

# Executive Summary

## State Party

Republic of South Africa

## State, Province or Region

Mpumalanga Province

## Name of Property

Barberton Makhonjwa Mountains

## Geographical Coordinates to the Nearest Second

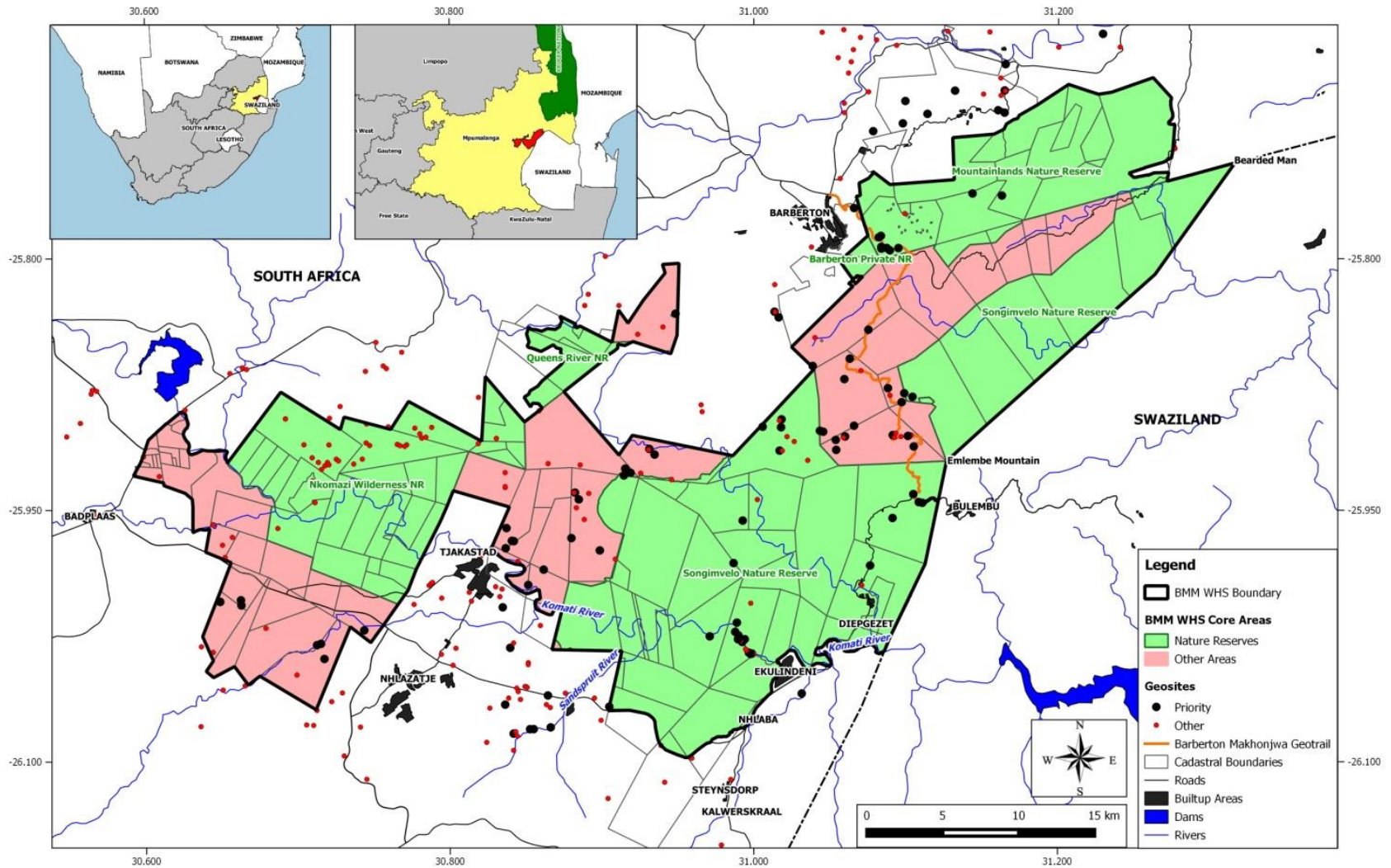
Central Point and highest peak ('Shokholwa' – 1900 m): S 25 ° 58' 26'' E31 ° 00' 50''

