

THE GEOLOGICAL SITE AT TWO RIVERS PLATINUM MINE NEAR STEELPOORT, LIMPOPO PROVINCE
STATE OF CONSERVATION REPORT

Prepared By
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25 July 2024



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DOCUMENT CONTROL

Project Name	Geological Site at Two Rivers Platinum Mine Report
Report Title	The Geological Site at Two Rivers Platinum Mine Near Steelpoort, Limpopo Province: Heritage Report
Report Status	FINAL
Project Owner	Two Rivers Platinum Mine

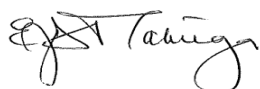
	Name	Qualifications	Date
Field Work & Report	Edward Matenga	. MPhil in Archaeology. . PhD in Archaeology & Heritage . ASAPA #363 . ICOMOS #11323	August 2024

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EXECUTIVE SUMMARY

1. This document is a state of conservation report for the Dwars River Geological Site at Two Rivers Platinum. The site is a Provincial Heritage Site in terms of the National Heritage Resources Act (No 25 of 1999).
2. The report is an updated description of the site and highlights its multi-component facets. Iron Age period grinding grooves on the stream bedrock including one of the largest known are now included in the site description as well as the ritual ceremonies held at the site.
3. Several threats to the conservation of the site have been identified and will be addressed in the Integrated Heritage Management for Two Rivers Platinum Mine which will be updated.
4. *Table of threats and proposed mitigation measures.*

	Threat	Proposed Mitigation
1	Night vigil fires	Assessment of potential damage and remedial action. Stakeholder engagement.
2	Vandalism of facilities /infrastructure (e.g. the information plaque)	Stakeholder engagement. Delineation of a buffer zone. Construction of perimeter fence around the buffer zone. Visible policing. Restoration of Information Plaque.
	Careless litter disposal	Litter Management. Introduce waste bins. Waste collection.
3	Community relations	Stakeholder Engagement Strategy.

5. This Report will be uploaded to the SAHRIS Site Inventory under the Site: Dwars River Geological Occurrence, Site Reference: 9/2/236/0006.

1. INTRODUCTION

The Geological Site at Two Rivers Platinum Mine (Lat: 24°54'38.84"S. Long: 30° 6'12.17"E) is a streambed geological formation on the Dwars River through which water at low channel flows in a straight groove representing a linear fracture/fault separating alternating beds of chromitite and anorthosite (plagioclase). There is a significant tilt in streambed gradient creating a minor rapid (Figure 1). The zebra – striped beds are a rare and spectacular landform associated with Upper Group 1 (UG1) geo-stratification in the Bushveld Igneous Complex. The Bushveld Igneous Complex (BIC) is a vast composite body of plutonic and volcanic rocks stretching from Burgersfort in eastern Limpopo Province to Rustenburg in the North West Province. The platinum-carrying Merensky Reef exploited at the Two Rivers Platinum and other Mines in the area is one of the world's greatest reserves of the Platinum Group Metals (PGM). It is also the largest known mafic-ultramafic plutonic intrusion in the world. It occupies an area of more than 90000 km² and extends 430km East-West and 300km North-South. It is a discontinuous oval body consisting of five major lobes: the Northern, Western, Far Western, Eastern and South-Eastern (Figure 2).¹

¹ Latypov, R & M. Pebane. 2027. The significance of magmatic erosion for bifurcation of UG1 chromitite layers in the Bushveld Complex. Pp65-66.



Figure 1: The channel is running in a fault between the zebra-striped beds of chromitite and anorthosite. The gradient along the groove creates a rapid.

