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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 NORTHERN 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 program to expand its current open cast mining activities of the eastern limb of the Merensky Reef (also known as the Platreef near Potgietersrust) from the farms Vaalkop 819LR and Sandsloot 236KR onto the farm Zwartfontein 818LR.

Heritage resources consisting of graves and cemeteries, the ruins of dwellings and abandoned mining activities 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 early platinum mining activities were short-lived and dates from c. 1920 to 1930.

The levels of significance of the graves, the ruins of the dwellings and the abandoned mining activities were determined 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.

As these remains will be affected (destroyed) by the development of the open pit and associated infrastructure mitigation measures were recommended, namely that the graves be exhumed and relocated and that the abandoned mining activities be documented before they are destroyed. PPRust manages the exhumation of the graves although this report provides more information on the gravesites. The main focus of this report is a description of the abandoned mining activities. This description is based on a research of literature on early platinum mining in Potgietersrust and elsewhere in South Africa. The abandoned mining activities are also correlated with these descriptions in order to explain some of these remains.

No detail reconstruction of the early platinum mining activities is possible anymore as these remains have been affected (altered, destroyed and vandalised) since their abandonment some seventy years ago. The affected nature of the remains does not warrant their conservation. However, the theme of mining in the Limpopo Province, where other metals such as gold and tin was mined at an early period, reflect the importance of South Africa's mining heritage which have not yet received been researched. Early mining activities in South Africa such as platinum mining in Potgietersrust, diamond mining in Kimberley, copper mining in Namakwaland, gold mining in Johannesburg, etc, indicate that a rich and diversified mining heritage exist 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 kilometers 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 Program 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 any 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' mining activities 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 old abandoned mining activities have high significance. The dwellings dating from the relatively recent past were rated as of low significance (Table 1).

The table also outlines 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). 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 1).

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

The mitigation measures put forward in the Phase 1 report recommended that the graves be exhumed and removed and that the mining activities be documented before they are destroyed. This report subsequently provides more information on the graves and cemeteries and also describes the nature and the extent of the old mining activities.

## 2 METHODOLOGY

### 2.1 Researching and documenting the old abandoned mining activities

The early mining activities in the proposed new open pit area are historically important and part of South Africa's mining heritage as it served as the precursor of Potgietersrust Platinums Ltd (PPRust), a platinum mine currently mining the Merensky Reef in Mokopane in the Northern Province. The mitigation measures for the abandoned mining infrastructure consisted of the documenting of these remains with descriptions, photographs and maps of the remains and a survey of literature on early platinum mining in South Africa and in 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 who today occupy numerous villages around the PPRust's leasing area.

The proposed new open pit area was surveyed on foot in order to photograph and to describe the old abandoned mining activities that were mapped by PPRust's survey department. The old abandoned mining activities were mapped on a CAD computer program that is maintained by PPRust's survey department. The aim with 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 that were followed in Potgietersrust in the early 20<sup>th</sup> century. Photographs of old mining activities 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 that were conducted in the study area. These analogies were useful to describe the mining features and the mining activities as the remains have been affected in the more recent past due to natural weathering processes, the closure of trenches and adits for safety purposes and the dismantling 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 with a GPS system.

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 are coordinated by a department of PPRust and is a long established 'practice' with which the mine is well acquainted as they have commissioned a large number of reburials over the past years. The exhumation and reburial of the deceased is therefore not the concern of this report. However, this Phase II report confirms the existence or non- existence of the graves and cemeteries that have been referred to in the Phase I report (and which emanates 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 intense than what was realised when the Phase I survey was done. The open pit area was disturbed when the first platinum mining activities 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 mining activities of the 1920's] are on the sites of ancient native copper workings'. These copper working activities must have dated from the Iron Age.

However, the original mining workings (or mining heritage) studied in this report were also disturbed. These remains were firstly affected by the original miners and secondly, in more recent times, by PPRust who had to alter some of these remains in order to ensure the safety of local people and of stock grazing in the area. Shafts and trenches were back filled as they posed a danger as humans or animals could fall into these features, particularly when they are covered by grass and therefore not visible.

The Phase I and Phase II surveys may have missed heritage resources, particularly 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 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 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 as 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 Tshaloga 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 Tlókwa 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 **Thutiwane 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 **Thutiwane** 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 **Thutiwane**. 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

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

The first reference to platinum is found in a narrative published in 1784 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 (Columbia today). The metal was described by Sir William Watson an English physicist as a semi-metal or metalloid in 1750. It was soon established from experiments 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 can be traced to the onset of the 20<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 while Wagner (1924) reported the presence of sperrylite in the ore bodies at Vlakfontein near the Pilanesberg. However, none of these discoveries were considered of any economic significance. Adolf Erasmus made the first economic discovery, called the Waterberg Platinum, in the Rooiberg fellsites between Nylstroom and Potgietersrus. The reserves, ultimately, 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 as the initial discovery of the Merenky Reef.

The Merensky Reef occurs, geographically, in the westerly and the easterly parts of the Bushveld Complex. These two limbs of the Reef 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 the northern limb of the Bushveld Complex, near Mokopane (Potgietersrust). 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 due to more limited mining activities in this part of the Reef (Figure 1).

