uncovered during the construction and operation of the open pit and associated infrastructure.

## **2 METHODOLOGY**

### **2.1 Sources of information**

The possible presence of heritage resources in and near the open pit area was determined by using evidence derived from maps, the grave census compiled by the survey department of PPRust and a survey on foot of the proposed open pit area.

The presence of old mines on Zwartfontein 818 LR are indicated on the 1:50000 topographical map of Limburg 2328. Maps produced by the survey department of PPRust provide detail information regarding the nature and the extent of these mines. The surface infrastructure and activities associated with what seems to have been the abandoned Northern Prospect Platinum Mine have been mapped by PPRust's survey department.

PPRust's survey department also surveyed and mapped the presence of graves and the ruins of dwellings in and near the proposed open pit area. The co-ordinates for the sites with graves, the ruins of dwellings and mining infrastructure are part of a GIS database. Maps indicating the spatial occurrence and distribution of these features are therefore readily available when required.

The proposed open pit area was also subjected to a survey on foot. The survey confirmed the presence of old, abandoned mines, the ruins of dwellings and sites with graves. However, it also suggested that not all the sites with 'graves' may in fact be graves.

### **2.2 Assumptions and limitations**

The survey on foot may have missed heritage resources and graves. The dense vegetation currently growing in or near the proposed open pit may cover some of these features. Graves may also have been covered by the large amount of waste material that has been dumped on this site over a long period of time. Heritage resources may occur below the surface of the earth. These remains may only be exposed after the development of the open pit has commenced. This Phase I survey, therefore, has to be seen in the light of the dynamic nature of EMPRs, which must be updated on a regular basis. The discovery of previously undiscovered heritage remains may require that further studies (Phase II work) be done (in collaboration with SAHRA or other state departments).

The position of graves in and near the proposed open pit area can be problematic with regard to a number of issues. Graves are not always clearly marked. Some markings merely consist of stone edgings or a few stones placed on a grave. Soil or vegetation covers graves that are unattended, while markings on some graves may have been disturbed over time. It is therefore not certain that all individual graves have been identified in the proposed open pit area.

The six sites with graves that have been recorded, however, vary in size between a cemetery containing 54 graves to a site that contains three graves. On one of the sites (No. 6), no graves are visible on the surface. The larger the number of graves in each cluster, the more likely it is that these sites are in fact graveyards, especially when the names of the deceased have also been recorded.

### 2.3 Some remarks on terminology

The cultural heritage assessment referred to in the title of this report includes a survey of heritage resources as outlined in the National Heritage Resources Act (Act No 25 of 1999).

Cultural heritage (or cultural resources) includes all human-made phenomena and intangible products that are the result of the human mind. Natural, technological or industrial features may also be part of heritage resources, as places that have made an outstanding contribution to the cultures, traditions and lifestyles of the people or groups of people of South Africa.

The term 'pre-historic' generally refers to the time before any historical documents were written or any written language developed in a particular area or region of the world. The historical period and historical remains refer, for the Potgietersrus area, to the first appearance or use of 'modern' Western writing brought to Potgietersrus (Mokopane) by the first Colonists who settled in this area c. 1845. The historical period for the Potgietersrus area therefore dates from c. 1845.

The term 'relatively recent past' refers to the 20<sup>th</sup> 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 40 000 years ago) and the Late Stone Age (40 000 years to 200 years ago).

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

The term 'study area' or 'project area' refers to the area where PPRust wants to focus its mining activities and other infrastructure.

The 'peripheral area' refers to the area where PPRust does not intend to focus any mining activities in the near future, but which are in close proximity to the project area.

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 archaeological mapping and excavating work, the documenting of rock art sites, engraving sites or historical dwellings and other architectural features and structures, the sampling of archaeological sites or shipwrecks, etc. Phase II work requires the co-operation and approval of SAHRA.

### **3 THE OPEN PIT STUDY AREA**

#### **3.1 Location**

PPRust's proposed new open pit is oblong in shape, measuring approximately 2 kilometres from north to south and approximately 800 metres from east to west. The largest part of the open pit will be situated on the southern part of Zwartfontein with a smaller part extending onto the farm Sandsloot 819 LR. The northern part of the pit will be bisected by the dirt road between the PPRust platinum mine and Fonthane and other Mapela villages further to the north-west. The study or project area in this report is therefore referred to as the open pit area.

The open pit area is located approximately 1.3 km from the former Ga Pila village. The inhabitants of Ga Pila were resettled some years ago in order to make way for one of PPRust's rock waste dumps that encroached on and eventually buried the abandoned village. One of the dirt roads that gave one access to the former Ga Pila village bisects the proposed open pit area from north to south. A few smaller dirt roads and footpaths criss-cross the open pit area (Figure 1).

#### **4.2 The disturbed (affected) nature of the study area**

The proposed new open pit area is not an unaffected piece of land any longer. In the 1920's platinum mines were established where the new open pit is proposed. This mine, which in fact was the precursor of PPRust, was established on the Merensky Reef, locally known as the Platreef, on the southern part of Zwartfontein 818 LR. This early attempt to mine and to process platinum was not economically viable and it was soon abandoned. However, it left a mining heritage, in the form of trenches, waste dumps and other remains on the surface of the proposed new open pit. These early mining activities have scarred and disturbed the study area and any heritage remains that may have existed on this piece of land. These early activities included the digging of shafts and trenches, the building of mining infrastructure as well as accommodation (such as a hostel or compound) for workers, the dumping of rock waste, the building of slimes dams, etc.



### 4.3 Heritage resources in a wider regional context

The open pit area is a restricted piece of land with regard to the surface area that it covers, as well as its geographical setting in the wider historically and culturally rich and diversified Potgietersrus area. Numerous types of heritage resources have been uncovered in the wider Potgietersrust area during the last few decades. The most important heritage resources discovered include:

- limestone caves near Potgietersrus where hominids (ape-man creatures) lived perhaps as long as 1 million years ago;
- Stone Age sites which may be associated with the San people and which date back hundreds of thousands of years;
- rock engraving and rock painting sites which date from the last 20 000 years;
- Early Iron Age sites occupied by the first Bantu-Negroid agriculturists, metal workers and possibly cattle herders which date back 1 500 years;
- Late Iron Age sites dating from the last 500 years;
- trade routes dating back centuries and wagon trails along which trade goods were moved between the interior of the country and the East Coast;
- remains dating from the previous century when the first Immigrant Boers settled at Potgietersrus, Lydenburg, Ohrigstad, Leydsdorp and other places from the 1840's onwards;
- block houses built by British troops on mountain ranges during the Anglo-Boer War (1899-1900);
- sensitive remains such as graves and graveyard sites dating from the pre-historic, historical and recent times; and
- numerous other, formal historical features (the Potgietersrust Museum, the Makapans Caves, the Pietersburg Museum with the Bakone Malapa, etc).

However, sources of information used including maps and the survey on foot confirmed only the presence of the following types of heritage resources and sensitive remains in and near the open pit area:

- graves;
- ruins of dwellings; and
- ruins of abandoned mines.

## **4 HERITAGE RESOURCES IN AND NEAR THE OPEN PIT AREA**

The remains found in and near the proposed open pit area are graves and cemeteries, ruins of dwellings and abandoned mines.

### **4.1 Graves**

The PPRust census of graves identified at least six localities with graves in or near the open pit area. These cemeteries are tabulated in Table I. The co-ordinates for the graves were not repeated in this report as they are incorporated in a GIS database maintained by PPRust.

### **4.2 Ruins of dwellings**

The ruins of dwellings and other structures occur to the south-east, on the farm Vaalkop 819LR and to the north-east of the existing open pit area on Zwartfontein. These remains are mainly those of dwellings (to the south-east) and those of older mining structures (to the north-east). The dwellings were probably once situated on the outskirts (to the north) of the former Ga Pila village, before the inhabitants of the village were resettled. The square foundations further north may perhaps be associated with the Northern Prospecting Platinum Mine.

The dwellings include multi-component structures with square foundations, indicating that they date from the relatively recent past. Both the dwellings and the mining structures are dilapidated, as they have been destroyed and vandalised for building material. It is unlikely that all these structures are older than sixty years (hence they do not all qualify as historical structures).

The ruins of the dwellings cannot be considered to be of high significance in terms of their uniqueness, architectural style, age, aesthetic appearance, cultural historical significance or ideological meaning. The dwellings have also been largely demolished. (An assessment of the indigenous architecture of dwellings in the Ga Puka and Ga Sekhaolelo towns has been recommended in the Overysel Swartfontein Project that runs concurrently with the Zwartfontein South Project).

### **4.3 Ruins of abandoned mining activities**

The remains of abandoned mines are scattered over the proposed open pit area. They extend further to the north of the open pit area. These remains

include waste rock dumps, slimes dams, trenches, concrete foundations, winches, borrowing and prospecting pits, etc. PPRust's survey department has mapped these remains, which can probably be traced back to the Northern Prospect Platinum Mine that started with the mining of platinum in the 1920's. Platinum mining was hereafter continued in the Rustenburg District and was only restarted in this region in the late 1980's with the rebirth of the Potgietersrust Platinums Ltd Mine.

The remains of the old mine have high historical significance as these remains represent the origins of PPRust. However, the mining infrastructure has been damaged. Most of this infrastructure has collapsed or has been demolished or vandalised during the years when the mine was abandoned. The most conspicuous remains are the waste rock dumps and the slimes dams. Trenches have collapsed or were filled in. It is unknown whether any shafts or underground infrastructure still exists.

If the original mining infrastructure, features and activities of this mine cannot be preserved or restored e.g. as a living mining museum, the demolished remains have little significance. The old mining complex can always be 'rebuilt' (or replicated) in order to serve an educational or tourism need.

A mine museum in the Limpopo Province could illustrate the development of the platinum industry in the Mokopane area. An early mining theme could be fruitfully exploited, given the fact that the first gold in the former Transvaal Province was mined in the 19<sup>th</sup> century, slightly further to the north, at Eerstegoud, close to Pietersburg.

## **5 THE IMPACT OF THE OPEN PIT DEVELOPMENT ON HERITAGE RESOURCES AND GRAVES**

### **5.1 Heritage resources and levels of significance**

The assessment of the proposed open pit study area indicated the presence of graves, the ruins of dwellings and the ruins of abandoned platinum mines in and around the open pit area. These remains are listed in Table 2. This table also outlines the level of significance of these remains and the degree of impact these remains have experienced in the past (past impact) and the magnitude of impact the remains will experience in the future (future impact).

Three levels of significance were used to grade the heritage resources and the graves, namely 'high', 'medium' and 'low'. These levels of significance were determined by considering criteria such as the ideological/symbolic and aesthetic values, uniqueness, cultural historical value, the state of preservation and the research value of the different types of heritage resources. The degree of impact on the remains in the past (mostly before the new heritage bill was promulgated) and in terms of future impact that will occur during the construction and the operation of the open pit is also indicated as 'high', 'medium' or 'low' (Table 2).

### **5.2 Legislation, mitigation and heritage resources**

The status of the remains that exist in and near the open pit is determined by cultural heritage legislation. A synopsis of all legislation relevant to the heritage resources and the graves is provided below. It can be used as a guideline to manage the mitigation measures that have to be implemented for the heritage resources and the graves concerned.

Mitigation measures also have to be implemented whenever hitherto undiscovered heritage resources are (accidentally) discovered during the construction of the open pit or during its operation. Consequently, mitigation measures have been spelled out with regard to all possible ranges of heritage resources that may be encountered in or near the open pit area.

#### **5.2.1 The National Heritage Resources Act (Act No 25 of 1999)**

The National Heritage Resources Act (Act No 25 of 1999) requires all developers (including engineers, farmers [agriculturists] and mines, previously excluded from the bill) to undertake impact assessment studies whenever any



development activities are undertaken. The law also provides guidelines for impact assessment studies to be done whenever heritage resources may be destroyed by development activities. Permits must be acquired from the South African Heritage Resources Agency (SAHRA) before a heritage site can be affected or destroyed during the course of development activities.

Archaeological impact assessment studies have therefore become a common procedure for all development activities, even if such development may be exempted in terms of the Environment Conservation Act.

The new law stipulates the types of remains that qualify as heritage resources (heritage). These cultural resources are classified into national, provincial and other cultural heritage resources. The law stipulates general principles for heritage resources management and involves all three levels of government in the management of the country's cultural heritage. The law also requires community participation in the protection of living heritage resources.

SAHRA establishes and maintains a national policy, strategy plans and standards for heritage resources management and monitors the system as a whole. Heritage authorities assist and co-operate with individuals and organisations concerned with the study, the conservation and the promotion and utilisation of national heritage resources. A National Heritage Resources Fund provides financial assistance for heritage projects.

## **5.2.2 Graves, the exhumation and relocation of human remains**

Different legislation applies to different categories of graves, namely:

### **5.2.2.1 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 local or regional council relevant to the area to which 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).

#### **5.2.2.2 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.

#### **5.2.2.3 Graves older than 100 years**

All graves older than 100 years are legislated as being archaeological and therefore protected under Act 25 of 1999 (the National Heritage Resources Act). SAHRA authorisation is required for all graves in this category, regardless of where they are located. Any alteration to a grave in this category or the relocation thereof must be supervised by an archaeologist accredited by SAHRA and the Cultural Resources Management Section of the South African Association of Archaeologists. If the grave is situated in a cemetery administered by a local authority, the authorisation as set out for graves younger than 60 years is also applicable, over and above SAHRA authorisation. At the discretion of SAHRA, the Procedure for Consulting Regarding Burial Grounds and Graves (Section 36[5] of the National Heritage Resources Act) might also be required. 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).

#### 5.2.2.4 Graves of victims of conflict

All graves of victims of conflict, regardless of how old they are or where they are situated, are protected by Act 25 of 1999 (the National Heritage Resources Act). SAHRA authorisation is required for all graves in this category. Any alteration to a grave in this category or the relocation thereof must be supervised by an archaeologist accredited by SAHRA and the Cultural Resources Management Section of the South African Association for Archaeologists. If the grave is situated in a cemetery administered by a local authority, the authorisation as set out for graves younger than 60 years is also applicable, over and above SAHRA regulations. On the discretion of SAHRA, the Procedure for Consulting Regarding Burial Grounds and Graves (Section 36[5] of the Act 25 of 1999, the National Heritage Resources Act) might also be required. 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).

## 6 RECOMMENDATIONS

From the regional contextual evidence, it is clear that the Mokopane area has a rich and diversified cultural heritage. This has been amply proven by the discovery of the ruins of dwellings and old mining infrastructure belonging to the Northern Platinum Prospecting Mine and graves in and near the proposed open pit area. The ruins of the dwellings and the abandoned mining infrastructure have been demolished in the past. All these remains, including the graves, will be affected (destroyed) when the new open pit is constructed and kept in operation.