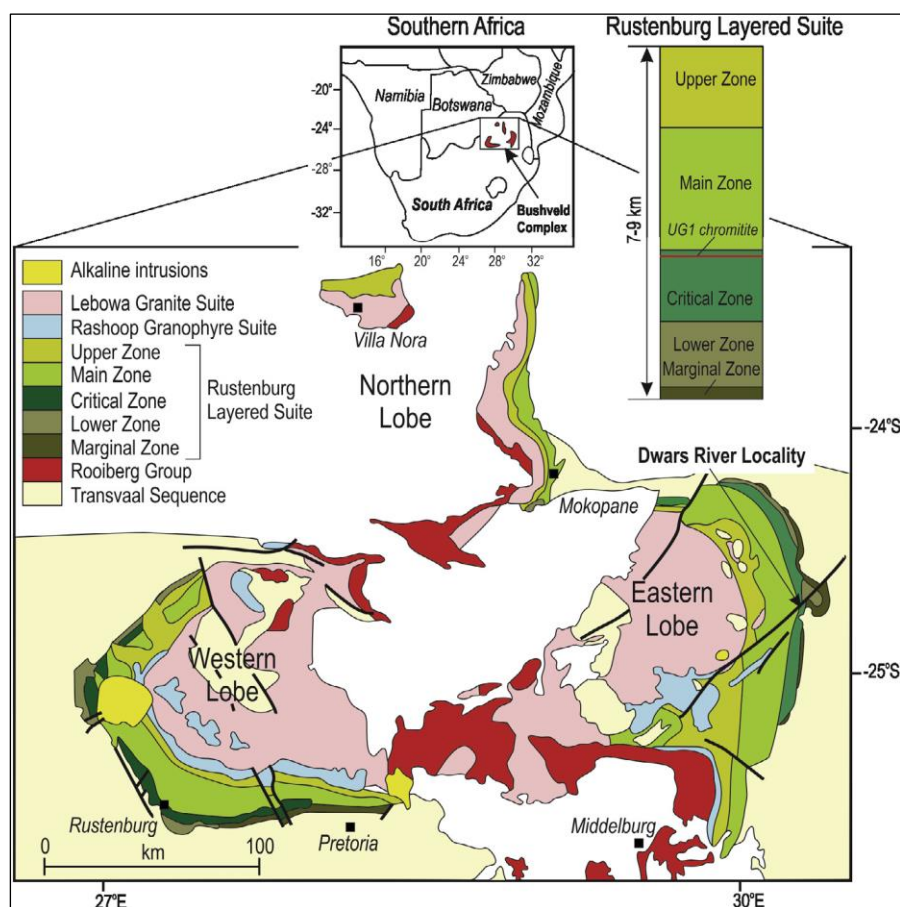


Figure 2: Map of the Bushveld Igneous Complex (Latypov & Pebane 2017, p66).

2. GEOLOGICAL EVOLUTION OF THE SITE

This Heritage Report does not attempt to give a detailed on the mechanism through which the stratified igneous rocks were formed. A synopsis is based on an article by Prof. Rais Latypov and Mr. Mosili Pebane (2017).² With due permission of the authors, the scientific article is appended to this report. Suffice it therefore to say the zebra beds are igneous intrusions (and not sedimentary stratification as one might be misled to think) dating 2060 billion years BP. How these beds came about (a geological process called bifurcation) is puzzling to scholars who until recently explained them under three hypotheses.

(i) Depositional Model

The intermittent accumulation of plagioclase on the chamber floor as lenses, terminated by crystallization of continuous chromitite layers.

(ii) Intrusive Model

Late-stage (secondary) injections of chromite mush or chromite-saturated melt along anastomosing fractures that dismembered semi-consolidated plagioclase cumulates.

(iii) Deformational Model

Post-depositional deformation of alternating plagioclase and chromite cumulates, resulting in local amalgamation of chromitite layers and anorthosite lenses that wedge out laterally.