## Textual Description of the Boundary(ies) of the Nominated Property

Starting at the South Africa/Swaziland boundary trig beacon at Bearded Man, the boundary follows the International boundary southwest to Emlembe mountain, then southwards until it crosses the Komati River. It then follows the Komati river to the west of Ekulindeni village and then follows the Songimvelo Nature Reserve southern boundary game fence to a point on the main road where it crosses an eastern tributary of the Sandspruit River near Enkhaba village. Here it turns north along the Songimvelo Nature Reserve (NR) boundary to the main entrance gate and further west and north until it returns to the Komati River. It continues from here westwards to include the Nkomazi NR and farming land up to the R38 just north of Badplaas, then returning eastwards to include the Queens River NR and part of the southern part of Barberton NR (Mountainlands) and back to the starting point. A complete list of all boundary-defining coordinates is given in **Appendix R**.

In summary the Property includes the whole of Songimvelo and Nkomazi NRs, the Queens River NR and most of the southern portion of Barberton NR. Included are the timber growing properties that lie between these protected areas and two enclaves of communal land in the Komati Valley. Detailed maps of all boundaries are attached separately as **Appendix A**.

# THE NOMINATED PROPERTY: BARBERTON MAKHONJWA MOUNTAINS



Date created: 22 December 2016  
Map Version: Property Description

## Criteria Under Which Property is Nominated

Criterion viii.

### Draft Statement of Outstanding Universal Value

#### a. Brief Synthesis

**Summary of facts:** The Barberton Makhonjwa Mountains are referred to geologically as the Barberton Greenstone Belt (BGB). They are located in north-eastern South Africa, against the north-western border of Swaziland. This approximately 120 x 30 km stretch of rugged mountain terrain is substantially untransformed and includes a wide variety of Archaean rocks (from 3.6 to 3.25 Ga) that are highly accessible all year round. The 113 137 ha Property encompasses about 40% of the BGB, is protected by four major Nature Reserves and includes minor components of timber growing and livestock grazing lands (~15% each). Geoheritage values are identified at 300 registered geosites of which 51% (n=154) are encompassed within the Property. A 38 km motorised geotrail linking key geosites was built with illustrated information panels at lay-bys along a public road in 2014.

**Summary of values:** *The Barberton Makhonjwa Mountains contain the best-preserved, oldest and most diverse sequence of volcanic and sedimentary rocks on Earth. These well researched outcrops provide a globally unique source of information about the earliest measurable conditions of the Earth's gradually solidifying oceanic crust, from 3.5 billion years ago. From these rocks, more has been learned than from anywhere else about the surface processes at work as the Earth cooled from a molten body, to the creation of the primitive biosphere. This is the field repository for the genesis of life.*

*Protected from beneath by rising plutons of granite, and later buried by a thick layer of Transvaal sediments, this 340 million year sequence of Archaean lavas and sediments has escaped both subduction and erosion for all of that time. They provide earliest evidence of the chemical nature of our oceans and atmosphere and of the way continents are formed – all unique attributes of our planet. Their outstanding universal value lies in both their remarkable state of preservation and in the variety of sites conveniently grouped together. That they occur in attractive surroundings with a comfortable climate, easy to access by researchers and the visiting public, extends their remarkable geological heritage value. Combined, they form a growing outdoor education facility at all levels and for many aspects of our present and past environments. There are literally hundreds of geosites of interest which, when their information is combined, allow the Barberton Makhonjwa Mountains to tell a richly consistent and as yet only partly explored story of how life on Earth began.*

An inventory of all significant geosites within and associated with the BGB, has been compiled by a select group of geological scientists and researchers most familiar with the region. These data clearly show the number, distribution and variety of outcrops that have contributed so significantly to our understanding of the Archaean Eon. The project database records about 380 geosites representing the extraordinary variety of evidence available on what our planet was like three and a half billion years ago. Interpretation of most of these sites is formally recorded in more than 2 500 refereed scientific papers that have been published since the 1960s. As only about half the BGB has been thoroughly mapped by geologists, there is the potential for a similar number of new geosites to be added.

These special and spectacular features have the potential to enhance geo-heritage tourism. The findings of cutting-edge geological research, appropriately interpreted in dramatic mountainous landscapes with abundant wildlife and interesting cultural and historical features, provides an exciting and fascinating destination for visitors. The Property is a rich and inspiring outdoor education and recreation resource.