Legislation requires mitigation whenever heritage resources or graves 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 must therefore be implemented with regard to the graves and the old abandoned mines. It is also possible that heritage resources and graves not discovered during this study may be uncovered during the construction or operational phases of the open pit. These and other types of resources have to be subjected to the mitigation measures outlined in Table 3.

The mitigation measures for graves in and near the open pit area include actions such as the exhumation and reburial of human remains. Mitigation measures for the abandoned mining infrastructure would require that these activities be thoroughly documented with photographs and maps. A study of appropriate literature must also be undertaken to sketch a brief historical account of the earliest attempts at platinum mining in the Mokopane (Potgietersrust) District. This Phase II study (report) must be completed by an archaeologist (according to the National Heritage Resources Act) and be forwarded to SAHRA in order to obtain the necessary permit for the destruction of the old mining infrastructure.



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6 **BIBLIOGRAPHY OF LITERATURE PERTAINING TO THE BROADER REGIONAL CONTEXT**

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Table 1. Cemeteries in and near the proposed new open pit on Zwartfontein 818 LR and Vaalkop 819 LR. The Zwartfontein South Project will affect (destroy) these features.

	Clusters	No of graves	Farm	Visible on surface	Remarks
1	1 of 5	54 (8)*	Vaalkop	Yes	
2	2 of 5	9 (1)*	Zwartfontein	Yes	
3	3 of 5	5	Zwartfontein	Yes	
4	4 of 5	4 (1)*	Vaalkop	No (?)	Associated with ruins of dwellings
5	5 of 5	3	Zwartfontein	Yes	
6				No (?)	

\* Graves of unidentified persons.

? These 'graves' may not contain human remains.

Table 2. The level of significance of the graves, the ruins of dwellings and the ruins of the abandoned Northern Prospecting Platinum Mine in and near the proposed open pit area. Note the degree of impact on these remains in the past as well as the degree of impact on these remains during the construction and operation of the open pit.

GRAVES AND CEMETERIES IN AND NEAR OPEN PIT	LEVEL OF SIGNIFICANCE	MAGNITUDE OF PAST IMPACT	MAGNITUDE OF FUTURE IMPACT
Graves 1 of 5	High	Low	High
Graves 2 of 5	High	Low	High
Graves 3 of 5	High	Low	High
Graves 4 of 5	High	Low	High
Graves 5 of 5	High	Low	High
Graves 6	High	Low	High
Ruins (of former dwellings)	Low	Damaged to affected	High
Ruins (of former mine)	High (historical)	Damaged to affected	High

Level of significance

High (3), Medium (2), Low (1)

Magnitude of future impact

High (3), Medium (2), Low (1)

Degree of past impact

Destroyed (non existent) (4), Damaged (altered) (3), Affected (recognisable) (2), Unaffected (pristine) (1)

Table 3: Heritage resources and sensitive remains that may exist in or near the proposed new open pit. Note the mitigation measures to be followed whenever any of these resources are discovered during the opening, operation and closure of the open pit.

HERITAGE RESOURCES	MITIGATION MEASURES	PROCEDURES	GENERAL REMARKS
Stone Age sites and scatterings of stone tools	<ul style="list-style-type: none"> <li>Collection from surface and donation to Potgietersrus or Pietersburg Museums</li> <li>Test excavations if unique</li> <li>Extended excavations if exceptionally unique</li> </ul>	<ul style="list-style-type: none"> <li>Permit from SAHRA and collaboration with archaeologist</li> </ul>	Stone Age tools may exist in dongas and in the Sandsloot and Mohlosane Rivers, outside the open pit area.
Early Iron Age sites	<ul style="list-style-type: none"> <li>Surveys and test excavations</li> <li>Extended excavations if unique</li> </ul>	<ul style="list-style-type: none"> <li>Permit from SAHRA and collaboration with archaeologist</li> </ul>	It is highly unlikely that there are Early Iron Age sites in or near the open pit area.
Late Iron Age sites	<ul style="list-style-type: none"> <li>Survey and test excavations</li> <li>Extended excavations if unique</li> </ul>	<ul style="list-style-type: none"> <li>Permit from SAHRA and collaboration with archaeologist</li> </ul>	It is highly unlikely that there are Late Iron Age sites in or near the open pit area.
Historical sites and structures (houses, farm homesteads, etc.)	<ul style="list-style-type: none"> <li>Documentation before destruction</li> <li>Restoration and utilisation</li> <li>Incorporation into new development schemes</li> </ul>	<ul style="list-style-type: none"> <li>Permit from SAHRA and collaboration with historical architect</li> </ul>	The ruins of mining infrastructure and dwellings have no historical significance. Mitigation measures for the abandoned mines include the thorough documentation of these remains before their destruction.
Graves and graveyards	<ul style="list-style-type: none"> <li>Incorporation of graveyards in development schemes</li> <li>Relocation of graves and graveyards</li> </ul>	<ul style="list-style-type: none"> <li>Permits from SAHRA, national and provincial health departments.</li> <li>Community consultation.</li> <li>Collaboration with forensic archaeologists.</li> </ul>	There are at least six graves and graveyards in and near the open pit area.

## **Appendix I: Cultural heritage assessment: Phase 2**



Zwartfontein South Open Pit Phase II

**TO:**

**SOUTH AFRICAN HERITAGE RESOURCES AGENCY**

**A PHASE II INVESTIGATION OF CULTURAL HERITAGE  
REMAINS IN OR NEAR THE PROPOSED NEW OPEN PIT FOR  
POTGIETERSRUST PLATINUMS MINE (PPRust) ON THE FARM  
ZWARTFONTEIN 818LR IN THE LIMPOPO PROVINCE OF  
SOUTH AFRICA**

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## EXECUTIVE SUMMARY

PPRust plans to develop a new open pit on the southern part of the farm Zwartfontein 818LR, near Potgietersrust (Mokopane) in the Limpopo (former Northern) Province of South Africa. The Zwartfontein South Project is part of PPRust's programme to expand its current open cast mining activities on the eastern limb of the Merensky Reef (also known as the Platreef near Potgietersrust) from the farms Vaalkop 819LR and Sandsloot 236KR to the farm Zwartfontein 818LR.

Heritage resources consisting of graves and cemeteries, the ruins of dwellings and abandoned mines were discovered in and near the proposed new open pit area during an earlier Phase I survey of the proposed open pit area. Six sites with graves were discovered, although the status of some of the graves is in dispute. There may also be other graves that may never be found. The graves and ruins of dwellings date from the relatively recent past. The abandoned platinum mines resulted from a short period of activity and date from c. 1920 to 1930.

The levels of significance of the graves, the ruins of the dwellings and the abandoned diggings were evaluated during the Phase I survey. The graves are highly significant, while the ruins of the dwellings have little (low) significance. The abandoned mining areas are historically significant in that they represent the earliest mining activities of PPRust.

Because these remains will be affected (destroyed) by the development of the open pit and associated infrastructure, mitigation measures have been recommended (namely the exhumation and relocation of the graves and the documentation of the abandoned diggings before they are destroyed). PPRust will manage the exhumation of the graves, but this report provides more information on the grave sites. The main focus of this report is a description of the abandoned diggings. This description is based on a review of the literature on early platinum mining in Potgietersrust and elsewhere in South Africa. The abandoned diggings are also correlated with these descriptions in order to explain some of these remains.

No detail reconstruction of the early platinum diggings is possible any longer, as these remains have been affected (altered, destroyed and vandalised) since the the diggings were abandonment some seventy years ago. The remains are to damaged to warrant conservation. However, mining and its remains in the Limpopo Province (including the mining of metals such as gold and tin) reflect the importance of South Africa's mining heritage which has not yet been fully researched. Early mining activities in South Africa such as platinum mining in Potgietersrust, diamond mining in Kimberley, copper mining in Namaqualand, gold mining in Johannesburg, etc., indicate that there is a rich and diversified mining heritage in this country. Some of these remains must be conserved for posterity, while others must be researched and used for educational, tourism or other purposes.

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## 1 TERMS OF REFERENCE

Potgietersrust Platinums Mine (PPRust) is situated approximately 35 kilometres to the north-west of Potgietersrus (Mokopane) in the Northern Province of South Africa. The mine intends to expand its current mining activities from the farm Sandsloot 236KR to a newly planned open pit on the adjoining southern part of the farm Zwartfontein 818LR. PPRust commissioned Steffen, Robertse and Kirsten Consulting (SRK Consulting) to amend the mine's Environmental Management Programme Report (EMPR). SRK Consulting commissioned me to undertake a cultural heritage impact assessment study of the proposed new open pit area. The aim with the (Phase I) assessment study was threefold, namely:

- to establish whether heritage resources of significance occur in or near the open pit area;
- to determine the significance of these remains; and
- to propose mitigation measures (such as Phase II studies) with regard to any of the heritage resources that may be affected by the proposed development project.

PPRust needed this information in order to take pro-active measures with regard to any heritage resources that may be affected by the proposed new development.

The cultural heritage impact assessment (or Phase I) study revealed the presence of the following types of heritage resources and sensitive remains in and near the open pit area:

- the remains of dwellings dating from the relatively recent past;
- graves and cemeteries dating from the relatively recent past; and
- the remains of 'old' diggings that were abandoned decades ago.

The levels of significance of these remains were determined. Three levels of significance were used to grade the heritage resources and the graves, namely 'high', 'medium' and 'low'. These levels of significance were determined by considering criteria such as the ideological/symbolic and aesthetic values, uniqueness, cultural historical value, the state of

preservation and the research value of the different types of heritage resources. It was pointed out that only the graves from the recent past and the abandoned diggings have high significance. The dwellings dating from the relatively recent past were rated as being of low significance (Table 1).

Table 1 outlines the degree of impact these remains have suffered in the past (past impact) and the magnitude of impact the remains will experience in the future (future impact). The degree of impact on the remains in the past (mostly before the new heritage bill was promulgated) and in terms of future impact that will occur during the construction and the operation of the open pit are also indicated as 'high', 'medium' or 'low' (Table 1).

The proposed new open pit development will affect (destroy) all the heritage remains that occur in or near the open pit area, either in the short term or in the long term. The remains of the dwellings and the graves dating from the relatively recent past, as well as the abandoned diggings will be affected (damaged and/or destroyed) during the construction and the operational phases of the open pit.

The mitigation measures proposed in the Phase I report recommended that the graves be exhumed and removed and that the diggings be documented before they are destroyed. This Phase II report provides more information on the graves and cemeteries and also describes the nature and the extent of the old diggings.

## **2 METHODOLOGY**

### **2.1 Researching and documenting the abandoned diggings**

The early diggings in the proposed new open pit area are historically important and part of South Africa's mining heritage. The activities at these diggings were precursors of Potgietersrust Platinums Ltd (PPRust), a company currently mining platinum on the Merensky Reef in Mokopane (Potgietersrust) in the Northern Province. The mitigation measures for the abandoned mining infrastructure consist of the documenting of these remains in the form of descriptions, photographs and maps of the remains and a survey of literature on early platinum mining in South Africa and in Mokopane (Potgietersrust) in particular. This report also contains a short overview of the history of the Langa Ndebele and other Late Iron Age clans who occupied the Potgietersrust area where the PPRust Ltd mine is located. The remains of dwellings in the open pit area are associated with descendants of these people. These descendants today occupy numerous villages around the PPRust leasing area.

The proposed new open pit area was surveyed on foot in order to photograph and to describe the old diggings that have been mapped by PPRust's survey department. The old mines were mapped on a CAD computer programme that is maintained by PPRust's survey department. The aim of the survey was to describe the nature and the extent of these physical remains and to attempt to reconstruct some of the platinum mining activities in Potgietersrust in the early 20<sup>th</sup> century. Photographs of old diggings were used as evidence to illustrate and to explain some of the early mining activities. Maps of some of the platinum deposits documented in the early 20<sup>th</sup> century as well as drawings of mining activities (methods) were incorporated in the report to obtain some understanding of the early mining activities in the study area. These analogies are useful in describing the mining features and the mining activities as the remains have been affected by natural weathering processes, the closure of trenches and adits for safety purposes and the dilapidation of the remains as a result of vandalism.

### **2.2 Mitigation measures for graves**

The presence of graves in and near the open pit area was determined by using evidence derived from maps, the grave census compiled by the survey

department of PPRust and the Phase I survey on foot of the proposed open pit area. The locations of graves were recorded using a GPS.

Mitigation measures for graves in and near the open pit area include actions such as the exhumation and the reburial of human remains. These activities will be coordinated by a department of PPRust and is a long-established procedure with which the mine is well acquainted, as PPRust has commissioned a large number of reburials over the past few years. Exhumations and reburials are therefore not the concern of this report. However, this Phase II report confirms the existence or non-existence of the graves and cemeteries that were referred to in the Phase I report (and emanate from PPRust's grave census data).

### **2.3 Assumptions and limitations**

The proposed new open pit area has been extensively disturbed in the past. These disturbances were more intensive than was realised when the Phase I survey was done. The open pit area was disturbed when the first platinum diggings were established on the Merensky Reef in the 1920's. These activities may have affected heritage remains that may have existed in the open pit area. Wagner (1924:166) states that 'it is of interest to record that most of the existing excavations [the diggings of the 1920's] are on the sites of ancient native copper workings'. These copper working must have dated from the Iron Age.

However, the original mining diggings (or mining heritage) studied in this report have also been disturbed. These remains were first affected by the original miners and then, in more recent times, by PPRust, who had to alter some of these remains in order to ensure the safety of both local people and livestock grazing in the area. Shafts and trenches were backfilled, as they posed a danger to humans or animals particularly when they were covered by grass and therefore not clearly visible to anyone who might fell in.

The Phase I and Phase II surveys may have missed heritage resources, particularly graves. The dense vegetation currently growing in and near the proposed open pit area may cover some of these features. Graves may also have been covered by the large amount of waste material that has been dumped on this site over a long time. Heritage resources may also occur below the surface of the earth. These remains may only be exposed after the development of the open pit has commenced.



## 2.4 Some remarks on terminology

The cultural heritage assessment referred to in the title of this report includes a survey of heritage resources as outlined in the National Heritage Resources Act (Act No 25 of 1999).

Cultural heritage (or cultural resources) includes all human-made phenomena and intangible products that are the result of the human mind. Natural, technological or industrial features may also be part of heritage resources, as places that have made an outstanding contribution to the cultures, traditions and lifestyles of the people or groups of people of South Africa.