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

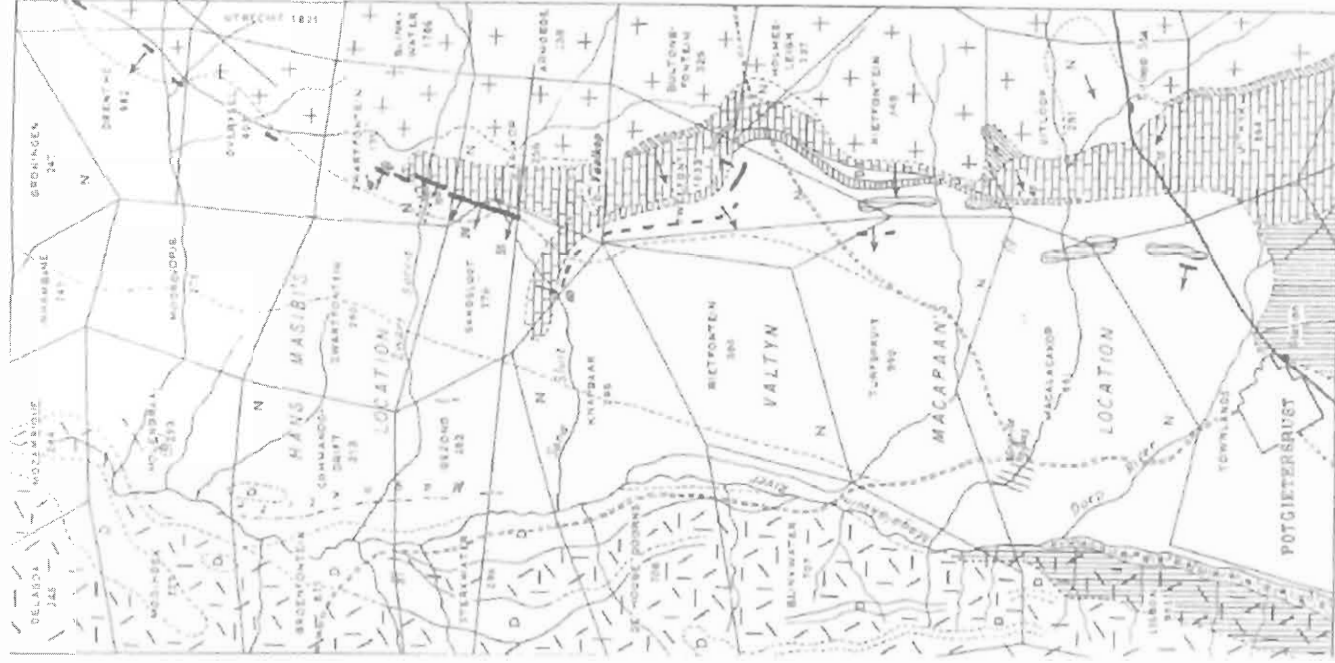
The platinum-group metals (PGM's), along with nickel and cobalt, are in the forefront of industrial demand in the developed world. The platinum group metals are amongst the least abundant elements on earth. However, their properties such as density, strength, catalytic features and high melting temperature give these elements unique applications in high technology engineering. The irreplaceable nature of some of these elements in industrial processes emphasises 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 and this application is expected to increase due to strict emission control legislation being applied in Europe, North and South America and Japan. A second major and growing use of platinum is in the stationary phosphoric acid cell (PAFC) and the 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 The location of the study area**

Potgietersrust Platinums Ltd is located approximately thirty kilometres to the north-north-west of the town of Mokopane (Potgietersrust) in the Limpopo (former Northern) 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 smaller 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 in shape, measuring 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 included on the farms Sandsloot236LR, 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 mining activities, dating from the third decade of the 20<sup>th</sup> century, occur (Figure 3).

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

#### **4.4 The geological features of the Platreef**

The early exploration for platinum in South Africa was undertaken by the Northern Platinums Ltd company who did a great deal of exploratory work in the Steelport area during the second half of the 1920's. The company also did exploration work in Potgietersrust as their name still appears on the old abandoned mining workings indicated on the Zwartfontein 818LR on the 1: 50 000 topographical map of Limburg 2328DD. Exploration work usually consisted of the putting down of incline shafts, some of 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 area occupied by the norite (to the west of the study area) is devoid of out standing physical features, except the presence of a few ranges of rugged kopjes. These kopjes, as was pointed out in the historical context of the wider area, Part 3, were the abode of the Langa Ndebele and other Late Iron Age clans. The extent of the platinum field is considerable as the known deposits can be traced from the north-western part of the Potgietersrust Townlands to the farm Witrivier, a distance of 40 kilometres.

The Platreef extends from about 20 km south of Potgietersrust northwards in a sinuous form for a total distance of over 100km. It averages 8 km in width, attaining its maximum width of 12 km in its central sector. The succession 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 is floored by Archaean granite, the Reef is 100 metre thick and shows development of three pyroxenitic reef

types. Partial melting of the Archaean granite gneiss 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 activities in and near the study area**

Exploration work done in the 1920's indicated that the platinum deposits in and near the proposed new open pit occurred on at least three horizons, all of which were represented 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 clad 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.

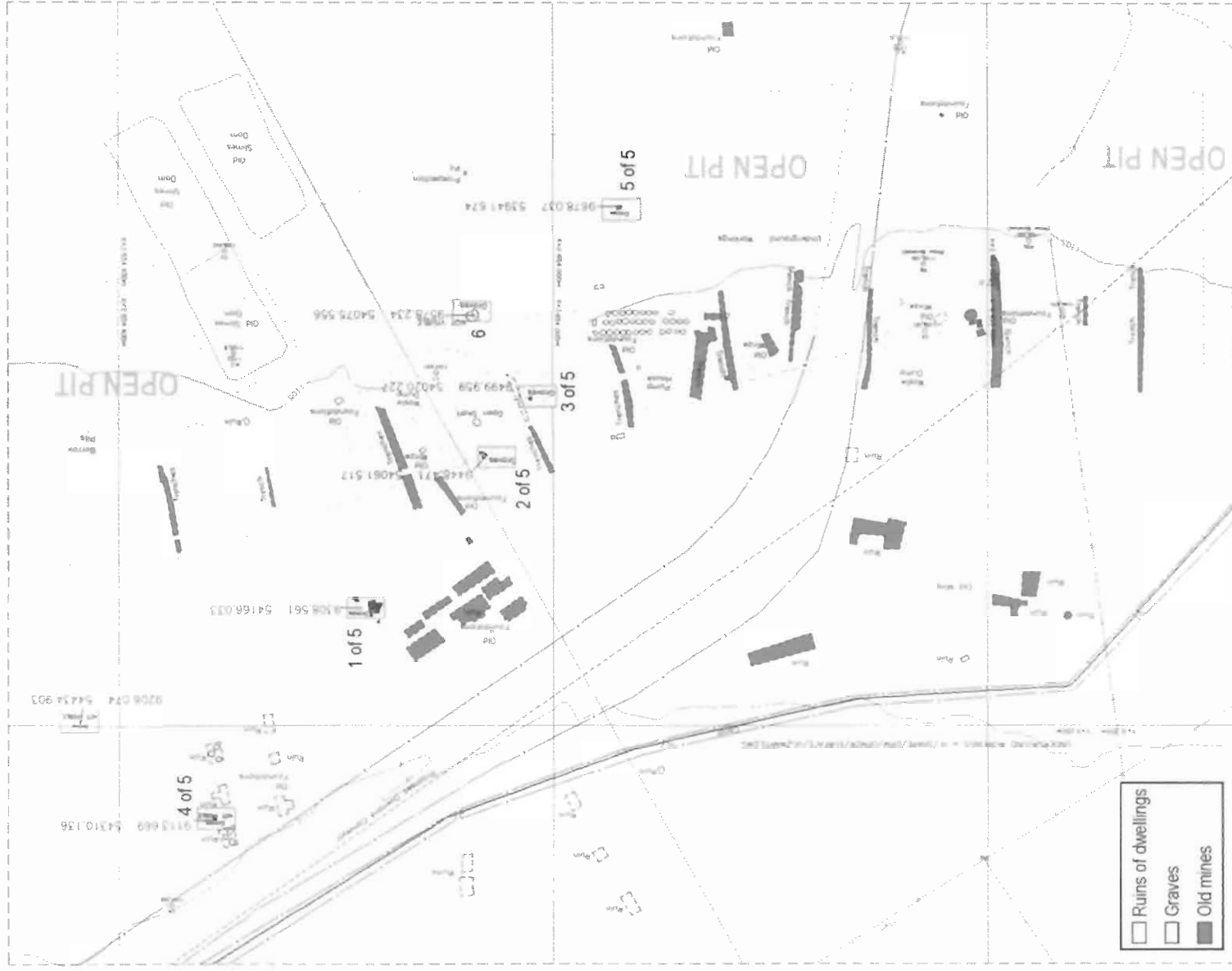
The second horizon was situated on the south-western slopes of Tweefontein Hill. The platinum bearing rocks showed conspicuous copper and iron stains. Chrysocolla, a type of copper carbonate ore with an exquisite bright peacock blue tint, could be seen in the platinum bearing rocks. These copper carbonate ores were found throughout the entire length of the ore body. According to Wagner (1973) all the exploration 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 from a distance of 25 kilometres from the Potgietersrust Townlands to the farm Witrivier.