## **b. Justification for Criteria**

The Property is proposed for inscription under **Criterion VIII**, given that it contains the best, most diverse and outstanding examples of rock outcrops from the Archaean stage of Earth's history. Its rocks have revealed the earliest record of single-celled life forms as well as the earliest and most significant geomorphic features, including detailed evidence of the processes involved in the evolution of the originally oxygen-free oceans and atmosphere, and creation of the first continental landforms.

Inscription is justified because the BGB is a truly unique remnant of the ancient Earth's crust, containing among the oldest, and undoubtedly the best-preserved sequence of volcanic and sedimentary rocks on Earth. These highly accessible ancient exposures present a continuous 340 million year sequence of rocks, starting 3 600 million years ago. Their physical and chemical characteristics provide an unparalleled source of scientific information about the early Earth. The outstanding value of these rocks lies in the large number of sites and features that, when combined, provide a unique, and as yet only partially explored, scientific resource.

The outstanding universal value of these rocks is due largely to their remarkable state of preservation. They are not entirely unaltered, but large areas exist where original components are intact for most rock types in a thick Archaean sequence. Geologists and paleo-biologists have learned more about the Earth's early history from these rocks than from any other comparable site elsewhere. Since the description of komatiites in 1969 a global network of researchers in the field of Archaean geology has been steadily producing new discoveries and testing new theories concerning the Earth's early evolution. More than 2500 geological papers on the BGB have been published in refereed research journals since the 1960s. Although rocks of similar age and even slightly older are known from elsewhere, none combines the outstanding and diverse characteristics of the Barberton Greenstone Belt. For more detail see **Appendix C**.

## **c. Statement of Integrity**

The geology of the Property has not been significantly damaged by human activities and the environment is substantially in a natural untransformed state. It includes no medium to large settlements, residential, mining, or any industrial areas. The entire 113 137 ha property lies within the BGB and covers some 40% of that geological formation. Nature Reserves that are natural and largely undeveloped comprise some 68% of the Property. Of the remainder, 17% comprises timber plantations and a further 15% comprises livestock grazing on untransformed natural pastureland. These three land-use zones are sustainably managed in compliance with the country's conservation, forestry and agriculture laws. Where the geology has been disturbed historically by a few small-scale mines and minor road cuttings, the scars have re-vegetated and stabilised naturally.

The Property's boundary encloses a fully representative sample of 154 registered rock outcrops (n= 300, i.e. 51% of geosites considered for inclusion). The distribution of all geosites (**Figure 3**) and the information they convey define a landscape of the highest scientific value in terms of Earth's earliest discernable history. The variety of geological processes, evident both as chemical signatures and as more visible physical structures within the rocks are also unmatched in any comparable area (see **Section 3.2**).

Of the many outstanding geological features of the BGB, the following have contributed most prominently to scientific knowledge and understanding of the evolution of the early earth:

- Evidence of the Earth's earliest life forms, including microfossils, stromatolites, biomats and other biologically derived material.

- Evidence of the earliest continent-forming processes showing how land masses emerged from the hot and murky Archaean oceans that dominated the planet's surface, with only scattered volcanic peaks aligned as island arcs in an otherwise endless sea.
- Evidence of the earliest large meteorite impact events occurring as spherule beds of molten rock droplets from a period of intense meteorite bombardment.
- Chemical and physical evidence of the nature of the Archaean atmosphere and oceans, the oxygen-free chemical soup that supported abundant single-celled life and created vast ocean-floor deposits of chemical sediments such as banded iron formations and coastal sand deposits showing tidal intervals and the earliest moon-Earth interactions.
- The 'type-locality' of the distinctive komatiite volcanic rocks, and pillow lavas, the komatiites being the hottest lavas by far to have ever emerged on the Earth's surface.
- Volcanic lapilli embedded in chert, appearing as pea-sized 'hailstones' of accreted volcanic ash and vaporised rock, that have settled into chert sediments on the Archaean sea floor. These extensive deposits signify the presence of airborne volcanism as compared to the more common under water lava flows occurring at this time.
- Oldest migmatites at the Greenstone Belt margins, abundant exposures occur in the contact zones between the dark basaltic Archaean lavas and the plutons of lighter silica-rich granite rising beneath them. Spectacular patterns show evidence of melting and recrystallization due to intense pressures and extreme temperatures generated around the contact area.

