

## **MANAGEMENT, MONITORING AND EVALUATION OF THE CRADLE OF HUMANKIND FOSSIL SITES**



**UPDATED FOSSIL SITE MANAGEMENT PLAN  
FOR**

**MINNAAR'S SITE**

**2009 - 2013**



**REVISED DRAFT**  
**UPDATED SITE MANAGEMENT PLAN**  
**MINNAAR'S SITE**

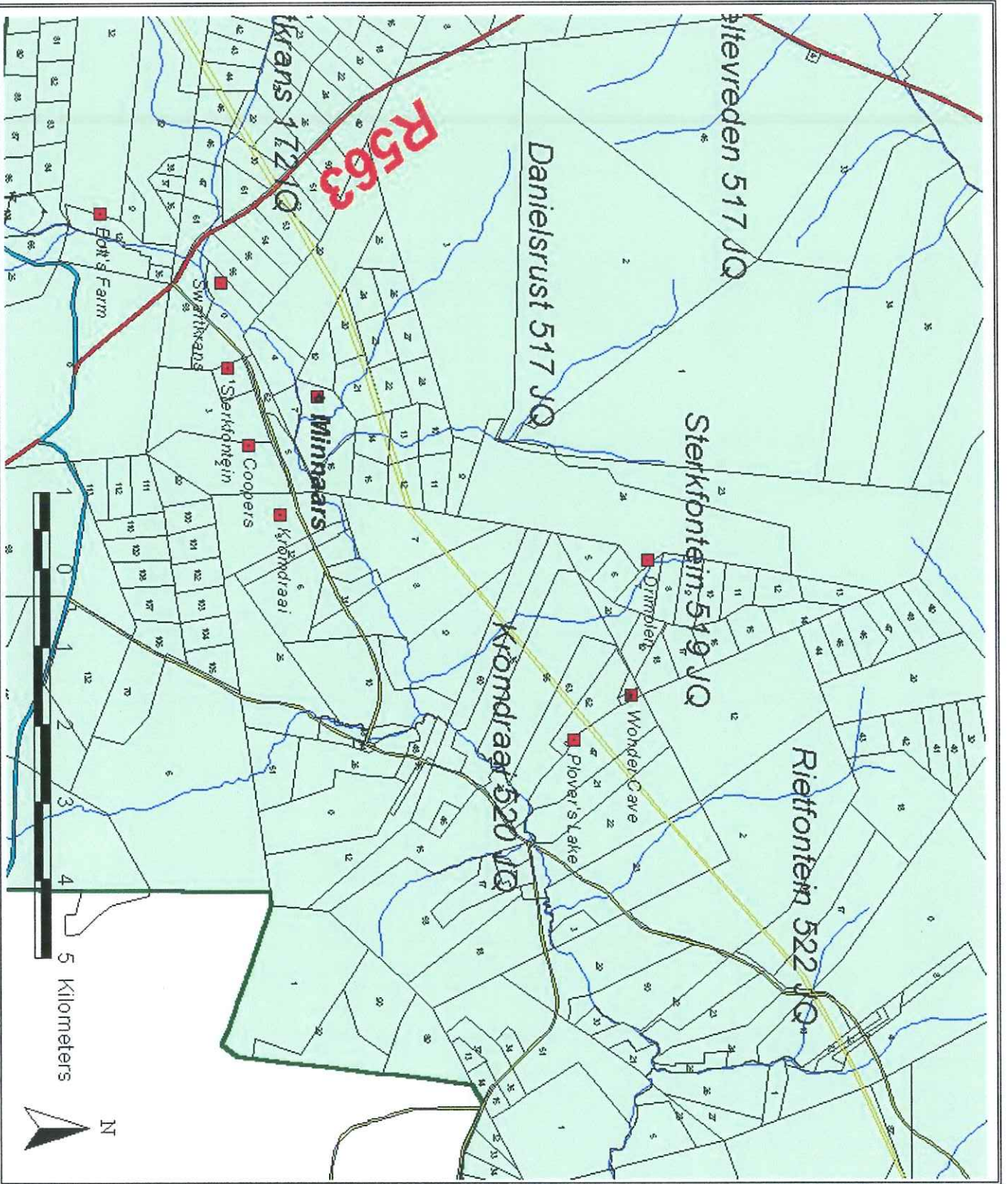
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## **SUMMARY OF KEY ISSUES**

- At 8592 sq m., the site is the smallest of all the fossil sites in the Cradle of Humankind
- The site has a proven record of fossil occurrences but there has been no systematic exploration of its breccias thus far
- The scientific potential of the site is unproven
- The site is close to Cooper's, Kromdraai and the two 'big' fossil sites of Sterkfontein and Swartkrans and would offer the potential of being linked in a hiking trail should that possibility ever arise
- The landform providing an eminence on the west offers an excellent view of all the main sites in the Blaauwbank valley
- The fact that the site is close to an access road and is unfenced means that it is vulnerable to unauthorized entry, and dumping of litter in the sinkholes appears to be a problem
- There are significant infestations of alien plant species and animal traps have several times been observed
- On the whole, the site has little to offer the average tourist, except for dramatic examples of open avens, and the view.