The term 'pre-historic' generally refers to the time before any historical documents were written or any written language developed in a particular area or region of the world. The historical period and historical remains refer, for the Potgietersrust (Mokopane) area, to the first appearance or use of 'modern' Western writing brought to Potgietersrust (Mokopane) by the first Colonists who settled in this area c. 1845. The historical period for the Potgietersrust (Mokopane) area therefore dates from c. 1845.

The term 'relatively recent past' refers to the 20<sup>th</sup> 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 40 000 years ago) and the Late Stone Age (40 000 years to 200 years ago).

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

The term 'study area' or 'project area' refers to the open pit area where PPRust wants to focus its mining activities and other infrastructure.

The 'peripheral area' refers to the area where PPRust does not intend to focus any mining activities in the near future, but which are in close proximity to the project area.

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 archaeological mapping and excavating work, the documenting of rock art sites, engraving sites or historical dwellings and other architectural features and structures, the sampling of archaeological sites or shipwrecks, etc. Phase II work requires the co-operation and approval of SAHRA.

### 3 BRIEF SUMMARY OF THE HISTORICAL CONTEXT OF THE WIDER AREA

The original and present occupants of the wider study area are the Langa Ndebele. The names of some of their historical settlements appear in bold. (Also note the 1:50 000 topographical maps of the area (2428BB Tinmyne; 2328DD Limburg).

The Ndebele of Langa are of Hlubi (Nguni) origin. The name of their clan, Langa, was derived from the name of their original chief (who lived during the latter half of the 17<sup>th</sup> century) when the clans were part of the Hlubi. They originated from eNgungunglovu (Pietermaritzburg) where they occupied a place known as **Langalibalele**.

The second half of the 17<sup>th</sup> century seems to have been a turbulent period in Hlubi history, as the Langa clan hived off from the main body. They were led by Langalibalele/Masebe I from Hlubi country through Swaziland. Their first significant stop was near Leydsdorp (**Mafefera**). They then moved to **Bosega**, east of Pietersburg. After a short stay, the Langa moved to Tšweu (Witkoppen Mountain), a few kilometers to the south-east of Pietersburg where they remained for four generations. The chiefs who ruled and died at **Thaba Tšweu** were Masebe I, Mapuso, Podile and Masebe II.

Seritarita, who succeeded Masebe II at **Thaba Tšweu**, led the clan to **Maleoko** (on the farm Bultongfontein [239KR]), where he remained for three years. From here, the clan moved to **Moumong-wa-Matswake** on the farm Zuid-Holland 773LR. Their settlement was known as **Mokgokong**. Seritarita was succeeded by Mapela, son of Seritarita's third ranking wife.

Two sons of Seritarita higher in rank than Mapela, namely Mosogo and Mamaala established several villages around the royal lineage of Mapela during the 19<sup>th</sup> century, e.g. **Mabyanamatshwaana**, **Tsotsodi** and **Segodini**. Numerous smaller Sotho clans were subjugated and incorporated in the Langa tribe, e.g. the Tlhaloga Kwena of Tshaba, the Bakwena of Lelaka and the Dikgomo of Lebelo. Internal strife amongst the Phalane enabled the Langa to incorporate a section of this group, as well as the Pedi of Matlou. Also incorporated amongst the Langa were the Kwena of Ramorulane and the Hurutshse of Molokomme. Groups that voluntarily joined the Langa were the Koni of Masenya and Puka; the Tlôkwa of Pila; the people of Tshokwe and the Koni of Seema.

When he was old, Mapela moved his village to **Fothane Hills** (Moordkopje) where he died in 1825. Maleya ruled from **Ditlotswana** hills until Mankopane (the rightful heir) ousted him. The Langa stronghold, **Magagamatala**, a high flat-topped mountain with steep cliffs on Ruigtevlei 710LR, was attacked on 14 April 1858 by a punitive expedition sent by the Voortrekkers and 800 of Mankopane's subjects were killed. After the Langa's defeat, the Mankopane settled on **Thutlwane Hill** (Kromkloof 744 LR). The first mission stations of the Berlin Missionary Society were established in Langa country in 1867.

Other events were the following:

- the Langa expedition in 1837 aimed to expedite Mzilikazi's departure from what is today the North-West Province into Botswana;
- the Langa (and Kekana) were involved in the massacre of Voortrekker parties and the siege of the Makapans Caves in 1854;
- the Langa Ndebele (Lamola clan) scattered the copper miners of Mussina (Messina) with whom they bartered copper shortly before 1854; and
- the Langa subjugated the Bididi (Songwana) until 1890, exacting heavy tribute from this clan.

The second encounter between the Voortrekkers and the Langa took place in 1868. At the time, the Langa were in an alliance with the Kekana Ndebele of Mogemi (a regent for Mankopane). While the Boers besieged **Sefakaulo Hill** where Mogemi lived, Mankopane raided white farmers and outposts. The Voortrekkers attacked Mankopane at **Thutlwane** but they could not take the highest part of the mountain where Mankopane's headquarters were. The Boers could also not achieve much success with their raids on Mogemi's mountain fortress. The Voortrekkers then evacuated Potgietersrus.

Mankopane died on 30 May 1877 and was buried in his cattle kraal on **Thutlwane**. Masebe III was proclaimed chief on 3 June 1877. Sporadic wars continued between the Langa and the Kekana chiefdoms from 1883 to October 1886, when President Paul Kruger summoned the two chiefs before him.

After the death of Masebe III on 4 May 1890, a succession dispute split the tribe into two sections, namely the Ndebele of Bankeberg and the Ndebele of Hans Langa. Hans Langa became chief of the southern portion and Bankeberg of the northern portion. As the ancient grounds of Mapela (**Fothane Hill**) fall in the southern portion, this section of the Langa became known as the Bagamapela.

## 4 THE CONTEXT OF THE OPEN PIT STUDY AREA, THE PLATREEF AND PLATINUM

### 4.1 The discovery of platinum

PPRust's proposed new open pit area is located on the central limb of the Merensky Reef, also known as the Platreef, near Potgietersrust (Mokopane) in the Limpopo Province of South Africa. The Merensky Reef is part of the crescent-shaped Bushveld Complex that stretches across the central part of South Africa. This Reef is known for its wealth of mineral resources, generally referred to as the platinum-group metals (PGM's).

The first reference to platinum is found in a narrative published in 1748 by Don Antonio de Ullou y Gracia de la Torre, in which he mentioned that a heavy silvery metal occurred together with gold in New Granada (now called Columbia). The metal was described by Sir William Watson, an English physicist, as a semi-metal or metalloid in 1750. Experiments showed that platinum-rich grains consist of a mixture of several metals, namely platinum (Pt), palladium (Pd), iridium (Ir), ruthenium (Ru) and osmium (Os).

The discovery of platinum in South Africa dates back to the late 19<sup>th</sup> century. In 1892, William Bettel identified osmium-iridium alloy particles in concentrate from the Witwatersrand gold mines. Bettel (1902) and Hall and Humphrey (1908) also recorded the presence of platinum in the chromitite layers of the Bushveld Complex. Wagner (1924) reported the presence of sperrylite in the ore bodies at Vlakfontein near the Pilanesberg. However, none of these discoveries were considered to be of any economic significance. The first deposits that were economically viable, called the Waterberg Platinum, were found by Adolf Erasmus in the Rooiberg fellsites between Nylstroom and Potgietersrust. These deposits did not prove to be significant. Andries Lombaard's discovery of platinum nuggets in the Moopetsi River on the farm Maandagshoek in the Steelpoort area in 1924 can be considered the initial discovery of the Merensky Reef.

The Merensky Reef occurs, geographically, in the westerly and the easterly parts of the Bushveld Complex. These two limbs of the Complex are confined to the North-West Province and to the Northern and the Mpumalanga Provinces of South Africa. The open pit study area is situated on a part of the Bushveld Complex, near Potgietersrust (Mokopane). Geologically, this part of the Bushveld Complex is considered to be the equivalent of the Merensky Reef and the platinum-bearing rock in this complex is locally referred to as the Platreef.

The Merensky Reef has been traced for a total distance strike extent of 283 kilometre, 138 kilometre of which is in the eastern limb and 145 kilometre in the western limb of the Bushveld Complex. Vertical depths of 1 900m have been registered along the Reef, which also indicates its continuity. The eastern limb of the Reef is geologically less well known than the eastern limb, because mining activities in this part of the Reef have been limited (Figure 1).

#### **4.2 Platinum's uses and strategic importance**

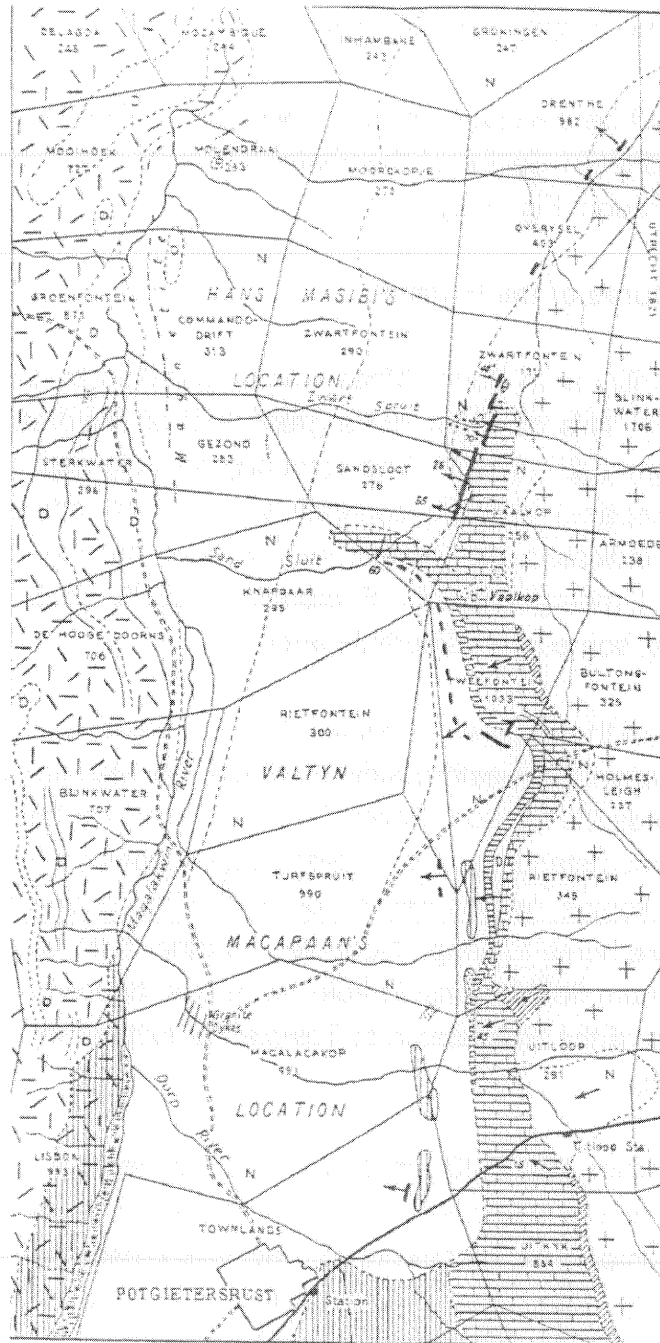
The platinum-group metals (PGM's), along with nickel and cobalt, are in high industrial demand in the developed world. The platinum group metals are amongst the least abundant elements on earth. However, their properties (density, strength, catalytic features and high melting temperature) give these elements unique applications in complex technology engineering. Some of these elements are irreplaceable in industrial processes, enhancing their strategic importance.

Due to the unique physical and catalytic properties of platinum, the metal is used in a number of applications. It is used in the industrial, chemical, electrical and electronic industries as well as in the manufacture of jewellery, glass and glass fibre. It is also very important in petroleum refining. In the automobile industry platinum and palladium are used in autocatalysts. This application is expected to increase, due to strict emission control legislation in Europe, North and South America and Japan. A second major (and growing) use of platinum is in stationary phosphoric acid cell (PAFC) and mobile proton exchange membrane (Pem) fuel cells, the latter absorbing hydrogen and converting it into electrical and heat energy. The cell is already being used to power vehicles and this use is expected to grow.

#### **4.3 Location of the study area**

PPRust's is located approximately thirty kilometres to the north-north-west of the town of Potgietersrust (Mokopane) in the Limpopo Province of South Africa. The mine's proposed new open pit will be located on the southern part of the farm Zwartfontein 818LR, with a small part of the open pit extending onto the adjacent farm Sandsloot 819 LR (Figure 2).

Figure 1. The Platreef near Potgietersrust. The open pit study area is located on the Platreef on the farm Zwartfontein 818LR. The primary platinum deposit is indicated with thick black lines (Wagner 1973:Plate 38).





PPRust's proposed new open pit is oblong, approximately 2 kilometres from north to south and approximately 800 metres from east to west. The open pit will be developed on the most important part of the platinum belt on the farms Sandsloot 236LR, Vaalkop 819LR and Zwartfontein 818LR. This part of the platinum belt consists of three sectors. The open pit will be developed on the Sandsloot-Vaalkop-Zwartfontein South Sector of the Platreef where abandoned platinum diggings from the 1920's occurs (Figure 3).

(Two other open pits will be developed on the Zwartfontein Central Sector and on the Zwartfontein Northern Sector of the Platreef. These developments are not the concern of this report, Figure 2).

#### **4.4 Geological features of the Platreef**

Early exploration for platinum in South Africa was undertaken by the Northern Platinums Ltd company. This company did a great deal of exploratory work in the Steelpoort area from 1925 to 1930. The company also did exploration work in Potgietersrust (Mokopane) and the company's name still appears on the abandoned diggings indicated on Zwartfontein 818LR on the 1: 50 000 topographical map of Limburg 2328DD. Exploration usually consisted of the sinking of incline shafts, some to considerable depths.

The platinum deposits of the Platreef are situated on the eastern side of a great flat-bottomed valley, down the western side of which the Magalakwena River flows northwards towards the Limpopo River. The norite area (to the west of the study area) is devoid of outstanding physical features, except for a few ranges of rugged kopjes. These kopjes, as was pointed out in the historical context of the wider area (Part 3) were home to Langa Ndebele and other Late Iron Age clans. The extent of the platinum field is considerable, as known deposits stretch from the north-western part of the Potgietersrust Townlands to the farm Witrivier, a distance of 40 kilometres.