The early exploration and mining activities indicated that the most important portion of the Platreef was included within the limits of 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.

**Figure 3.** The proposed new open pit on the southern part of the farm Zwartfontein 818LR. The construction and operation of the open pit will affect several graves, abandoned mining activities and ruins of dwellings, all dating from the relatively recent past.



### 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 silicated platinum-bearing dolomite and was studied with the so-called Long Trench Workings. The richest portion of the Sandsloot-Vaalkop-Zwartfontein Sector lied to the south and to the north of the Vaalkop-Zwartfontein boundary. Long trench workings indicated a stretch of some 1 300 feet in length which contained high values for considerable distances (Figure 4). Admirable sections across the composite ore-body could be seen in the No1 Vaalkop and the No 1 Zwartfontein workings (Figure 4). Both these trenches did not exist for very long as they were filled in by order of the Department of Mines.

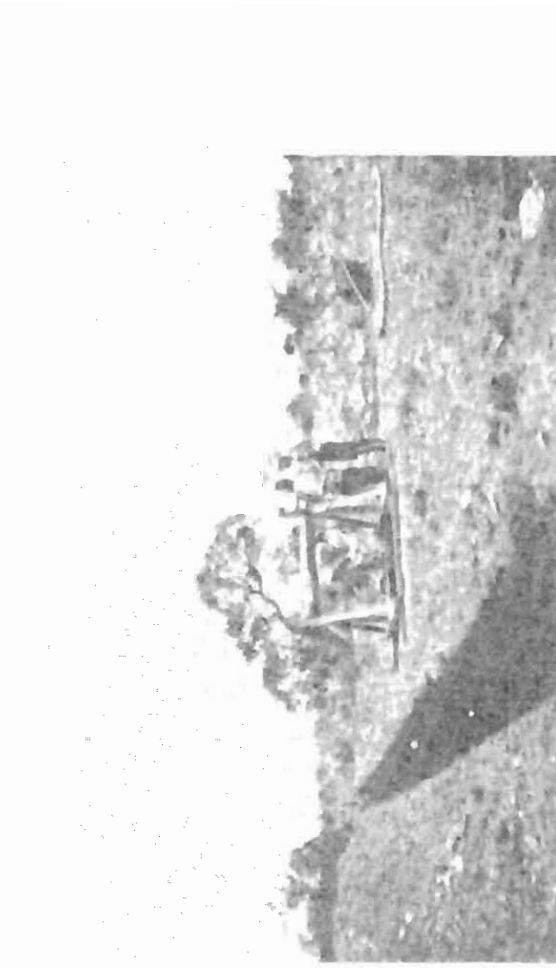
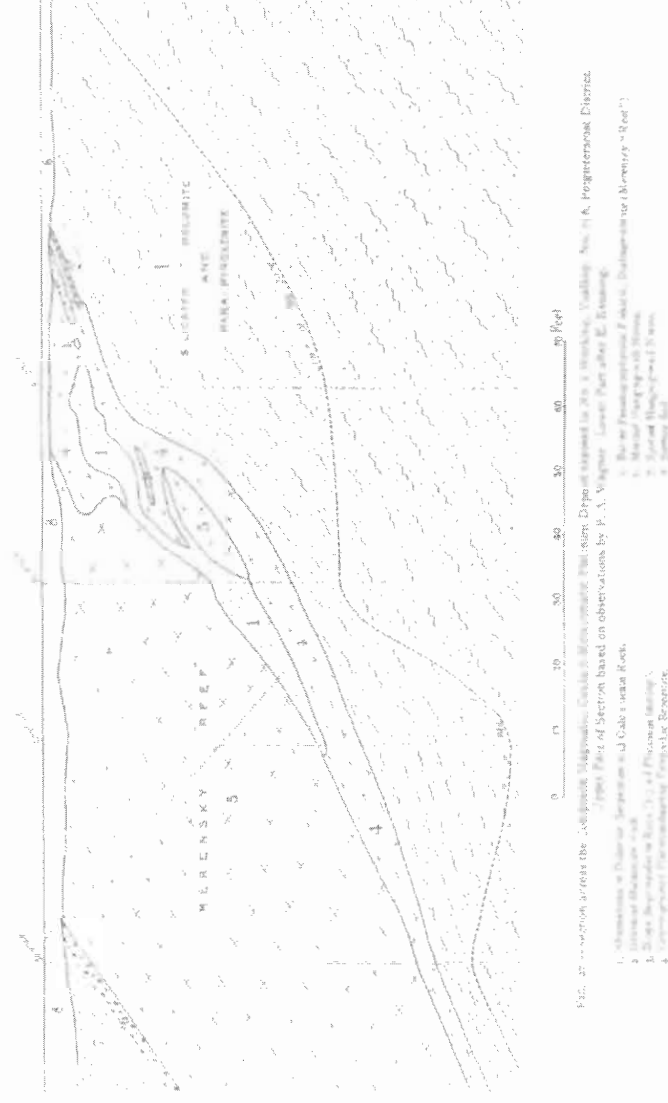
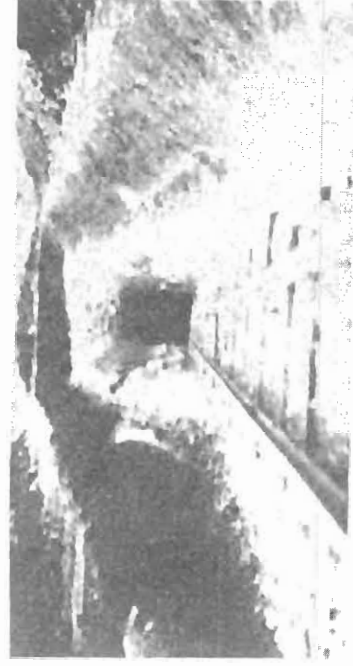