According to Prof Latypov, opinion is shifting to other possible models but not excluding the theories outlined above. Prof Latypov postulates “a novel hypothesis that envisages basal flows of new dense and superheated magma that resulted in intense thermo-chemical erosion of the temporary floor of the chamber. The melting and dissolution of anorthosite was patchy and commonly inhibited by chromitite layers, resulting in lens-like remnants of anorthosite resting on continuous layers of chromitite. On cooling, the magma crystallized chromite on the irregular chamber floor, draping the remnants of anorthosite

² Latypov, R & Pebane, M. 2017. The significance of magmatic erosion for bifurcation of UG1 chromitite layers in the Bushveld Complex. Ore Geology Reviews. Elsevier. journal homepage: www.elsevier.com/locate/oregeo

and merging with pre-existing chromitite layers excavated by erosion. With further cooling, the magma crystallized chromite-bearing anorthosite. Emplacement of multiple pulses of magma led to repetition of this sequence of events, resulting in a complex package of anorthosite lenses and bifurcating chromitite layers. This hypothesis is the most satisfactory explanation for most of the features of this enigmatic igneous layering in the Bushveld Complex.³ Figures 3-6 are photographs of the geological site.

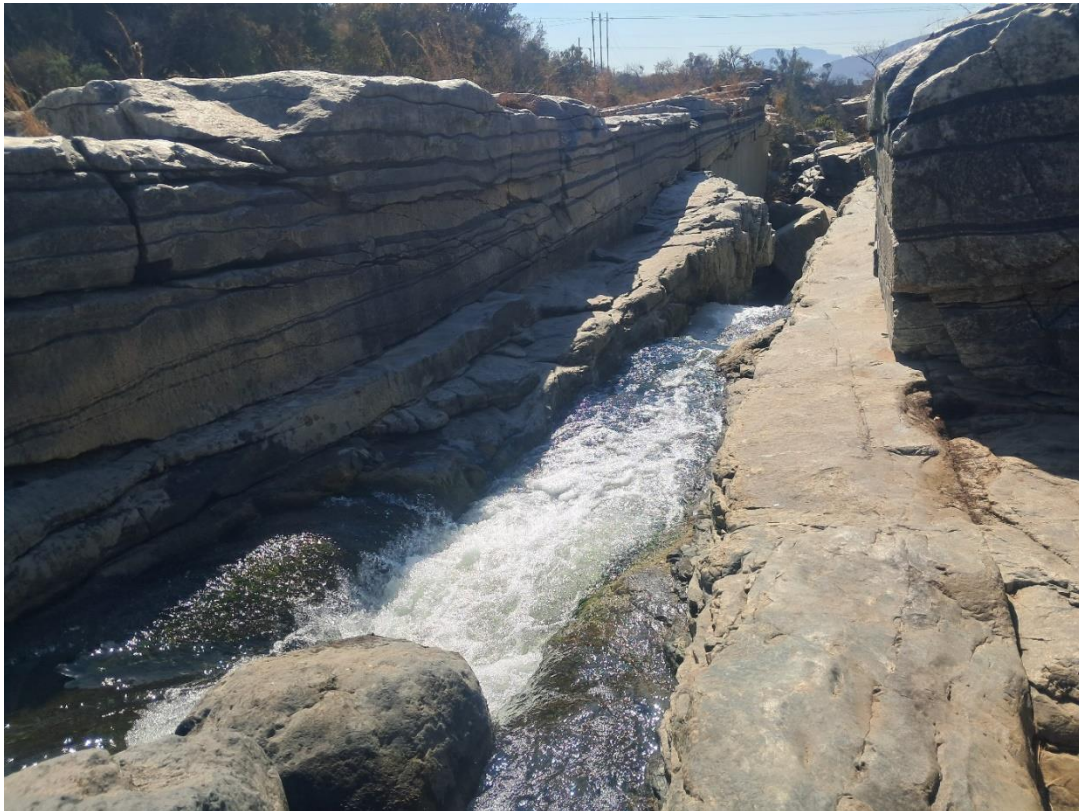


Figure 3: Close view of the grooved channel between zebra-striped rock and the rapid.