The Platreef curves from about 20 km south of Potgietersrust (Mokopane) northwards for a total distance of over 100km. It averages 8 km in width, up to 12 km in its central sector. The succession of deposits within the Potgieterust limb differs significantly from those of the eastern and central limbs of the Bushveld Complex. In the north, on the farms Overysel 815LR and Drenthe 778LR, where the Platreef stands on Archaean granite, the Reef is 100 metres thick. Three pyroxenitic reef types can be distinguished. Partial melting of the Archaean granite gneis floor has resulted in the formation of a rock



described as granofels. The granofels frequently exhibits an agmatitic texture and contains dark green schlieren that often host low-order PGE values.

#### 4.5 Early platinum mining in and near the study area

Exploratory work done in the 1920's indicated that the platinum deposits in and near the proposed new open pit area occurred on at least three horizons, all of which were present on the farm Tweefontein 238KR, located to the south of the study area. The first horizon was situated on the crest and upper western slopes of Tweefontein Hill, a conspicuous bush-covered ridge in the central part of the farm. The deposits on Tweefontein at the time proved too patchy to be worth working. Some of the old exploration adits can still be seen on this farm.

The second horizon was situated on the south-western slopes of Tweefontein Hill. The platinum-bearing rocks showed conspicuous copper and iron stains. Chrysocolla, a type of copper carbonate ore with an exquisite bright peacock blue tint, could be seen in the platinum-bearing rocks. These copper carbonate ores were found along the entire length of the ore body. According to Wagner (1973), all the exploratory work on Tweefontein occurred near ancient copper working activities. Metal workers must have mined and smelted these copper carbonate ores in order to manufacture copper implements during the Iron Age.

The third horizon was the main platinum horizon of the Potgietersrust fields. It was considered to be the equivalent of the Merensky horizon of the Lydenburg and Rustenburg districts and was traced at intervals for 25 kilometres from the Potgietersrust Townlands to the farm Witrivier.

Early exploration and mining activities indicated that the most important portion of the Platreef lay on the farms Sandsloot, Vaalkop and Zwartfontein and that it embraced three main sectors, namely:

- the Sandsloot-Vaalkop-Zwartfontein South Sector;
- the Zwartfontein Central Sector; and
- the Zwartfontein North Sector.

(Measurements for geological features in these three sectors were taken from Wagner [1973]). He used the English measurement system of miles, feet and inches as the method for recording measurements).



### The Sandsloot-Vaalkop-Zwartfontein Sector

In this sector platinum was found in a great sinuous lens 11 000 feet in length measured along the strike, and up to 146 feet in thickness. The dip was to the west and averaged about 55 degrees. The northern part of this sector carried the highest platinum values. The Southern or Main Sandsloot Section was systematically opened up for a distance of over 2 000 feet by means of trenches, shafts and cross-cuts.

The ore body was well exposed in the No 6 workings, where a shaft was sunk to a depth of 100 feet and tunnels and a cross-cut and tunnels drive across and along the deposit at a depth of 37 feet, close to the underground water level

In the northern or Vaalkop-Zwartfontein Section, the platinum-bearing rock rests directly on silicate platinum-bearing dolomite and was studied by means of Long Trench Workings. The richest portion of the Sandsloot-Vaalkop-Zwartfontein Sector lay to the south and to the north of the Vaalkop-Zwartfontein boundary. Long trench workings indicated a stretch of some 1 300 feet, which contained high values for considerable distances (Figure 4).

Admirable sections of the composite ore-body could be seen in the No 1 Vaalkop and the No 1 Zwartfontein workings (Figure 4). Neither of these trenches existed for very long, as they were filled in by order of the Department of Mines.

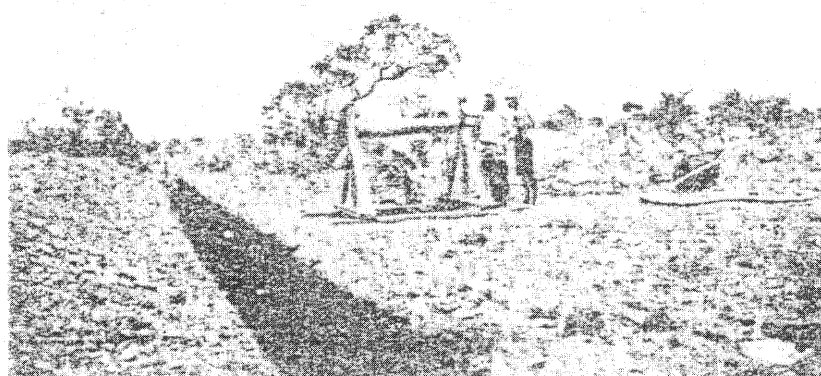


Figure 4. Prospecting Trench No. 1 on the farm Vaalkop 819LR photographed in 1925 (Wagner 1973:168).

Figure 5. A section across the composite magmatic contact-metasomatic

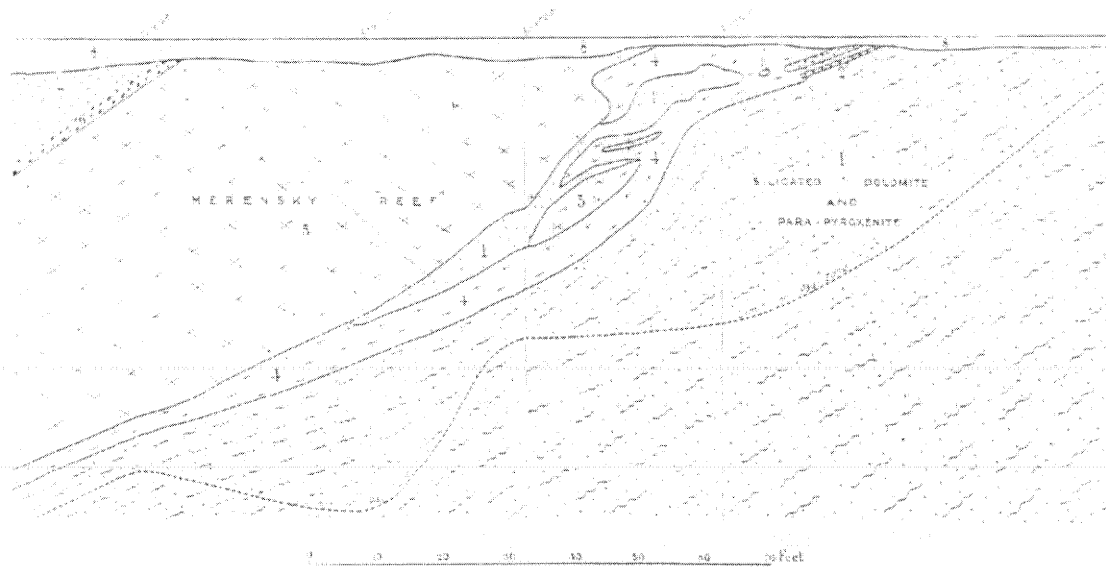


FIG. 5. Section across the Composite Magmatic Contact-Metasomatic Platinum Deposit exposed in No. 1 Working, Vaalkop, No. 276, Potgietersrus District. Upper Part of Section based on observations by P. A. Wagner. Lower Part after E. Reuning.

- |  |   |
|--|---|
| 1. Alterations in Dolomite, Serpentine and Chlorite-Rocks. | 5. Early Fluorapatite Felsite or Diagenetic (Meyensky Reef?). |
| 2. Granular Malachite Rock.                                | 6. Mottled Baringsall Series.                                 |
| 3. Dips-Argillaceous Rock (Fig. 24 Platinum-bearing).      | 7. Spotted Mangrove-wal Navor.                                |
| 4. Contact-metasomatic Pyroxenite.                         | 8. Surface Soil.  |

platinum deposit exposed in the No. 1 workings on Vaalkop (Wagner 1973:174). Zwartfontein Central Sector

Mining operations indicated that this lens had a length of 3 500 feet and was up to 90 feet wide. The dip is from 45 to 90 degrees to the west, the average being about 70 degrees. A section in the Quarry Working is shown in upward succession (Pt refers to platinum deposits) (Figure 6). At a depth of 100 feet the main body of pyroxenite (No 7 in section) is more clearly distinguished from the altered dolomite on which it rests. It is 20 to 30 feet thick and carries high platinum values throughout.

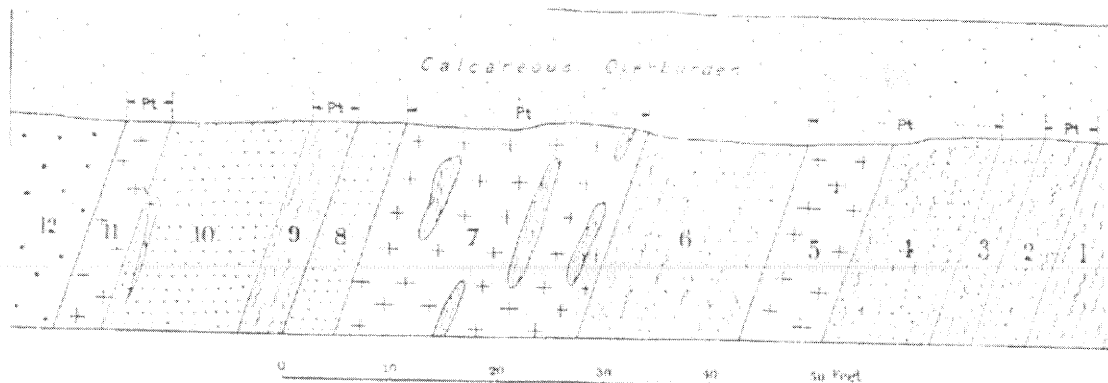


Figure 6. A section across the central ore body at a quarry working on Zwartfontein 818LR in the 1920's.



A section through the upper part of the Driekop Platinum Mine in the Lydenburg district in the 1920's shows how the platinum-bearing rock in the kopje was mined in a quarry at the top of the kopje (below). An incline shaft (or adit) was later excavated into the kopje in order to reach the platinum-rich deposit that could not be hauled from the quarry. A part of the old quarry working in the Zwartfontein Central Sector was photographed in the 1920's (far below) (Figure 8) (Wagner 1973:81, 180).

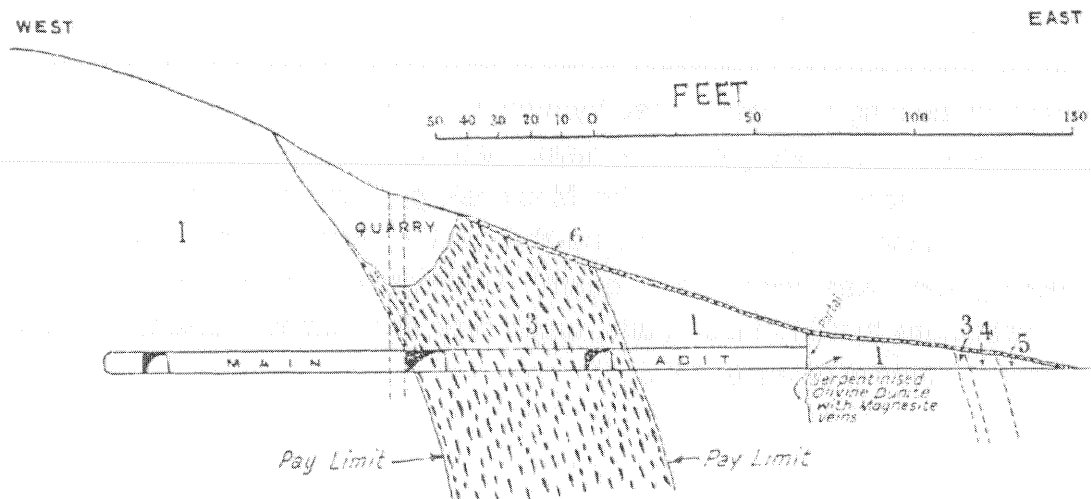
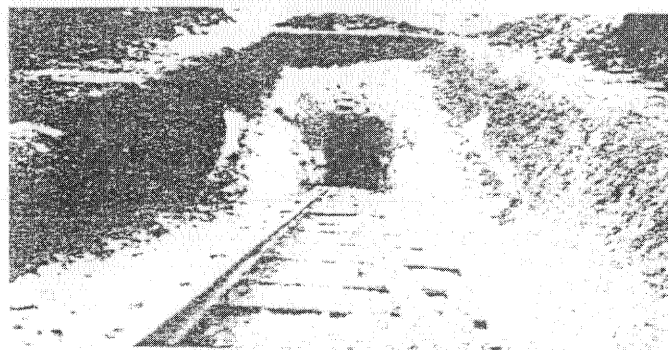
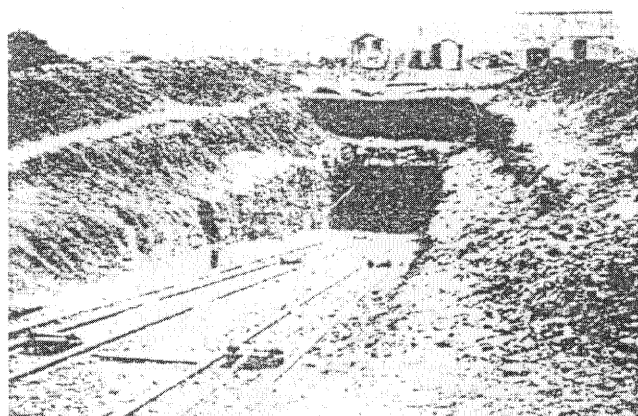
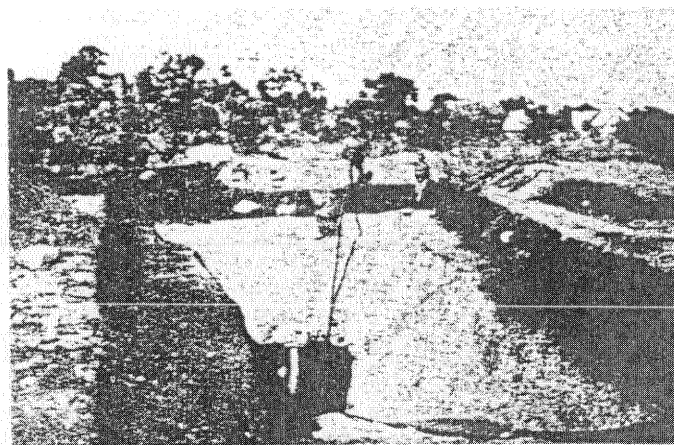


FIG. 8.—Section through upper part of Driekop Platinum Mine.