Figure 4. Prospecting Trench No. 1 on the farm Vaalkop 819LR as photographed in 1925 (Wagner 1973:168).

Figure 5. A section across the composite magmatic contact-metasomatic platinum deposit exposed in the No. 1 workings on Vaalkop (Wagner 1973:174).



Entrance into underground platinum mines was obtained through incline shafts or adits that were dug into kopjes or into the level ground, but with slight incline angles. 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 Baaubank 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 Potgietersrust (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 treatment.

The platinum metals and minerals in the Potgietersrus area were much coarser than those in the Merensky Horizon in the Rustenburg district. 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 include shaking and stationary tables, a James table and 'rougher' and 'cleaner' and 'recleaner' minerals separation flotation cells. The metallics caught on the corduroy tables were retreated the James table.

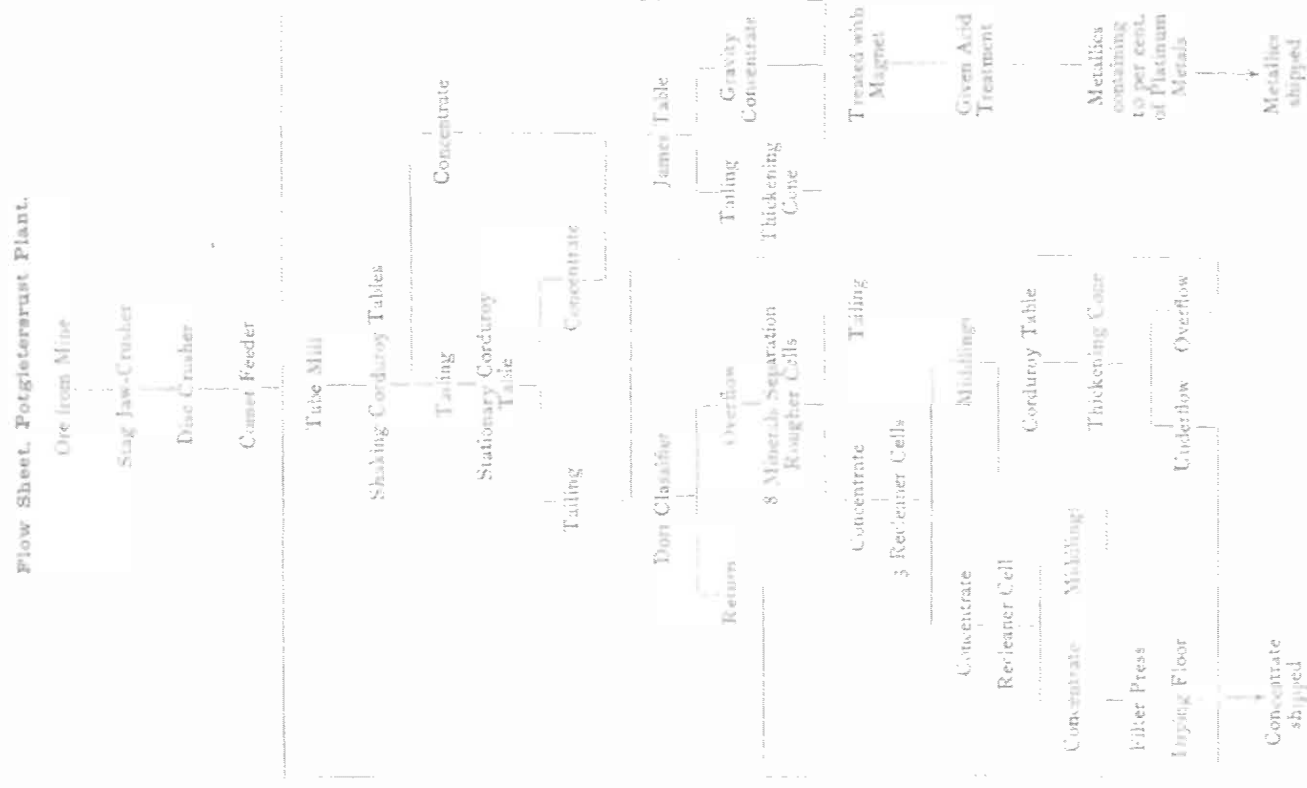
The heads from the latter were treated with a magnet and were then given an acid treatment. The final product assayed over 60 percent of platinum group metals. Roughly 30 percent of the platinum present in the ore was contained in these metallics which were shipped. The flotation concentrate that was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



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



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



The infrastructure of early 20<sup>th</sup> century platinum mines mainly consisted 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 head-gear of vertical shafts (Mooihoek Mine in Lydenburg, below) (Figure 17) (Wagner 1973:78, 96).