³ Adapted from Latypov & Pebane, 2017, p65.



Figure 4: The channel enters a pothole and the north end of the section of the river in the declaration.



Figure 5: Stratum of chromitite (black) more that 40cm thick on the west bank of the river.



Figure 6: Another example chromitite layer more than 40cm thick on the west bank of the river.

3. IRON AGE GRINDING SURFACES

Numerous grinding surfaces can be seen on the solid rock streambed close to the west bank of the river (Lat: 24°54'37.10"S, Long: 30° 6'12.70"E). They are oval and concave in shape meaning that they are deepest in the mid-section. In archaeology, a distinction is made between the oval grinding grooves such as those at Dwars River and circular holes that are deeper and sometimes end in a tapering hole. The Dwars River type were used for preparing cereals and medicines, and possibly sharpening knives.⁴ The circular ones are associated with precolonial gold ore processing. Dwars River features what could be one of the largest grinding grooves to be found in an archaeological context in South Africa, being 1,8m x 80cm x 30cm deep (Figures 7-8). The grinding grooves were apparently not mentioned in the National Monument declaration (Figures 7-8).

⁴ COOKE, CK. 1992. GRINDSTONES. The digging stick Vol. 9. No 2. Journal of the South African Archaeological Society.

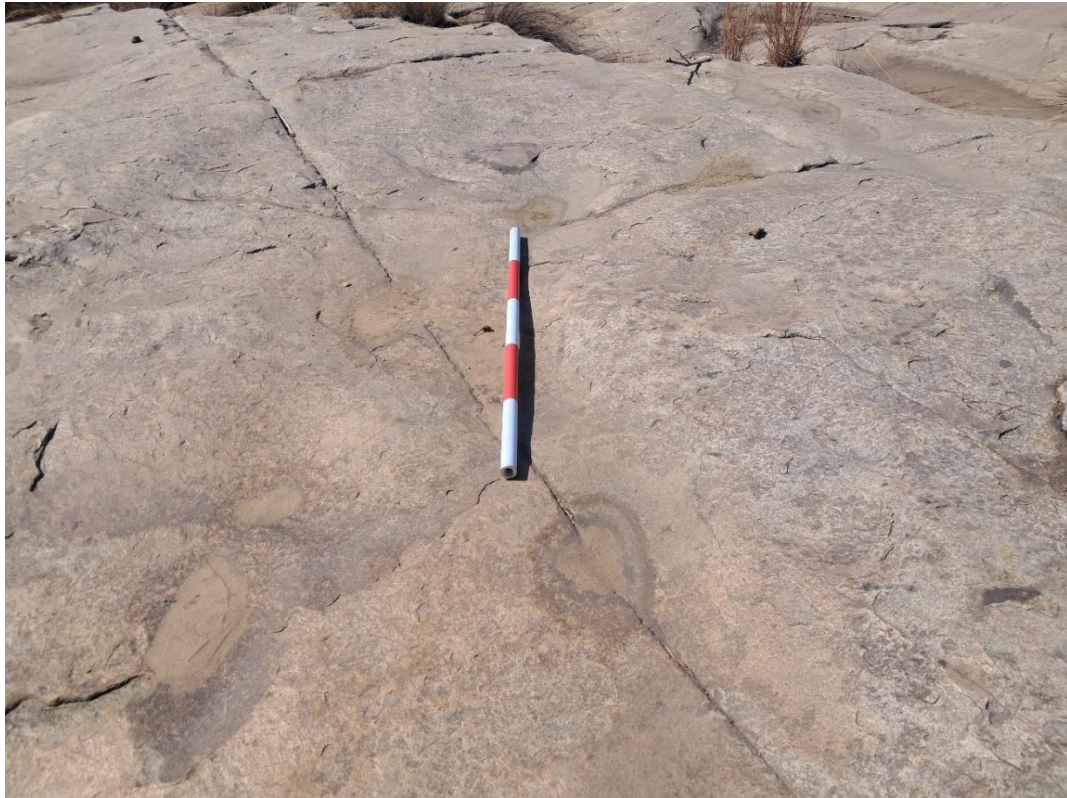


Figure 7: Oval grinding surfaces on the stream bedrock west of the channel.