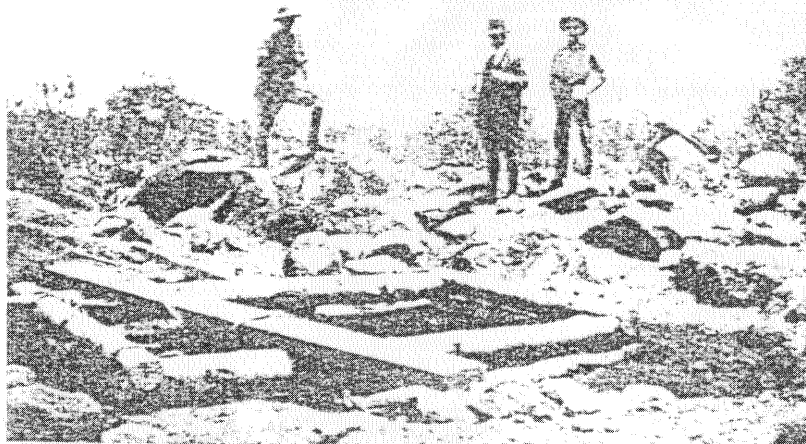
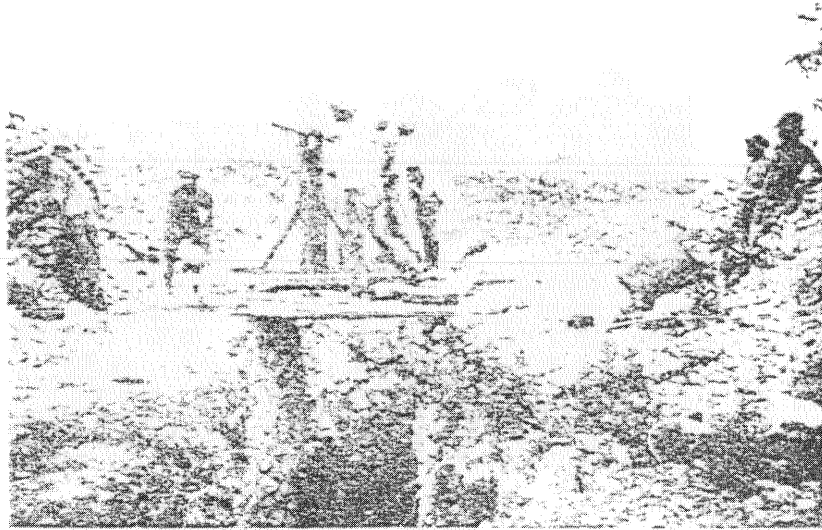
1. Olivine-dunite and Serpentine derived from it.
2. Main Platinum Pipe. Olivine-dunite with segregations of iron-rich Olivine-dunite and Wehrlite.
3. Transitional Zone between serpentinised Olivine-dunite and
4. Medium-grained iron-rich Olivine-wehrlite and allied rocks.
5. Coarse pegmatitic diagenite with segregations of iron-rich Olivine-dunite.
6. Rubble of silicified Serpentine and oxidised iron-rich Dunite.



Access to underground platinum mines could be gained through incline shafts or adits dug into kopjes or into the level ground, at a slight angle. Incline shafts into the Kroondal-Klipfontein, the Schilpadnest and the Waterval Platinum Mines, all located in Rustenburg in the 1920's, can be seen below (Figures 9, 10 & 11) (Wagner 1973:96, 128).



Vertical shafts for prospecting and mining were used in the 1920's to explore for platinum or to haul the rock to the surface. A prospecting shaft on the Blaauwbank Ridge, Middelburg, (below, Figure 12) and the collar of the No 6 Shaft (far below, Figure 13) that used to exist on Sandsloot 236KR in Mokopane (Wagner 1973:150, 168).





#### 4.6 The pilot plant

The pilot plant of the Potgietersrust Platinums Mine was built on Zwartfontein in 1927 and was still in operation when Wagner's book was completed in 1929. The plant was originally established as a flotation plant. However, it was modified by the addition of corduroy, shaking corduroy and James tables and was producing a saleable gravity concentrate in addition to a flotation concentrate in 1929. The concentrate was shipped overseas for further processing.

The platinum metals and minerals in the Mokopane area were much coarser than those in the Merensky Horizon in the Rustenburg district were. Consequently, crushing equipment consisting of a Stag jaw-crusher, said to have crushed from 1½ to 2½ inches, a disc crusher, said to have crushed from ½ to 1 inch and a 22 feet by 5 feet tube-mill fed by a Comet feeder were erected. The concentrating applications included shaking and stationary tables, a James table and 'rougher' and 'cleaner' and 're-cleaner' minerals separation flotation cells. The metallics caught on the corduroy tables were retreated on the James table.

The heads from the James table were treated with a magnet and were then given an acid treatment. The final product assayed over 60 per cent of platinum group metals. Roughly 30 per cent of the platinum present in the ore was contained in these metallics which were shipped abroad. The flotation concentrate that was shipped abroad represented 0,8 per cent by weight of the ore fed into the plant.

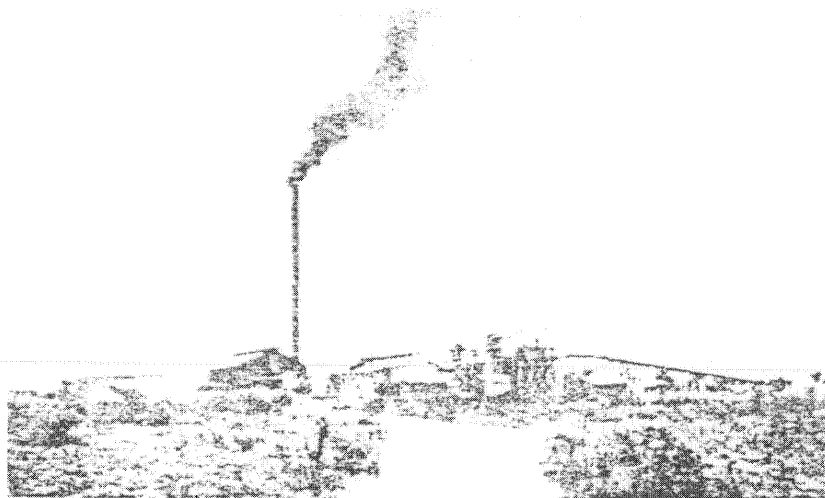
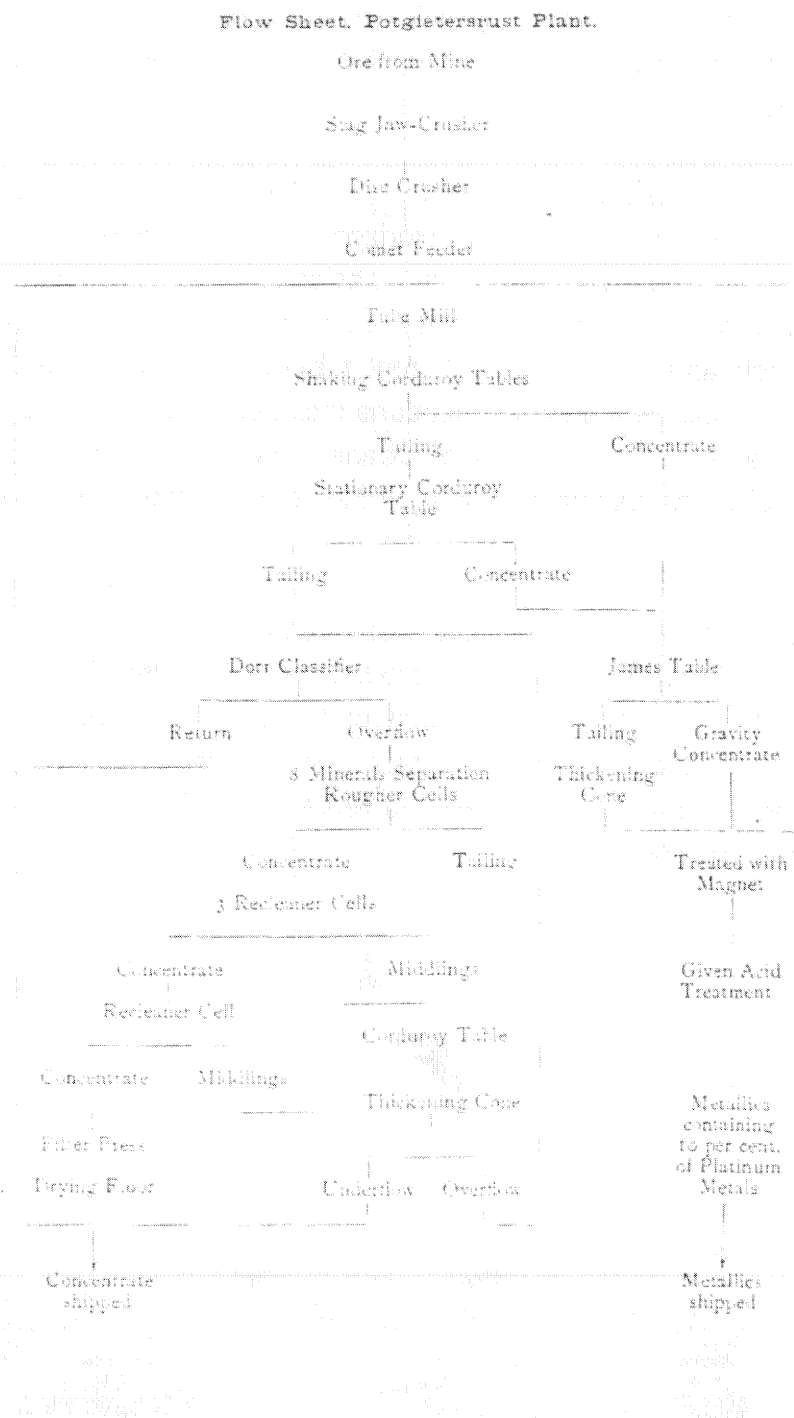


Figure 14. The treatment plant of the Potgietersrust Platinum Mine on Zwartfontein 818LR in the 1920's.

Figure 15. A flow diagram illustrating the workings of PPRust in the 1920's (Wagner 1973:283).



The infrastructure of early 20<sup>th</sup> century platinum mines consisted mainly of cement and brick buildings covered with corrugated iron. Important plants included treatment plants (Onverwacht Mine in Lydenburg, above) (Figure 15), power plants (Kroondal in Rustenburg, middle) (Figure 16) as well as mills. Other conspicuous structures were the towering headgear of vertical shafts (Mooihoek Mine in Lydenburg, below) (Figure 17) (Wagner 1973:78, 96).

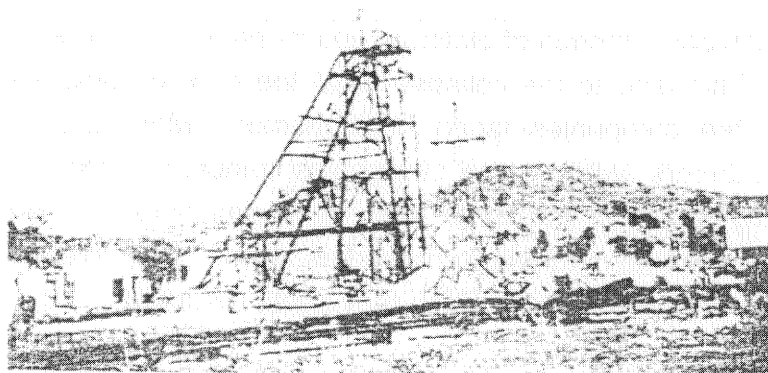
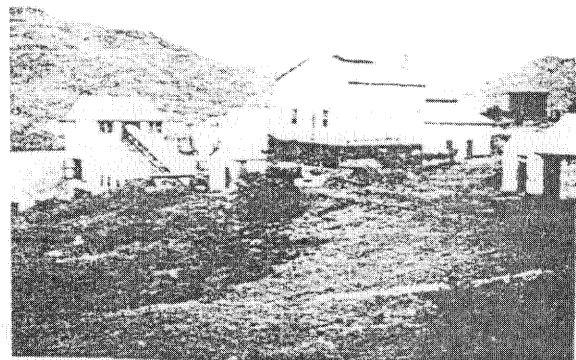
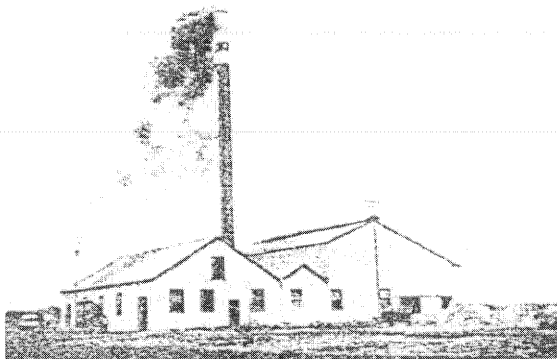
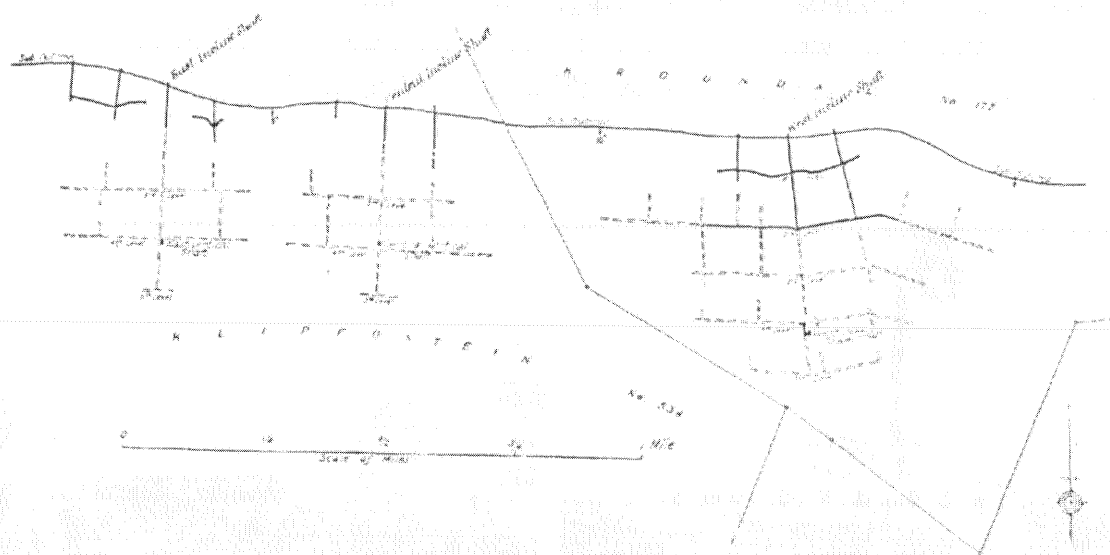


Figure 18. A section across the underground workings of an early 20<sup>th</sup> century platinum mine in Rustenburg.