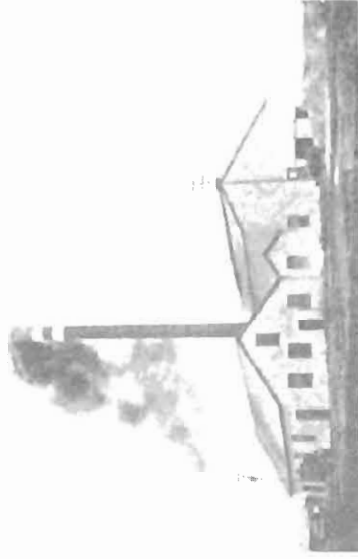
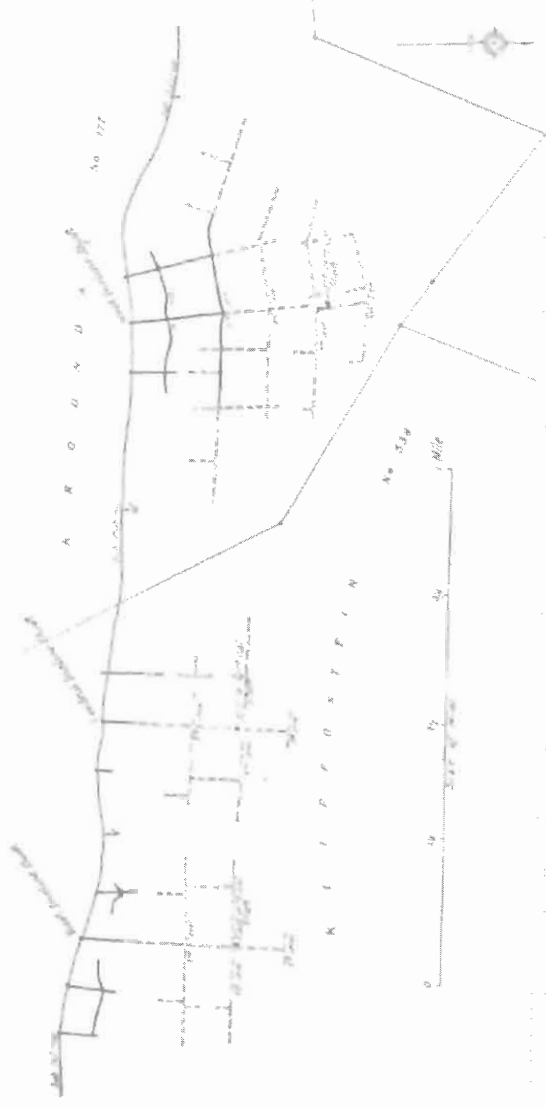


Figure 18. A cross section of the underground workings of an early 20<sup>th</sup> century platinum mine in Rustenburg.



#### 4.7 The decline of early platinum mining

During the great platinum boom of 1925 over fifty companies were floated in the Union of South Africa to exploit the mineral resources of the Bushveld Complex and the Waterberg district. Oxidized ores were initially exploited from the Merensky Reef. When these ores became 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 became financially exhausted and suspended their operations never to resume.

Further fluctuations in the price of platinum during the 1940's and 1950's did not encourage major expansions of mining activities. It 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 1122 tons of concentrated estimated to contain

4516 ounces of platinum, 4767 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 were 110, 000 pounds.

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

- 1 Potgietersrust Platinum Ltd.
- 2 The Lydenburg Platinum Areas, Ltd
- 3 Onverwacht Platinum Limited
- 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 Potgietersrust Platinum Ltd 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 Potgietersrus during 1927 to 1929, also acquired the properties of the Premier Rustenburg Platinum Ltd, the Steelpoort Platinum Syndicate Ltd and the Eestergeluk Platinum Mines Ltd., all situated in the Rustenburg district. PPRust had the most extensive holdings (farms owned, discovery rights, mineral rights owned, mineral rights leased and prospecting rights) than any of the South African platinum companies. Farms they owned included:

Potgietersrus district:	Witrivier
	Overysel
	Vaalkop
	Tweefontein
Rustenburg district	Swartklip
Lydenburg district	Eerstegeeluk

#### 4.8 Platinum mining resurrected

After the collapse of the platinum industry in the 1930's only two companies remained and became amalgamated, namely Rustenburg Platinums Ltd. this mine remained in production until the 1970's when three other companies developed mines to join in the platinum market which again experienced a boom. Project work on the new Potgietersrust Platinum Ltd mine started in 1994. Rustenburg Platinum and Lebowa Platinum equally share the Potgietersrus 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 of abandoned mining activities in this area. This part of the report only focuses on the abandoned mining activities.

### 5.1 The abandoned mining activities

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. 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 mining activities 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 was pointed out that many of the remains that have been mapped does not exist any more.

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

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

The activities currently visible on the surface of the proposed new open pit 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

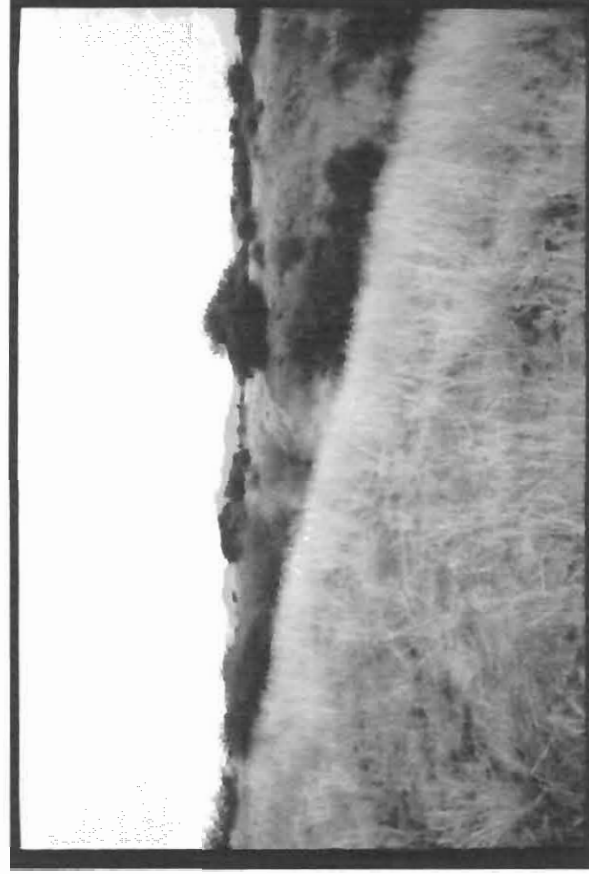
with any specific mine's activities from the past. It is also not possible to reconstruct all the infrastructure and workings of a platinum mine from the early 20<sup>th</sup> century from these remains. However, it is possible that some of the remains can be correlated with the descriptions that have been provided for platinum mining in the early 20<sup>th</sup> century on the Platreef and in Lydenburg and Rustenburg.