Most Archaean lavas and sediments elsewhere in the world have been reheated or otherwise deformed (metamorphosed) in the slow but incessant movements of the Earth's outer shell. Such altered rocks no longer relate closely to the conditions at their site of origin at the Earth's surface. They therefore have substantially less value as sources of evolutionary information. This is not the case in BMM where rocks remain substantially untransformed.

The purpose of protecting these sites is to safeguard their globally significant scientific and educational values, and to provide controlled access to them by the public and by scientists and researchers. At the most accessible geosites geological information has been interpreted for the benefit of visitors as part of an ongoing educational and tourism development programme. The vision for protecting and publicizing these sites is to maximize their combined scientific and educational value for all, and through creative development of this specialized niche in the tourism market, to benefit local communities through sustainable tourism.

#### **d. Protection and Management Requirements**

It is necessary to consider all three types of land use in order to protect and manage the exceptional geological heritage of the Property. Management provisions and plans for the Property are set out in the Integrated Management Plan (IMP) in **Section 5.e** and **Appendix N**. The applicable legislation is listed, together with the norms of land management in each of the three types of land use. All land owners have been made aware that Inscription of UNESCO WHS status for their land will result in this status also being endorsed on each property's Title Deeds in perpetuity.

In summary the Nature Reserves will continue to be managed for nature conservation and tourism by their present management agencies (see **Section 5a**), each with their existing staff and budgets. The additional task of protecting and providing access to geosites will be easy for them to manage without significant increase in cost or effort. It will however, require some increased staff attention to the geosites on their

land: to their location and their potential access by the public, and to the interpretation of the stories emanating from the most significant geosites in terms of popular visitor interest.

The same applies to timber plantations and farming/ grazing land, only here there are no budgets or staff to protect geosites and manage visitor access. In these areas this task falls to the Management Agency of BMM who will achieve protection via the National Heritage Resources Act (1999) and coordinate visitor access via the individual Memoranda of Agreement signed by each land owner. All these legal and operational arrangements have already been agreed to in principle and will be formalised by negotiation with each land owner separately. The basis of any management protocols drawn up will be that each land-owner can continue to derive income from their land using existing or current land uses, save only that they must not have any negative impact on the UOVs of the Property. Detail on these matters is set out in IMP, in particular in **Section 7**.

The IMP describes the need to protect specific geosites (rock outcrops) and geological landscapes, and includes lists of what is, and what is not permitted to protect the OUVs of the Property. It also deals with visitor access and how to balance the promotion of tourism and safeguarding privacy and land-owner rights. Along with the relatively straight forward management tasks to protect rocks, the IMP also deals with monitoring needs, both of geosites and of visitors, and with more technical matters of the interpretative needs at geosites and their educational value, both to visitors and to local community members. Marketing the OUVs of the Property is also dealt with, as is the role of scientific advisors in having technical oversight for all scientific/ geological aspects of the Property. Finally the IMP lists staffing requirements with an indicative budget and future development priorities.

The National Heritage Resources Act (1999) is the appropriate legislation for geosite protection on non-Protected Area land. Its implementing agency, South African Heritage Resources Agency (SAHRA), has approved the protection of the geosites and is in the process of registering these as described in **Section 1.e**, under 'Buffer Zones'. In recognition of the socio-economic circumstances of the region SAHRA has proposed an efficient and innovative way of legally defining these National Heritage Sites. In addition, this buffering mechanism for geosites outside PAs, will be registered on the Integrated Development Plan (IDP) and Spatial Development Framework (SDF) required by all Local Municipalities, thereby ensuring that all developments registered within their jurisdiction will be formally assessed to further protect such locations in terms of environmental and heritage impact regulations applied on a municipal level.

#### **e. Long Term Challenges for the Property**

Geoheritage protection and its resultant geotourism are new and untested concepts in South Africa. They are being developed without the benefit of tailor-made legislation, nor any appropriate institutional home save for being regarded as part of nature conservation in general and vesting with the well mandated and reasonably resourced conservation agencies for which conservation legislation amply provides. In the light of these special circumstances, the long term challenges for the Property include:

- a) To develop geotourism as a growing and sustainable form of land use;
- b) To develop the expertise to provide the interpretative interface between the geoheritage resource and the visitor.

#### **Name and Contact Information of Official Local Institution/Agency**

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