#### 4.7 The decline of early platinum mining

During the great platinum boom of 1925 over fifty companies were started in the Union of South Africa to exploit the mineral resources of the Bushveld Complex and the Waterberg district. Oxidized ores were initially taken from the Merensky Reef. When these ores had been exhausted, they were replaced by sulphide ores.

The world's consumption of platinum and its price became extremely depressed by 1930. This led to the collapse of all the mining companies in the 1930's. Many of the companies faded from memory. More prosperous companies absorbed others, while some companies transferred their activities from the Lydenburg district to the more favourably circumstanced Rustenburg district, while retaining their Lydenburg properties. Some companies went bankrupt and suspended their operations, which they never resumed.

Further fluctuations in the price of platinum during the 1940's and 1950's did not encourage an expansion of mining activities. The demand also did not support or necessitate the enormous scale of mining now seen around the Bushveld Complex until the early 1970's.

The Zwartfontein plant operated continuously from September 1926 until 4 December 1928. It produced 1 122 tons of concentrate estimated to contain 4 516 ounces of platinum, 4 767 ounces of palladium, 193 ounces of the platinum group of metals, 284 ounces of gold, 44 tons of nickel, 23 tons of copper. The estimated aggregate value of these metals was 110, 000 English pounds.

The most important actual and potential platinum producers still in existence in 1929 were:

- 1 Potgietersrust Platinum Ltd.
- 2 The Lydenburg Platinum Areas Ltd.
- 3 Onverwacht Platinum Ltd.
- 4 Waterval (Rustenburg) Platinum Ltd.
- 5 Platinum Exploration Company Ltd.
- 9 Northern Platinum Exploration Company Ltd.
- 10 Platinum Propriety Company of Lydenburg Ltd.

It is clear from this rating that PPRust was the most important role player in the platinum industry in South Africa during the first half of the 20<sup>th</sup> century. The company, originally formed to work the platinum deposits north-north-west of Mokopane from 1927 to 1929, also acquired the properties of Premier Rustenburg Platinum Ltd., the Steelpoort Platinum Syndicate Ltd. and the Eestegeluk Platinum Mines Ltd., all situated in the Rustenburg district. PPRust had the most extensive holdings (farms owned, discovery rights, mineral rights, mineral rights leased and prospecting rights) of any of the South African platinum companies. Farms they owned included:

Mokopane district:	Witrivier
	Overysel
	Vaalkop
	Tweefontein
Rustenburg district:	Swartklip
Lydenburg district:	Eerstegeluk

#### 4.8 Platinum mining resurrected

After the collapse of the platinum industry in the 1930's, only two companies remained and amalgamated namely Rustenburg Platinums Ltd. This mine remained in production until the 1970's when three other companies developed mines to join the platinum market, which again experienced a boom. Project work on the new PPRust started in 1994. Rustenburg Platinum and Lebowa Platinum each have an equal share in the Mokopane platinum project.

## **5 REMAINS OF MINING ACTIVITIES IN AND NEAR THE OPEN PIT STUDY AREA**

The survey of the proposed open pit area revealed the presence of graves and cemeteries, ruins of dwellings and abandoned diggings in this area. This part of the report only focuses on the abandoned diggings.

### **5.1 The abandoned diggings**

The open pit area is located approximately 1.3 kilometre from the former Ga Pila village. The inhabitants of Ga Pila were resettled some years ago in order to make way for one of PPRust's rock waste dumps that encroached on and eventually buried the abandoned village. One of the dirt roads that gave access to the former Ga Pila village bisects the proposed open pit area from north to south. A few smaller dirt roads and footpaths criss-cross the open pit area. The northern part of the pit will be bisected by the dirt road between the PPRust platinum mine and Fothane and other Mapela villages further to the north-west (Figure 2).

The remains of abandoned diggings are scattered over the proposed open pit area. They extend further to the north of the open pit area to where the Zwartfontein Central Sector of the platinum Reef was explored and mined in the early 1920's. These remains include waste rock dumps, slimes dams, trenches, concrete foundations, winches, borrowing and prospecting pits, etc. PPRust's survey department has mapped the majority of these remains. It has been pointed out that many of the remains that have been mapped do not exist any longer.

### **5.2 The nature and extent of the mining remains**

The early diggings (mining heritage) have been disturbed as some of remains have been vandalised or damaged in the recent past. Some of the mining infrastructure was deliberately altered for the sake of safety and security; e.g. trenches and adits have been back-filled, and vertical shafts have been closed. It is not certain what the nature and the extent of underground mining infrastructure may be and whether these features still exist. The mining heritage remains can therefore not be described as undisturbed or in a pristine condition any longer.

The remains currently visible on the surface of the proposed new open pit area do not necessarily represent the mining activities from one specific mine that

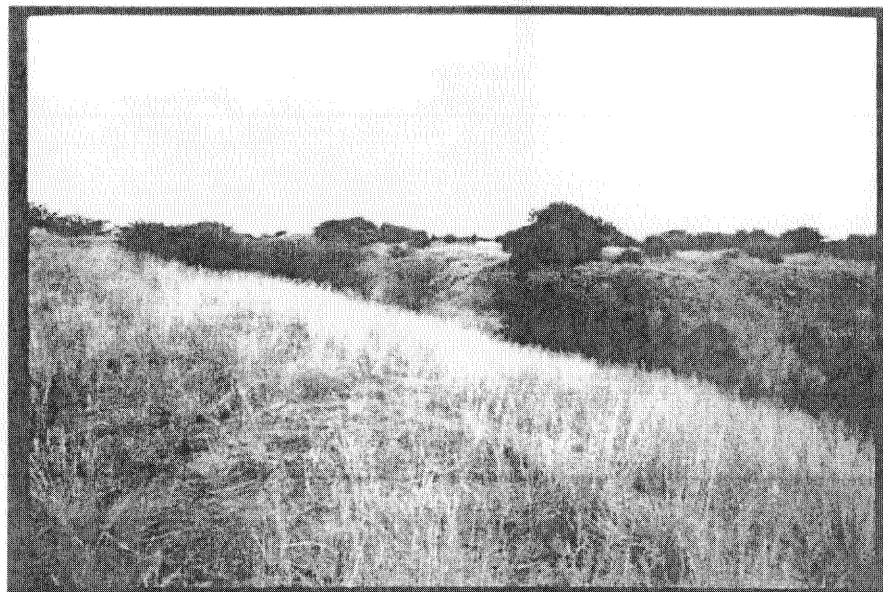
operated during a specific time period. The remains can also not be correlated with any specific mine's activities in the past. Nor is it possible to reconstruct the entire infrastructure and workings of a platinum mine from the early 20<sup>th</sup> century from these remains. However, it is possible that some of the remains may correlate with the descriptions provided of platinum mining in the early 20<sup>th</sup> century on the Platreef and in Lydenburg and Rustenburg.

Early mining activities included the digging of vertical and incline shafts (or adits) and trenches, the dumping of waste rock on waste rock dumps and the depositing of tailings in slimes dams. Other activities are reflected by infrastructure consisting of cement foundations. These remains may be the remains of the treatment plant, accommodation (such as a hostel or compound) for workers and other smaller structures such as buildings.

The following categories of remains can still be distinguished in the proposed open pit area:

#### Slimes dams

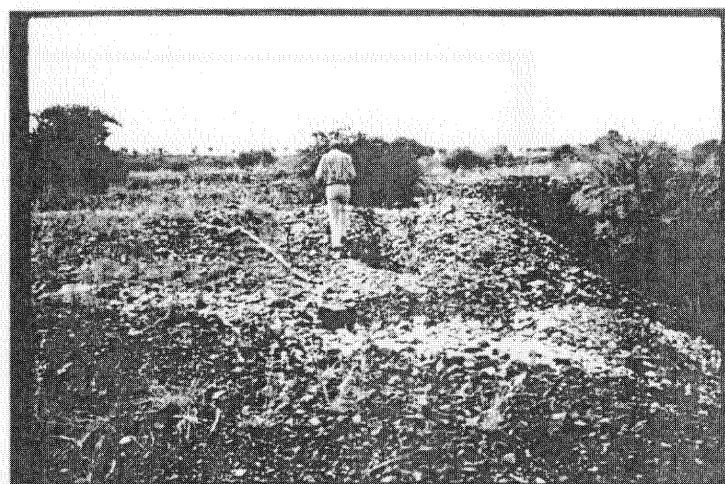
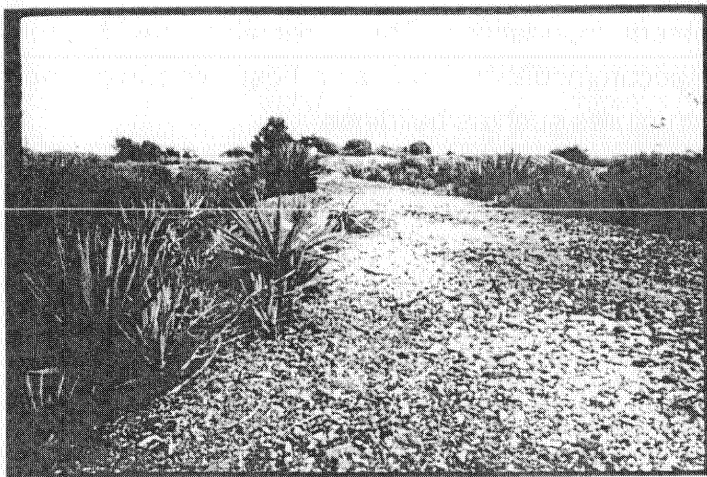
The largest remaining structures of the abandoned diggings consist of at least three linked slimes dams. These dams occur near the southern part of the proposed new open pit area. The slimes dams have been damaged, as some of their soil walls have been removed for building and filling purposes (Figure 19, below).





### Waste rock dumps

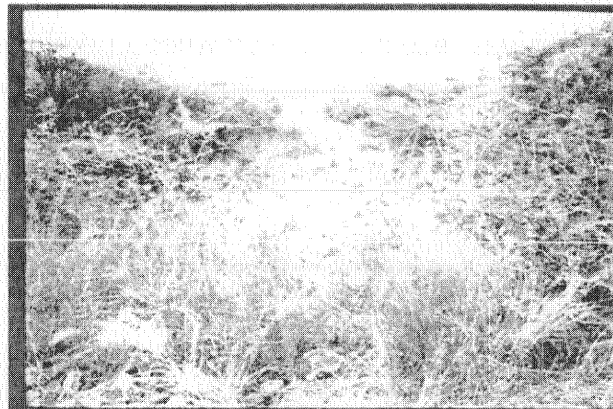
The second largest mining remains are waste rock dumps in the central part and in the northern part of the open pit area. PPRust has removed at least two of these waste rock dumps in the recent past, as these dumps still contain retrievable amounts of platinum (Figures 20 & 21, below).





## Trenches

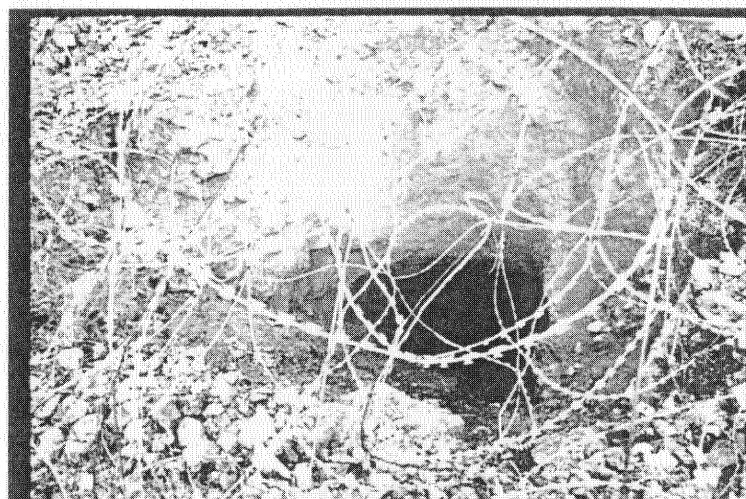
Two types of trenches can be distinguished, namely long narrow trenches used for exploration purposes, and wide short trenches. The Vaalkop-Sandsloot-Zwartfontein horizon of the Platreef was intensely explored. Some of these trenches still exists but are barely visible today (Figures 22 & 23, below).



## Shafts and adits

Two types of shafts can be distinguished in the proposed open pit area, namely vertical shafts and incline shafts. Several incline shafts can still be observed in the study area, and at least one vertical shaft with part of its headgear still exists. This structure is the most impressive of all the mining gear still remaining in the proposed open pit area (Figure 24, below).

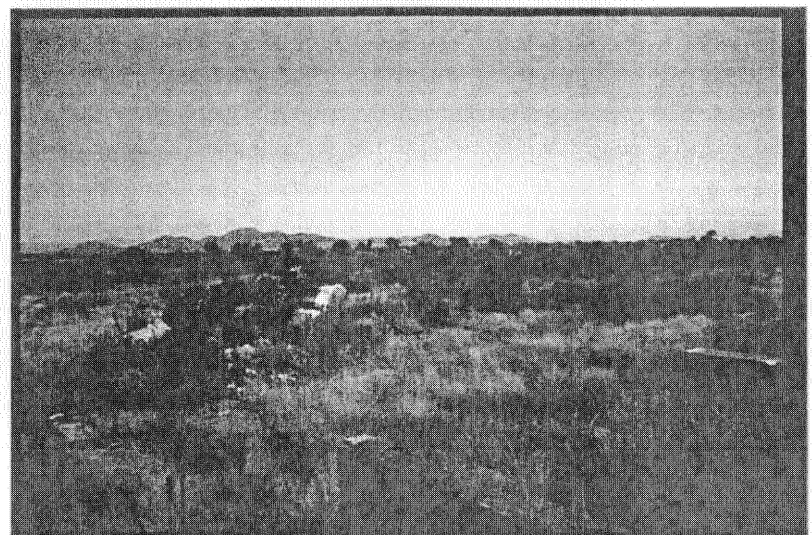
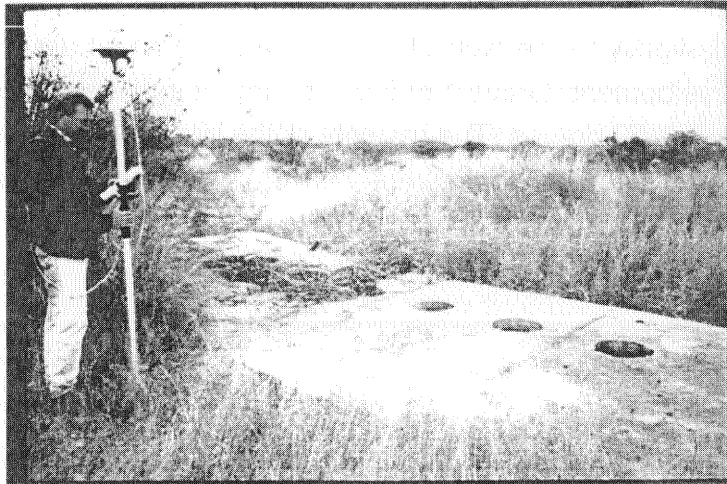
A vertical shaft or adit was recently exposed when one of the waste rock dumps was removed from the open pit area. This shaft was closed when mining activities were abandoned, as people or animals unaware of their existence may fall into such a shaft and be injured or die (Figure 25, far below).