The 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.

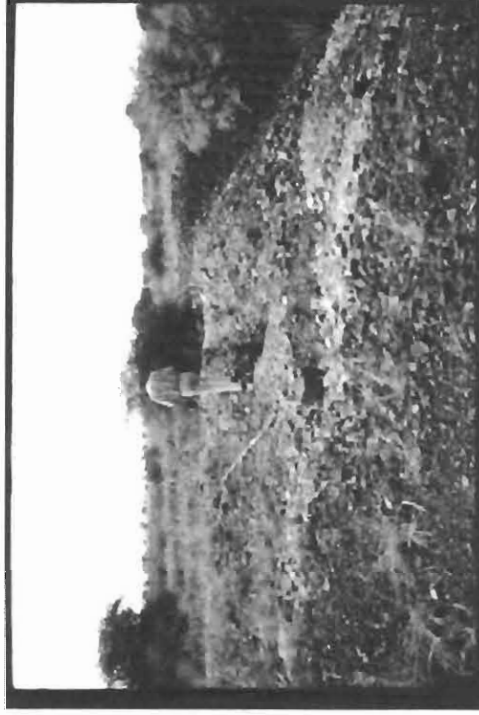
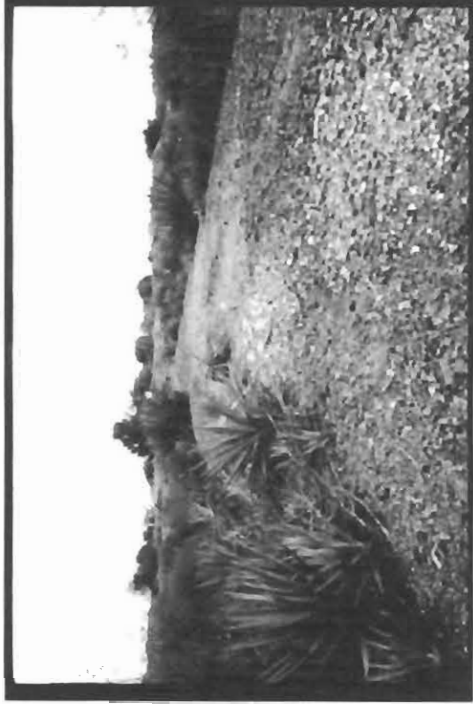
#### Slimes dams

The largest remaining structures of the abandoned mining activities consist of at least three slimes dams that are attached to each other. These structures occur near the southern part of the proposed new open pit. The slimes dams have been damaged as some of their soil walls have been removed for building and filling purposes (Figure 19, below).



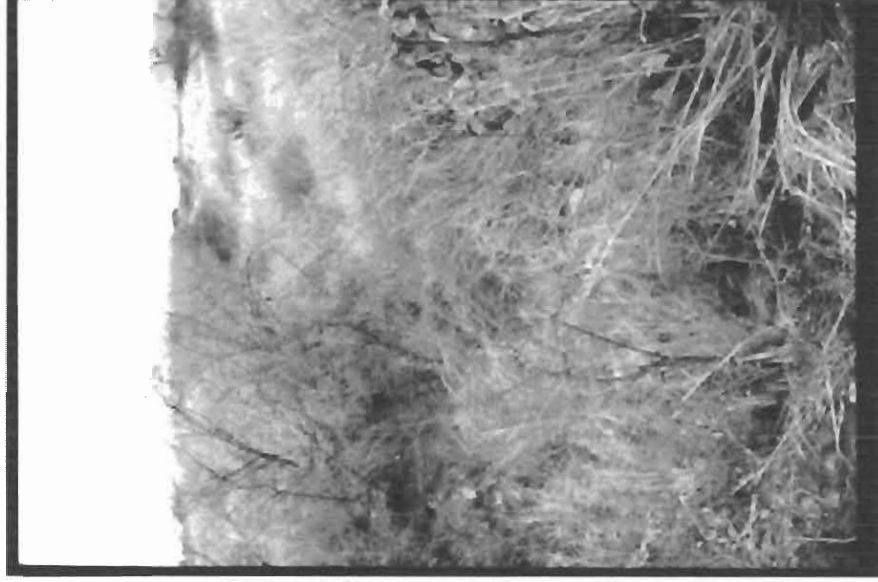
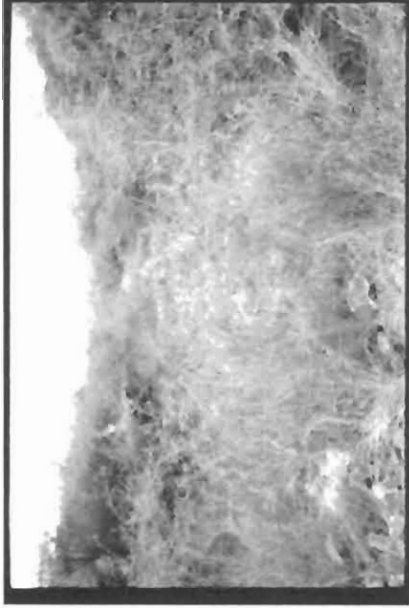
### Waste rock dumps

The second largest mining remains are waste rock dumps that are located in the central part and in the northern part of the open pit area. PPRust have 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 the long narrow trenches which were used for exploration purposes and broad, shorter trenches. The Vaalkop-Sandsloot-Zwartfontein horizon of the Platreef was intensely explored and some of these trenches are barely visible today (Figures 22 & 23, below).