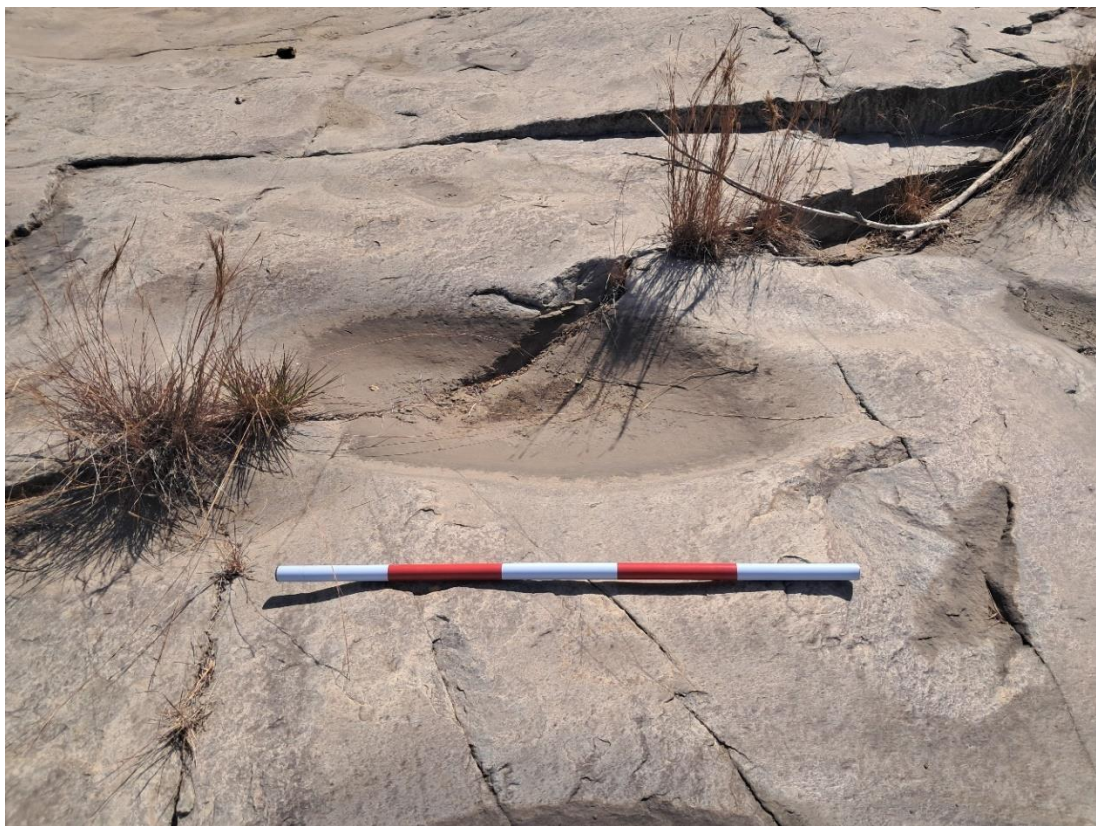


Figure 8: A large grinding groove measuring 1.8m x 80cm x 30cm deep.