### Other infrastructure

Other infrastructure still in the proposed open pit area includes the remains of a compound for workers (ablution facilities and the foundations of what seems like the labourers' dwellings) near the centre of the proposed open pit area (Figure 26, below).

The concrete foundations of an extensive structure still occur near the centre of the proposed open pit area. It is possible that these may be the remains of the treatment plant used by PPRust in the early 1920's (Figure 27, far below).



## 6 GRAVES AND OTHER HERITAGE REMAINS IN THE OPEN PIT AREA

### 6.1 Graves

The PPRust census of graves identified at least six localities with graves in or near the proposed open pit area. These cemeteries are set out in Table I. The co-ordinates for the graves were not repeated in this report, as they are incorporated in a GIS database maintained by PPRust's survey department.

The graves and cemeteries were the following (Table 1):

#### Graveyard 1 of 5

This gravesite is situated slightly to the east of the proposed open pit area, but will be affected by the development. Grave 1 of 5 is the largest in the study area and may contain as many as 50 graves. The majority of the graves are covered by stones. There are only three modern graves with granite tombstones and edgings in this cemetery.

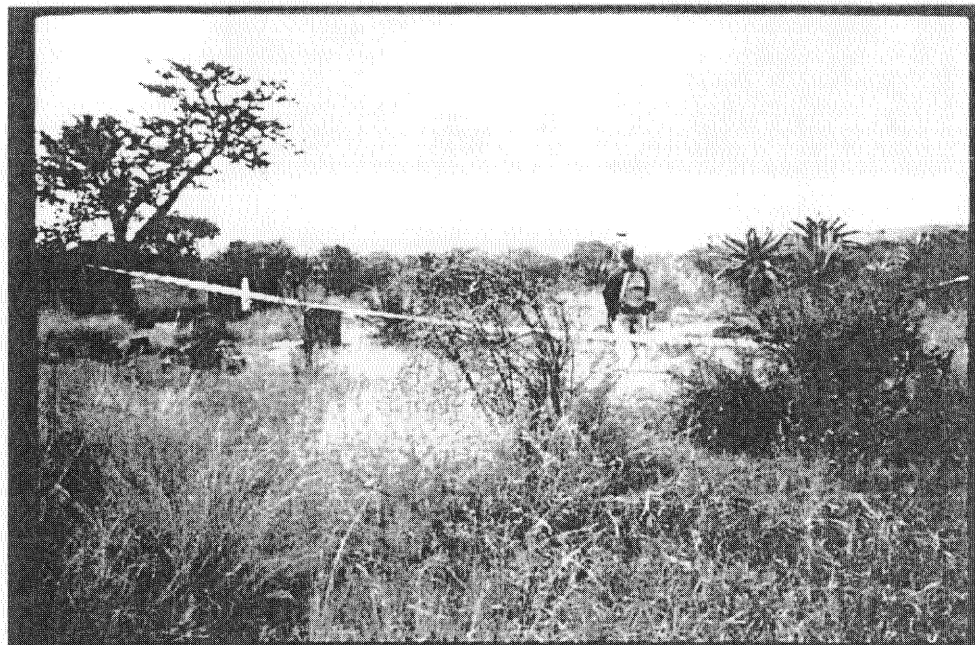


Figure 28. Graveyard 1 of 5 may contain as many as 50 graves.

### Graveyard 2 of 5

This small graveyard contains eight or nine graves. Only one of the graves has a granite tombstone and edgings. The inscription on this tombstone reads as follows:

Diase  
Seemole  
Mapala  
\*1888-05-11  
†1920-07-06  
Robala ka kgotso Mokwena

A second grave is covered by a concrete slab which is inscribed Maurice Chuene.

Four graves are covered by stones and have small non-corrugated iron plaques bearing the following names:

Klaas Teffo  
Ga-Molekana  
(A Malebana)

Johannes Legodi  
Ga Molekana  
(A Malebana)

Matiangoe  
Johanna  
Ga Molekana

There is another grave with thick concrete edgings. The centre between the edgings is filled with rock. The grave may contain the bodies of two persons, namely:

Magdeline  
Ramashala and  
Linder  
Salamina  
Ramashala



Figure 29. Graveyard 2 of 5 is a small graveyard with eight or nine graves (below).

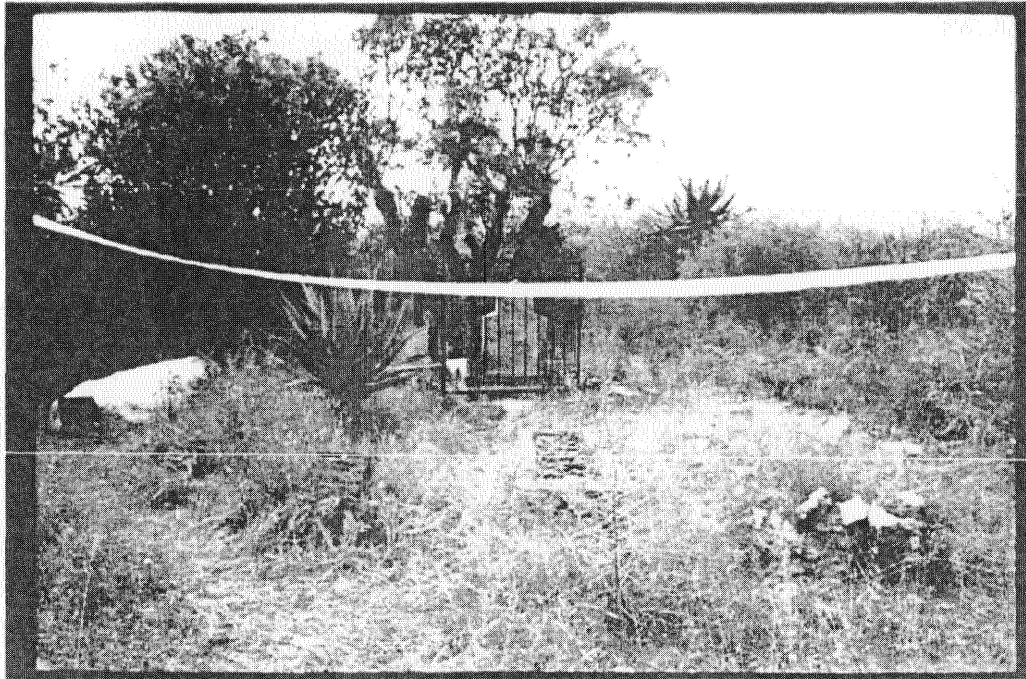


Figure 30. No evidence for any graves was found at the locality where Graveyard 3 of 5 is supposed to be located (above).



### Graveyard 3 of 5

No graves could be found at this location. This site where five graves must have been located has been severely disturbed in the past. The site is marked by a heap of soil that was either gathered on spot or brought from elsewhere and dumped on or near the graves. A relatively large quarry is also situated next to the dump.

### Graveyard 4 of 5

This site contains at least three graves that are covered with grass and which are not clearly visible. The graves are covered with stones and each grave has a corrugated iron plaque bearing the names of the deceased. Only one of the inscriptions can be read, namely 'Joseph Ndaba'.

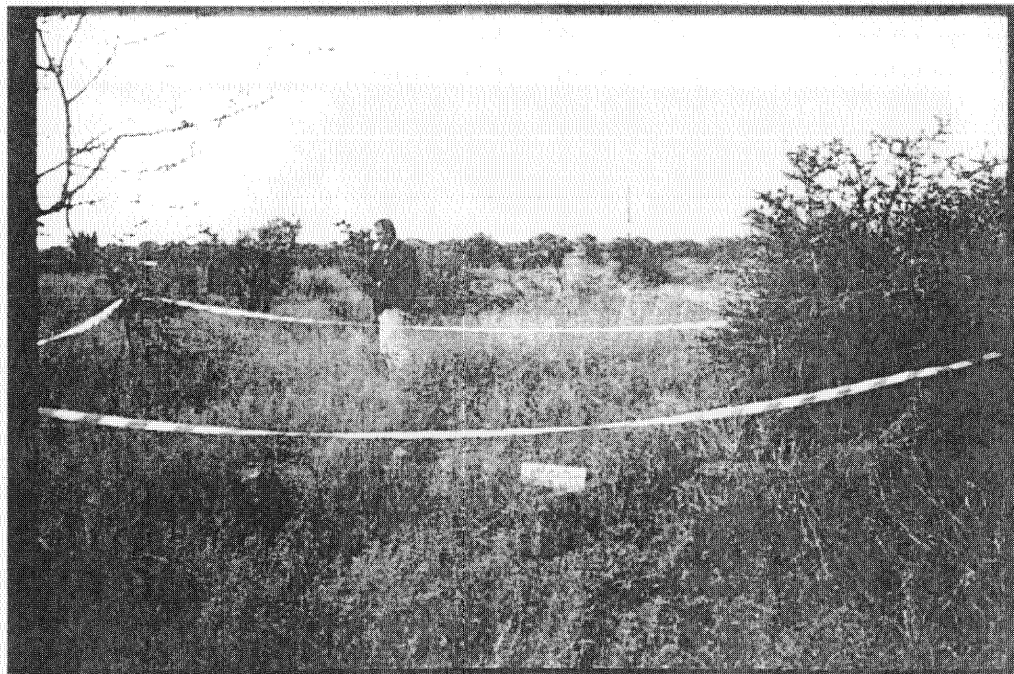


Figure 31. Graveyard 4 of 5 is inconspicuous, as it is covered by tall grass.

### Graveyard 5 of 5

This graveyard contains three graves. The graves are well maintained and covered by stones. Two of the deceased's names are painted on pieces of non-corrugated iron. The third grave is unmarked. The inscriptions on the two graves are the following:

Tatani wa Hina  
Jacob baloyi  
Etlela hi ku Rhula

and

Maja wa Nwira  
Piet Baloyi  
Wu Etlela hi ku Rhula

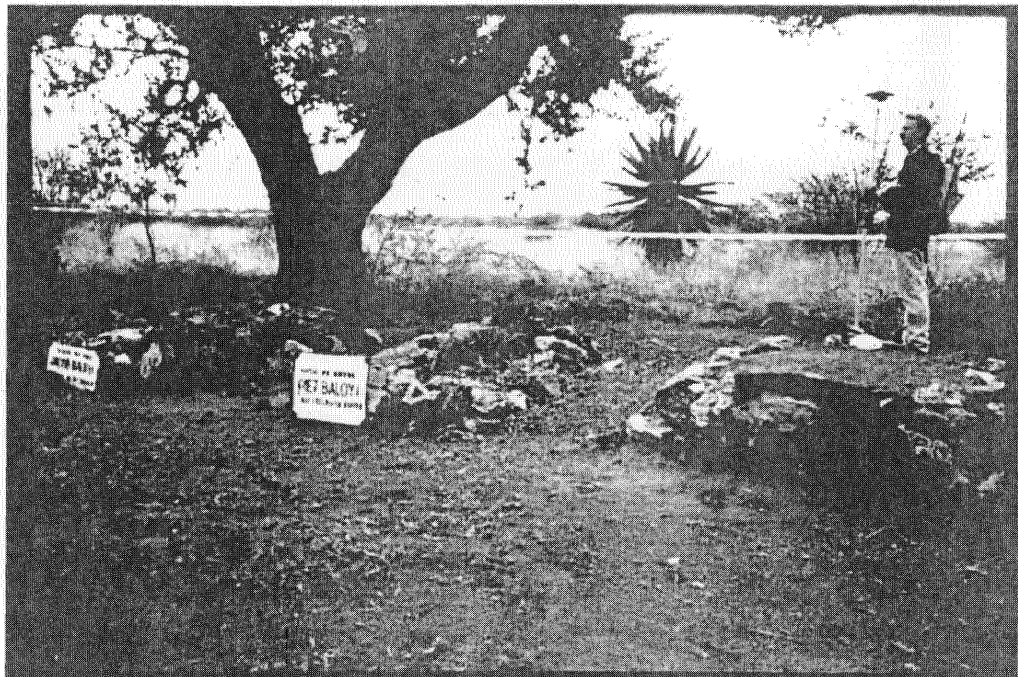


Figure 32. Graveyard 5 of 5 contains three well-kept graves.



### Graveyard 6

This gravesite is located close to a marula tree and is covered by tall grass. Waste rock and other stones are scattered over the area, but no graves were observed.

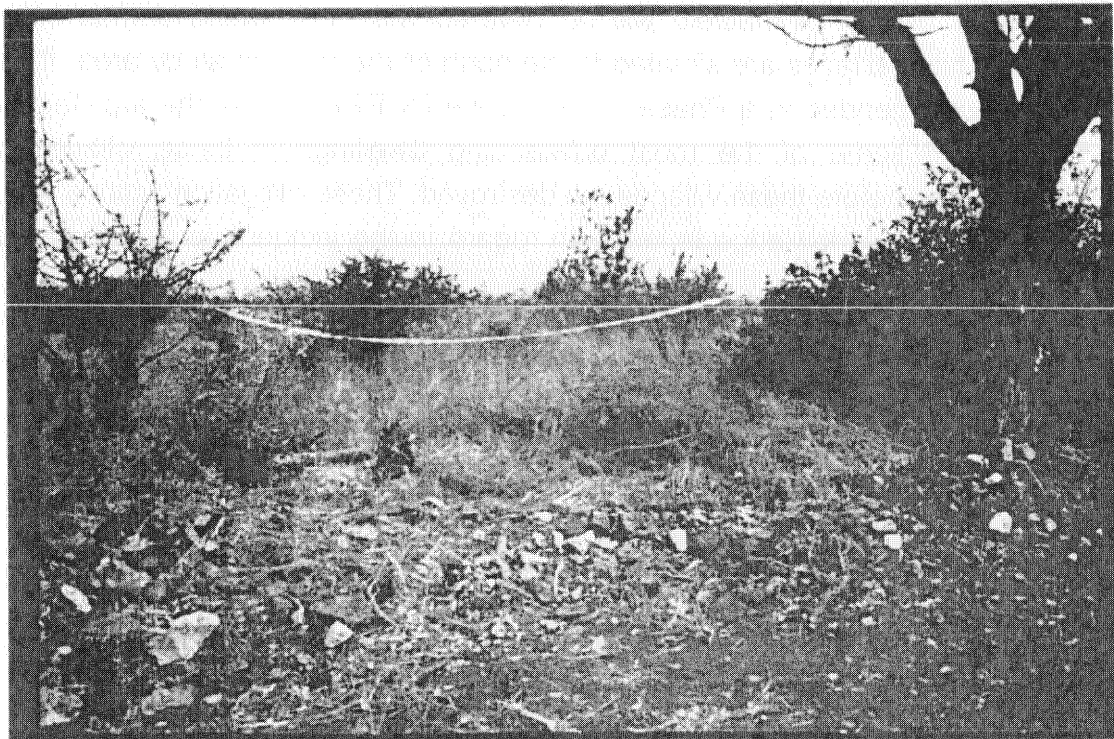


Figure 33. No graves were found at the locality where Graveyard 6 is supposed to be located according to PPRust's grave census database.