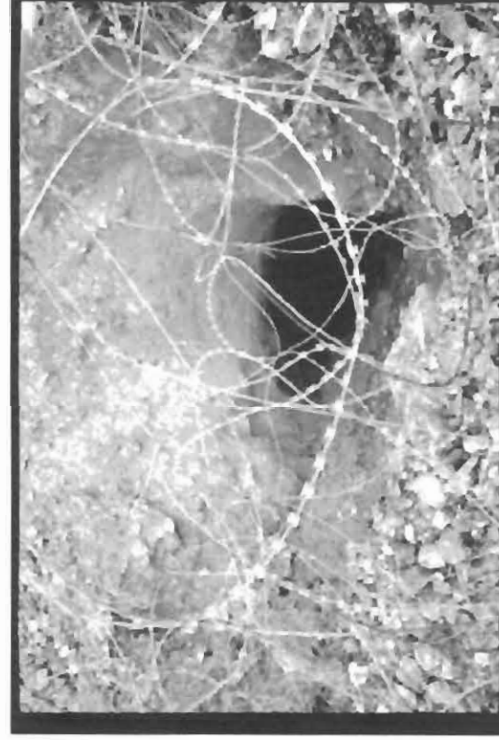




### Shafts and adits

Two types of shafts can be distinguished in the open pit area, namely vertical shafts and incline shafts. Several incline shafts can still be observed in the study area while the remains of at least one vertical shaft with part of its head-gear still exist. This structure is the most impressive of all the mining gear still remaining in the 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. These features were closed when mining activities were abandoned as people or animals, unaware of their existence, may fall into these features (Figure 25, far below).



### Other infrastructure

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

The cement foundations of an extensive structure still occur near the centre of the open pit area. It is possible that these may be the remains of the treatment plant that was 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 open pit area. These cemeteries are tabulated in Table 1. The coordinates 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):

#### Grave 1 of 5

This gravesite is situated slightly to the east of the 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 with stones. Only three modern graves with granite tombstones and edgings occur in this cemetery.



Figure 28. Grave 1 of 5 may contain as many as fifty graves.

Grave 2 of 5

This small graveyard contains as many as eight or nine graves. Only one of the graves is covered with a granite tombstone and edgings. The inscription on this tombstone reads as follow:

Diase

Seemole

Mapala

\*1888-05-11

†1920-07-06

Robala ka kgotso Mokwena

A second grave is covered with a cement slab that bears the name of Maurice Chuene.

Four graves are covered with stones and are furnished with small pieces of corrugated iron bearing the following names:

Klaas Teffo

Ga-Molekana

(A Malebana)

Johannes Legodi

Ga Molekana

(A Malebana)

Matiangoe

Johanna

Ga Molekana

A grave with thick cement edgings and an inner part that is filled with ore may contain the bodies of two persons, namely:

Magdeline

Ramashala

Linder

Salamina

Ramashala

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

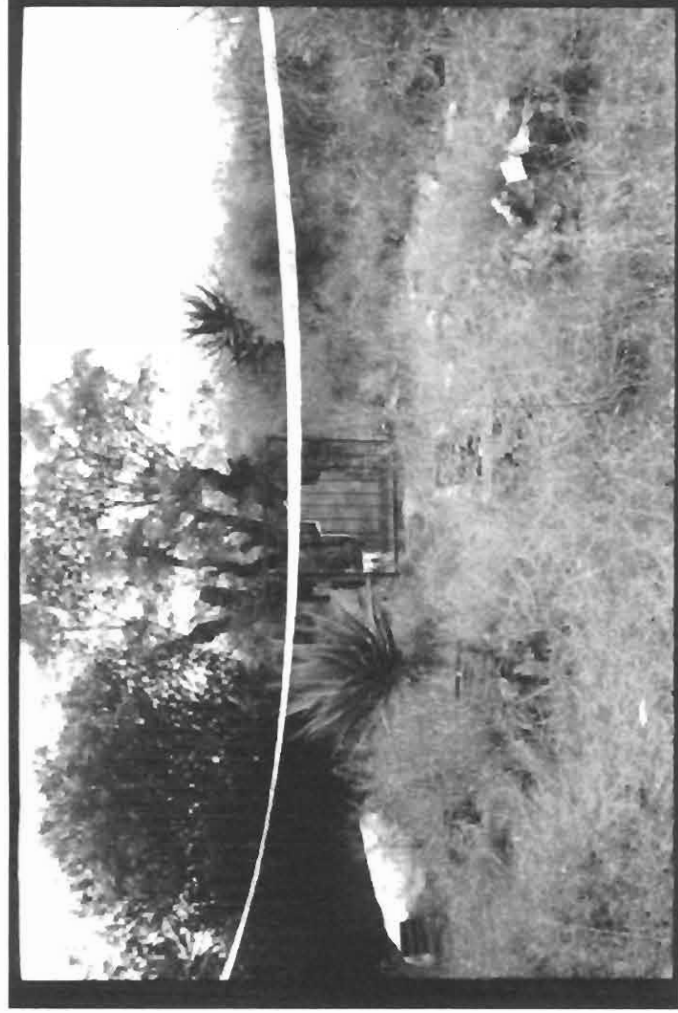
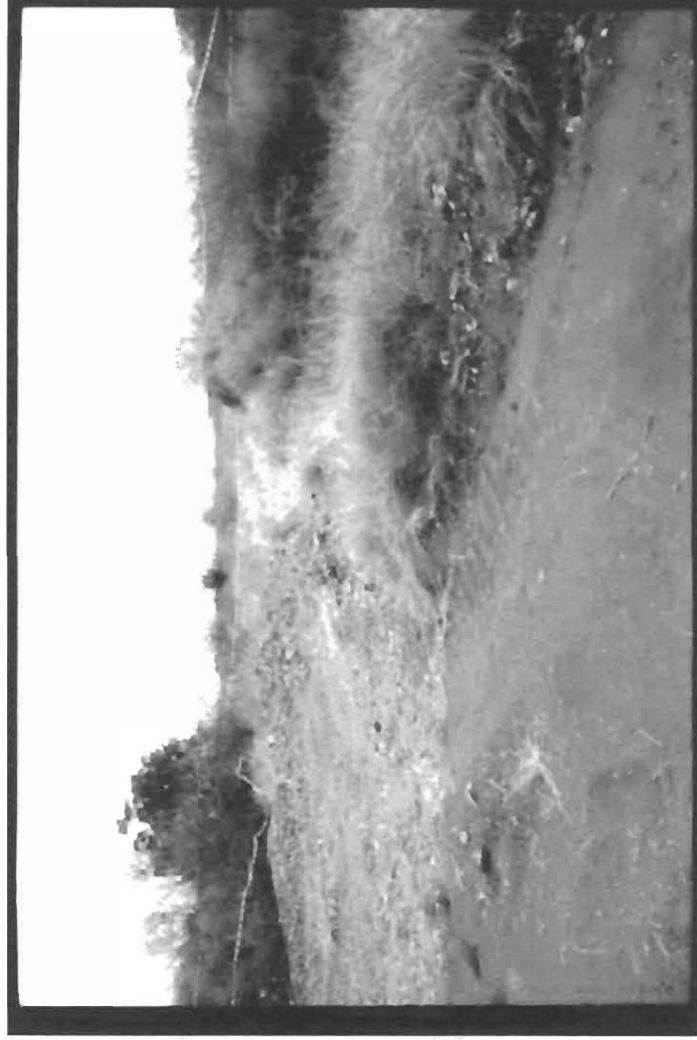