4. SPATIAL EXTENT OF DECLARED SITE AND LOCATION OF THE GRINDING SURFACES

4.1. Legal Status

Dwars River Geological Site was proclaimed a National Monument under the Natural and Historical Monuments, Relics and Antiques Act (No.4 of 1934) (amended several times between 1934 and 1969). The National Monuments Act (No 28 of 1969) came into force and supplanted previous legislation. The legal status of the site as a National Monument was maintained post-1969. In 1999 the South African Heritage Resources Act (No 25 of 1999) was passed and the National Monuments Act repealed, this happening five years after the attainment of democracy. There was concern at the time about creating a National Heritage Site inventory that was balanced and representative of the diversity of South African cultures and heritage. A resolution was made that all National Monuments proclaimed under previous legislation would by default become Provincial Heritage Sites until they were re-evaluated. By that resolution the Dwars River Geological Site is a Provincial Heritage Site (PHS) (Grade II) (Site Ref: 9/2/236/0006). Our view based on this study is that the site is an extremely valuable and rare geological occurrence, and recommend, therefore, that the grading be reviewed.

4.2. Extent of the Monument Proclamation

The diagram below shows the extent of the gazetted site (Figure 9). We have not been able to project this diagram on modern Google Earth maps. But we believe that the gazetted area included the grinding grooves. After the recent ground survey the core area of the site has been plotted (Figure 10), and the key features are:

- (i) Section of the channel in a straight groove / fault between zebra-striped beds; this section includes the rapid.
- (ii) North bank of the stream where chromitite layers >40cm thick are exposed.
- (iii) Grinding grooves on stream bedrock on the northside of the channel.
- (iv) Covered section of the channel and posthole (northend of the gazetted area).

Figure 9: Diagram showing the extent of the of the national Heritage Site declaration (Source: SAHRIS).



Figure 10: Identification of the core of the site based on the ground survey in July 2024.

4.3. Delineation of a Buffer Zone

Based on the recent study, a buffer zone is required around the site. A buffer zone is an area surrounding a core zone that is reserved and serves to improve the care, protection and management of the site by ensuring that activities in the adjacent area are compatible and consistent with conservation and sustainable development goals. The area proposed as the buffer zone will be a green reserve where development projects are carefully screened using environmental impact assessment tools.



Figure 11: Proposed buffer zone boundary. Note that on the west bank the proposed boundary encroaches on the Eskom 400kV powerline servitude outlined in red.

4.3.1. Fencing the Buffer Zone

Since the proposed boundary of the core of the property is along the stream banks it is difficult to erect a fence, even without considering likely negative visual impact of such fencing. A perimeter fence can be erected along buffer zone boundary, mindful that the proposed boundary encroaches into 400kV powerline servitude on the west side of the stream.

5. RITUAL ACTIVITIES AT THE SITE

There is evidence of ritual activities at the site indicating that it is an active shrine. People perform night vigils and other secretive ceremonies. Staff of the Department of Geology at the University of the Witwatersrand was aware of these activities. It was a common understanding that the religious activities demonstrated a connection with extant communities and that it is a tradition inherited from the past. The place is sacred and it adds to the set of values identified which must be protected. The likely negative impacts of visitations are described in the next section.

6. STATE OF CONSERVATION

In general, the site is in a good state. The physical components of the site being solid rock, running water and vegetation on the banks of the stream, these elements do not lend themselves easily to disturbance, barring human interference. This brings into focus the impacts of the night ceremonies.

6.1. Human Activities – Night Vigil Fires

The pilgrims to the site leave behind litter – plastic paper and bottles, beverage bottles. The visitors make fires on the bedrock to warm themselves. Fire can cause the bedrock to crack, although no studies have been carried out yet to assess the impact of the fires. The granite information plaque at the site was broken into pieces in an apparent act of vandalism.



Figure 12: A fire made on bedrock close to the east bank of the river.



Figure 13: Granite information plaque that was vandalised.

7. PROPOSED MITIGATION

7.1. Fencing and Visible Policing

The proposed *Fencing* need to be considered in this context. Since the conservation and other priority areas at Two Rivers Platinum Mine are fenced off, the geological site must also be fenced. Fencing alone is not adequate. Studies at other sites have shown fencing might produce the opposite result, encouraging people break the fence and trespass. Once the area is fenced *Visible Policing* is necessary. The site will be included in the security monitoring programme.