### **6.2 Ruins of dwellings**

The ruins of dwellings occur to the south-east on the farm Vaalkop 819LR and to the north-east of the existing open pit area on Zwartfontein 818LR. The dwellings were probably once situated on the outskirts (to the north) of the former Ga Pila village, before the inhabitants of the village were resettled.

The dwellings include multi-component structures with square foundations, indicating that they date from the relatively recent past. The remains of the dwellings are dilapidated as they have been destroyed and vandalised for

building material. It is unlikely that any of these structures is older than 60 years (hence they do not all qualify as historical structures).

The ruins of the dwellings cannot be considered to be of high significance in terms of their uniqueness, architectural style, age, aesthetic appearance, cultural historical significance or ideological meaning.

(The expansion programme that PPRust envisages implies that the villages of Ga-Puka and Ga-Sekhaolelo will be covered with rock waste dumps in the future. These villages are situated to the north of the present study area. It has been recommended in a Phase I report done for PPRust that the architectural features of some of the most outstanding dwellings in these villages be documented before these villages are destroyed. These mitigation actions would ensure that no knowledge is lost with regard to the indigenous architecture of the Langa Ndebele living in or close to the PPRust mining area).

## 7 CONCLUSION

The old diggings on Zwartfontein are historically significant as they represent the origins of PPRust and also reflect a part of the mining heritage of South Africa, particularly with regard to the origins of platinum mining in this country. However, the diggings and limited above-ground infrastructure have been altered significantly since the abandonment of the old mines some seventy years ago. The larger part of the diggings has collapsed or was filled in as required by the Department of Mines in the 1920's. Many of the diggings established on the Vaalkop-Sandsloot-Zwartfontein horizon of the Platreef, outside the study area, were destroyed when PPRust started its new operations in the early 1990's. The old platinum mines were established on some of the richest platinum-bearing deposits in the world and it seems inevitable that these deposits, sooner or later, would have been mined by one of the large mining houses in South Africa.

Infrastructure associated with the diggings on Zwartfontein consists merely of the foundations of what may have been PPRust's original treatment plant and the concrete headgear of a vertical shaft. The nature and extent of the remaining underground infrastructure (such as shafts, galleries, crosscuts, adits, etc) associated with the old mines is unknown, as these remains are not accessible. However, it is to be expected that some of the underground mining features are still impressive, but dangerous to investigate.

Early platinum mining in the Limpopo Province forms an important part of South Africa's mining heritage and the broader national estate. PPRust's expansion programme has confirmed that new mining ventures may endanger mining heritage sites, particularly at a time when the Minerals Act is under scrutiny and mineral development is considered a high priority by the government. The old mines were virtually unknown and would have remained shrouded in obscurity if their existence had not become endangered by PPRust's expansion programme. Mining heritage sites should therefore be investigated pro-actively by archaeologists and mining engineers working in collaboration with mining companies and SAHRA.

Mining development in the Limpopo Province has a long history. Mining there dates from the Iron Age when the Baphalaborwa metal workers mined copper carbonate ores from Loolekop as early as AD 800. During the Late Iron Age the Musina copper workers worked the copper mines at Messina. During this period iron ore was mined at places such as Tshimbupfe in the former Venda. The Mathipa and other clans obtained iron ores from the Rooiwater Complex

between Gravelotte and Tzaneen. Hundreds of tons of tin was also mined at Rooiberg near Warmbaths during the Iron Age.

Mining activities continued in the Limpopo Province during the historical period. Tin was mined at Zaaiplaats and other places near Mokopane (Potgietersrust). The first gold mined in the former Transvaal Province was mined at Eerstegoud, near Pietersburg (Polokwane). Platinum was first discovered near Nylstroom and the earliest platinum mines were started in the Lydenburg and the Potgietersrust (Mokopane) districts of the Limpopo Province. A mine museum that illustrates mineral development in the Limpopo Province is needed to do justice to South Africa's mining heritage.

This Phase II report serves as a descriptive and photographic record of the diggings and the positions (locations) of graves in the proposed new open pit area on Zwartfontein. The co-ordinates for the graves and a map of the remaining mining features (Figure 3) have been recorded on a CAD computer programme in PPRust's survey department.

**DR JULIUS CC PISTORIUS**

8      **BIBLIOGRAPHY OF LITERATURE PERTAINING TO THE BROADER  
REGIONAL CONTEXT**

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1. The mineral resources of South Africa are defined as those minerals which are known to exist in the country and which are capable of being mined and used for industrial purposes.

2. The mineral resources of South Africa are divided into two main categories: (a) metallic minerals and (b) non-metallic minerals.

3. The metallic minerals of South Africa are: (a) iron-ore, (b) manganese, (c) chromium, (d) vanadium, (e) cobalt, (f) nickel, (g) copper, (h) zinc, (i) lead, (j) silver, (k) platinum, (l) gold, (m) uranium, (n) thorium, (o) rare earth elements, (p) lithium, (q) beryllium, (r) niobium, (s) tantalum, (t) tin, (u) tungsten, (v) molybdenum, (w) selenium, (x) tellurium, (y) arsenic, (z) antimony, (aa) bismuth, (ab) cadmium, (ac) mercury, (ad) indium, (ae) gallium, (af) germanium, (ag) silicon, (ah) boron, (ai) phosphorus, (aj) sulfur, (ak) potassium, (al) sodium, (am) magnesium, (an) calcium, (ao) strontium, (ap) barium, (aq) rubidium, (ar) cesium, (as) francium, (at) actinium, (au) thorium, (av) uranium, (aw) plutonium, (ax) americium, (ay) curium, (az) berkelium, (ba) californium, (bb) einsteinium, (bc) fermium, (bd) mendelevium, (be) nobelium, (bf) lawrencium, (bg) rutherfordium, (bh) dubnium, (bi) seaborgium, (bj) bohrium, (bk) hassium, (bl) meitnerium, (bm) darmstadtium, (bn) roentgenium, (bo) copernicium, (bp) nihonium, (bq) flerovium, (br) tennessine, (bs) oganesson.

4. The non-metallic minerals of South Africa are: (a) asbestos, (b) mica, (c) talc, (d) graphite, (e) diamond, (f) silicon, (g) boron, (h) phosphorus, (i) sulfur, (j) potassium, (k) sodium, (l) magnesium, (m) calcium, (n) strontium, (o) barium, (p) rubidium, (q) cesium, (r) francium, (s) actinium, (t) thorium, (u) uranium, (v) plutonium, (w) americium, (x) curium, (y) berkelium, (z) californium, (aa) einsteinium, (ab) fermium, (ac) mendelevium, (ad) nobelium, (ae) lawrencium, (af) rutherfordium, (ag) dubnium, (ah) seaborgium, (ai) bohrium, (aj) hassium, (ak) meitnerium, (al) darmstadtium, (am) roentgenium, (an) copernicium, (ao) nihonium, (ap) flerovium, (aq) tennessine, (ar) oganesson.

5. The mineral resources of South Africa are distributed throughout the country, but are concentrated in certain areas.

6. The mineral resources of South Africa are of great importance to the country's economy.

7. The mineral resources of South Africa are being mined and used for industrial purposes.

8. The mineral resources of South Africa are being mined and used for industrial purposes.

9. The mineral resources of South Africa are being mined and used for industrial purposes.

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17. The mineral resources of South Africa are being mined and used for industrial purposes.

Table 1. Cemeteries in and near the proposed new open pit on Zwartfontein 818 LR. The Zwartfontein South Project will affect (destroy) these features.

	Graveyards	No of graves	Farm	Visible on surface	Remarks
1	1 of 5	54 (8)*	Vaalkop	Yes	
2	2 of 5	9 (1)*	Zwartfontein	Yes	
3	3 of 5	5	Zwartfontein	No	This graveyard probably does not exist
4	4 of 5	4 (1)*	Vaalkop	Yes	
5	5 of 5	3	Zwartfontein	Yes	
6				No	This graveyard probably does not exist

\* Graves of unidentified persons.

? These 'graves' may not contain human remains.

Table 2. The level of significance of the graves, the ruins of dwellings and the ruins of the abandoned Northern Prospecting Platinum Mine in and near the proposed open pit area. Note the degree of impact on these remains in the past as well as the degree of impact on these remains during the construction and operation of the open pit.

GRAVES AND CEMETERIES IN AND NEAR OPEN PIT	LEVEL OF SIGNIFICANCE	MAGNITUDE OF PAST IMPACT	MAGNITUDE OF FUTURE IMPACT
Graves 1 of 5	High	Low	High
Graves 2 of 5	High	Low	High
Graves 3 of 5	High	Low	High
Graves 4 of 5	High	Low	High
Graves 5 of 5	High	Low	High
Graves 6	High	Low	High
Ruins (of former dwellings)	Low	Damaged to affected	High
Ruins (of former mine)	High (historical)	Damaged to affected	High

Level of significance

High (3), Medium (2), Low (1)

Magnitude of future impact

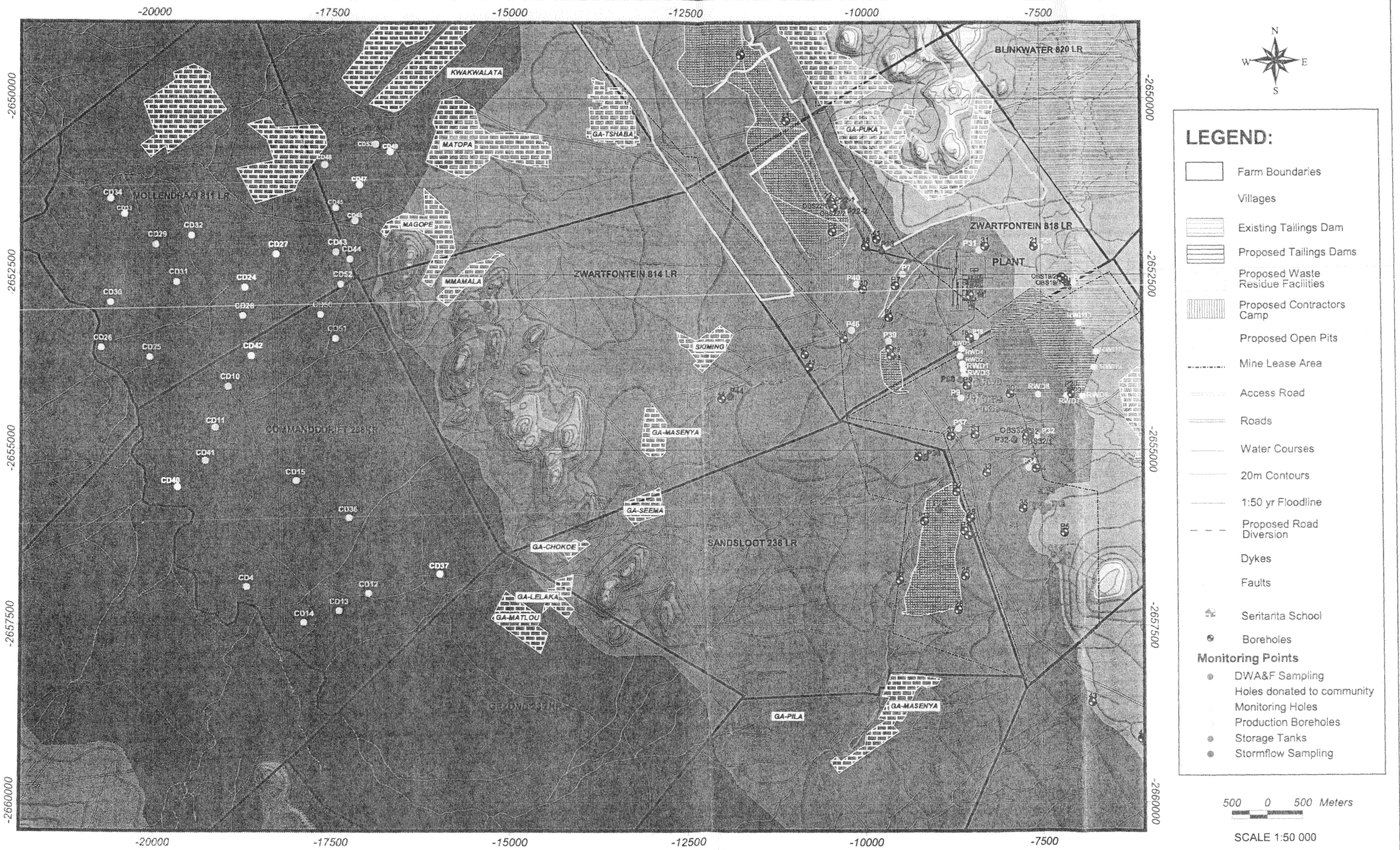
High (3), Medium (2), Low (1)

Degree of past impact

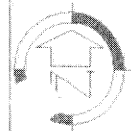
Destroyed (non existent) (4), Damaged (altered) (3), Affected (recognisable) (2), Unaffected (pristine) (1)











**LEGEND**

- current access road
- farm boundaries
- affected villages
- existing PPRust surface lease area
- proposed surface lease area
- existing pits
- proposed pits
- existing plant area
- existing tailings dam
- proposed tailings dam
- existing waste rock dumps
- proposed waste rock dumps
- proposed Zwartfontein South Pit

**REFERENCE**

1:50 000 TOPOGRAPHICAL  
2328DD LIMBURG  
2428BB TINMYNE

**SCALE**

0 1000 2000 3000 4000 5000m