Figure 30. No evidence for any graves were found at the locality where Grave 3 of 5 is supposed to be located (above).



### Grave 3 of 5

No graves could be found at this location. This gravesite, which should have contained five graves, 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.

### Grave 4 of 5

This site is marked by at least three graves that are covered with grass and which are not clearly visible. The graves have been covered with stones and each grave has a corrugated iron board with the names of the deceased. The name of only one of the deceased can be read, namely that of Joseph Ndaba.

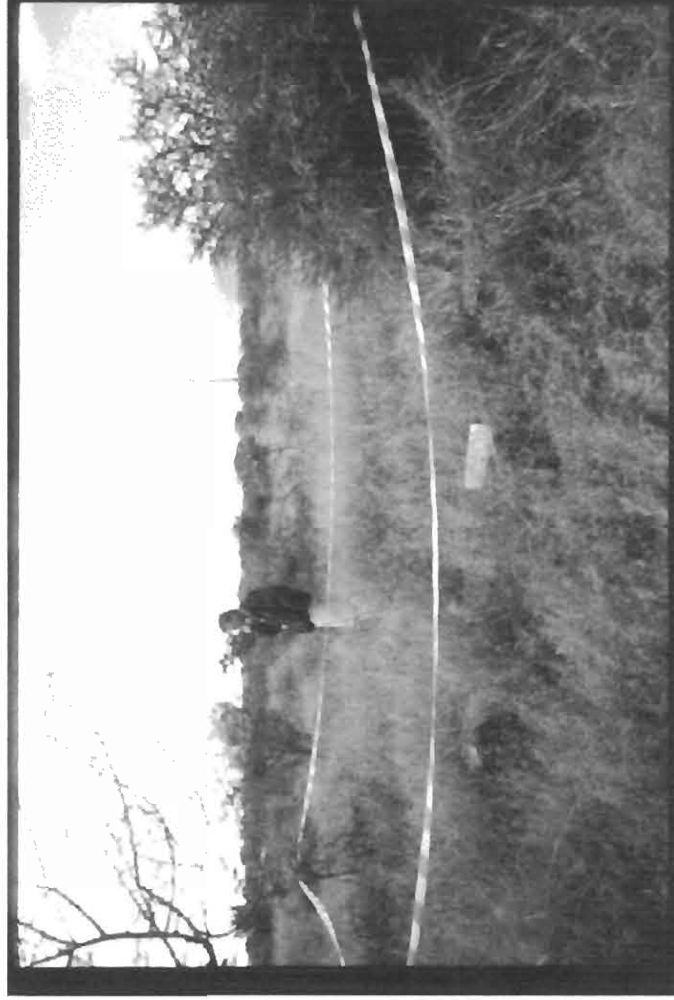


Figure 31. Grave 4 of 5 is inconspicuous as it is covered with tall grass.

### Grave 5 of 5

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

Tatani wa Hina  
Jacob baloyi  
Etlela hi ku Rhula

and

Maja wa Nwira  
Piet Baloyi  
Wu Etlela hi ku Rhula



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

### Grave 6

This gravesite is located close to a Marula tree and is covered with 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 Grave 6 should be located according to PPRust's grave census data base..

### **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 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 expansion program of PPRust envisages 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 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.

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

- Berg, J.S. (red.) 1999. *Geskiedenisatlas van Suid-Afrika. Die vier noordelike provinsies*. Van Schaik: Pretoria.
- Cawthorn, R.G. 1999. The discovery of the platinumiferous Merensky Reef in 1924. *South African Journal of Geology*. 10 (3): 178-183.
- Erasmus, B.P.J. 1995. *Oppad in Suid-Afrika*. Jonathan Ball: Johannesburg.
- Findlay, G. 1990. Potgietersrus Platinum: another costly expansion. *Financial Mail*. 118 (1).
- Jackson, A. O. 1969. *The history and political structure of the Mapela Chiefdom of the Potgietersrus district*. Unpublished manuscript.
- Jackson, A. O. s. a. *The Ndebele of Langa*. Ethnological publications no. 54. Department of Co-operation and Development.
- Lombaard, B. V. 1945. Die ontdekkers van platina in die Transvaal. *Historical Studies*. University of Pretoria, South Africa. 6(1):32-40.
- Macquire, J. s.a. *A guide to the Makapansgat valley sites*.
- Moore, M. P. J. 1981. *The Iron Age of the Makapan valley area*. Unpublished M.A. dissertation. University of the Witwatersrand.
- Standard Encyclopaedia of Southern Africa*. Volumes 7, 8 & 9 (1970). National Educational Publishers: Cape Town.
- Van Warmelo, N. J. 1930. *Transvaal Ndebele texts*. Government Printer: Pretoria.
- Van Warmelo, N. J. 1944. *The Ndebele of J. Kekana*. Government Printer: Pretoria.
- Viljoen, M.J. & Reinhold, W.U. 1999. *An introduction to South Africa's geological and mining heritage*. Mintek: Randburg.
- Wagner, P.A. 1973. *The platinum deposits and mines of South Africa*. Struik: Cape Town.

Wilson, M.G.C. & Anhausser, C.R. 1998 (eds). *The Mineral Resources of South Africa*. Council for Geoscience 16: Silverton, South Africa.

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	Vaalkop	Yes	
2	2 of 5	Zwartfontein	Yes	
3	3 of 5	Zwartfontein	No	This graveyard probably does not exist
4	4 of 5	Vaalkop	Yes	
5	5 of 5	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)