7.2. Restoration of the Information Plaque

The real and potential threats to the site must be addressed through the *Integrated Heritage Management Plan (IHMP)* which is being updated. Restoration of the information plaque must be considered in the light of ignorance about underlying reasons for the apparent malicious damage. The best route is to engage the community leaders for a common understanding on the treatment of the heritage site. In the interim, we propose that the information plaque is placed at the turn-off to the site from the road to the Two Rivers Platinum Mine North Decline (Lat: 24°54'42.24"S Long: 30° 6'12.46"E).



Figure 14: Proposed location of a new information plaque.

7.3. Visitor Management Strategy

The proposed strategy is not imposing any restrictions to visitors but to make sure that whether they are worshipers or tourists they must take all reasonable measures to keep the site clean and to desist from activities that may result in damage to the site. When a fence has been erected access can be controlled rather than restricted.

7.4. Litter Management

The first thing is to provide facilities for responsible litter disposal, - waste bins. The Mine Waste Management programme must extend to the Heritage Site.



Figure 15: Careless disposal of waste on the east bank of the river.

7.5. Integrated Heritage Management Plan

Two Rivers Platinum Mine is adopting an Integrated Heritage Management approach. This requires a consolidated register of all heritage sites and an understanding of conservation issues (threats) and appropriate conservation measures.

8. CONCLUSIONS AND RECOMMENDATIONS

The State of Conservation Report will be uploaded to the Provincial Heritage Inventory on SAHRIS. The conservation issues identified and proposed mitigation measures must be included in the Mine's Integrated Heritage Management Plan (IHMP).

9. PHOTO CATALOGUE

9.1. Geological Features

COORDINATES	
Latitude	Longitude
	
Fig 16	View west of the channel and flanking zebra-striped beds.
	
Fig 17	View west of the channel rapid, and flanking zebra-striped beds



Fig 18 View east showing the stream disappearing under a cover of blocks of stones.



Fig 19 Another view showing the bedrock and the fault line through which the stream flows.

	
Fig 20	Another view showing the bedrock and the fault line through which the stream flows.
	
Fig 21	Stratum of chromitite (black) more that 40cm thick on the west bank of the river.



Fig 22 Another example of chromitite stratum more that 40cm thick on the west bank of the river.



Fig 23 Weathered blocks of chromitite on west bank of the river.



Fig 24 A pedestal of chromitite and anorthosite layers close to the west bank of the river.



Fig 25 A large pothole in the channel at the end north end of the site.

9.2. Archaeological Relics

COORDINATES	
Latitude: 24°54'37.10"S	Longitude: 30° 6'12.70"E
	
Fig 26	Several grinding grooves on bedrock on the west side of the channel.
	
Fig 27	Close view of the grinding grooves.



Fig 28 A large grinding groove measuring 1.80m x 90cm x 30cm deep.

9.3. Ritual Activities

COORDINATES		
Fig 29	Latitude	Longitude
		
	(a) Coins deposited on the foot of the rock close to the channel (right end of pole).	
		
	(b) Close view of sacrificial coins and snail shell.	



(c) Candle stick used during a night vigil.



(d) Fires made on stream bedrock

DES

Evidence of religious ceremonies

9.4. Conservation Issues

COORDINATES		
	Latitude	Longitude
		
Fig 30	Broken information Plaque	
		
Fig 31	A fire made on stream bedrock may cause it to crack	



Fig 32 Another view of the fireplace showing its proximity to the river channel.



Fig 33 Plastic disposal.



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<https://sahris.org.za/sites-listing> [Dwars River Geological Occurrence]

Legislation

National Heritage Resources Act (No 25 of 1999)

National Monuments Act (No 28 of 1969).

Natural and Historical Monuments, Relics and Antiques Act, (No.4 of 1934)