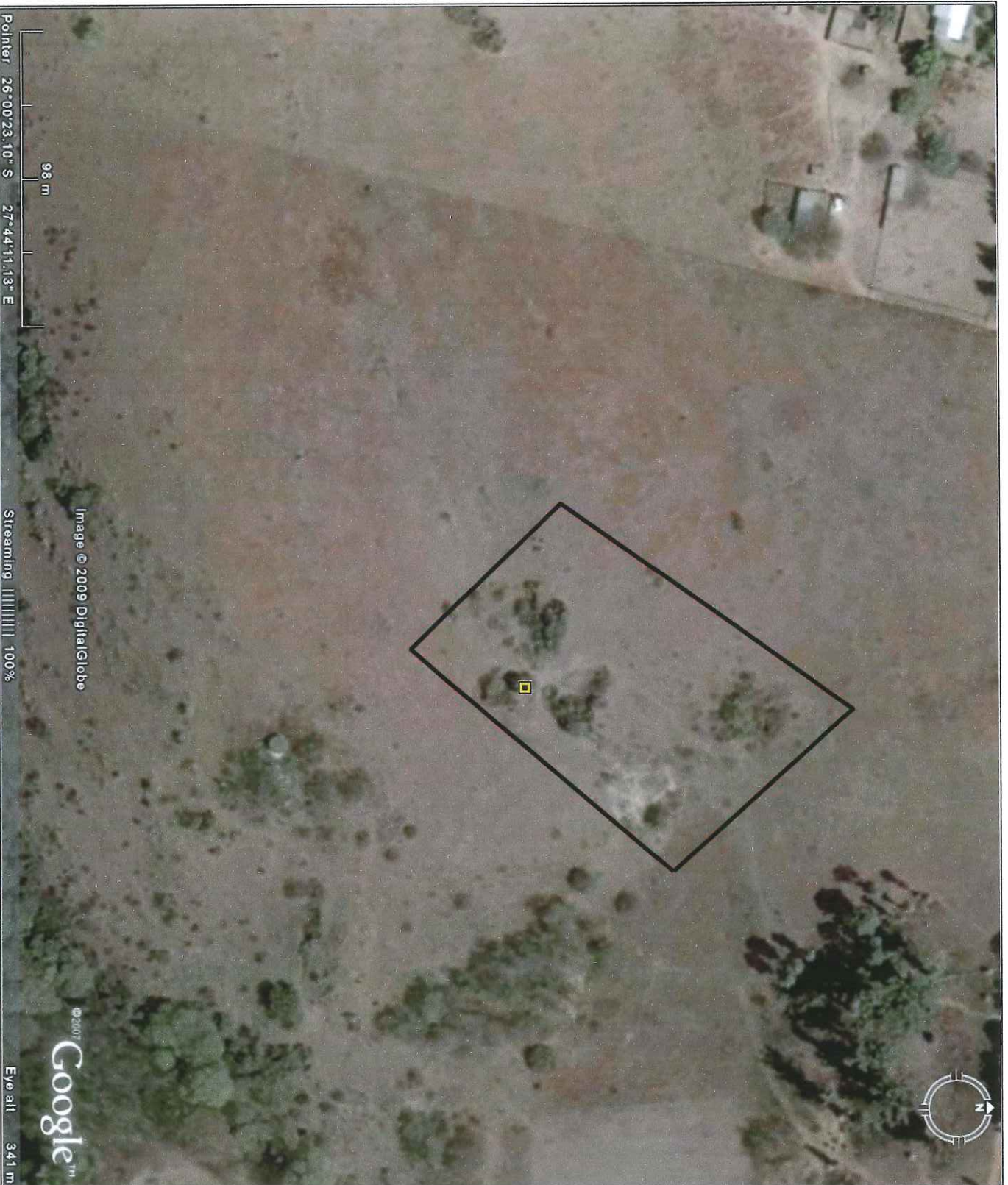
**MINNAAR'S SITE  
MANAGEMENT  
PLAN**

**Legend**

- Fossil sites
- Arterial Road
- National Road
- Secondary Road
- Farm boundaries
- River
- World Heritage Site

**MINNAAR'S**


**Figure 1**  
Locality map



**MINNNAAR'S SITE  
MANAGEMENT  
PLAN**

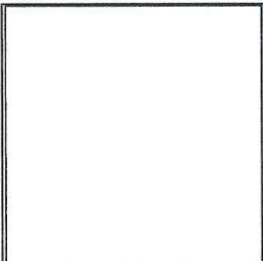
**Legend**

**N**  
approximate  
position of  
site boundary

 palaeontological  
site

**MINNNAAR'S**

Figure 2  
Aerial view  
of site



PROCLAMATION DIAGRAM

REGISTRATION COPY

SIDES metres		ANGLES OF DIRECTION	CO-ORDINATES		
			Y	System: WG.27°	X
			Constants	+0, 00	+2 800 000, 00
A B	80, 68	320.15.50	A	-73 768, 46	+77 644, 26
B C	114, 23	43.10.10	B	-73 820, 04	+77 706, 30
C D	69, 12	138.27.10	C	-73 741, 89	+77 789, 61
D A	118, 36	217.43.20	D	-73 696, 05	+77 737, 88

SG No.  
2297/2004

Approved

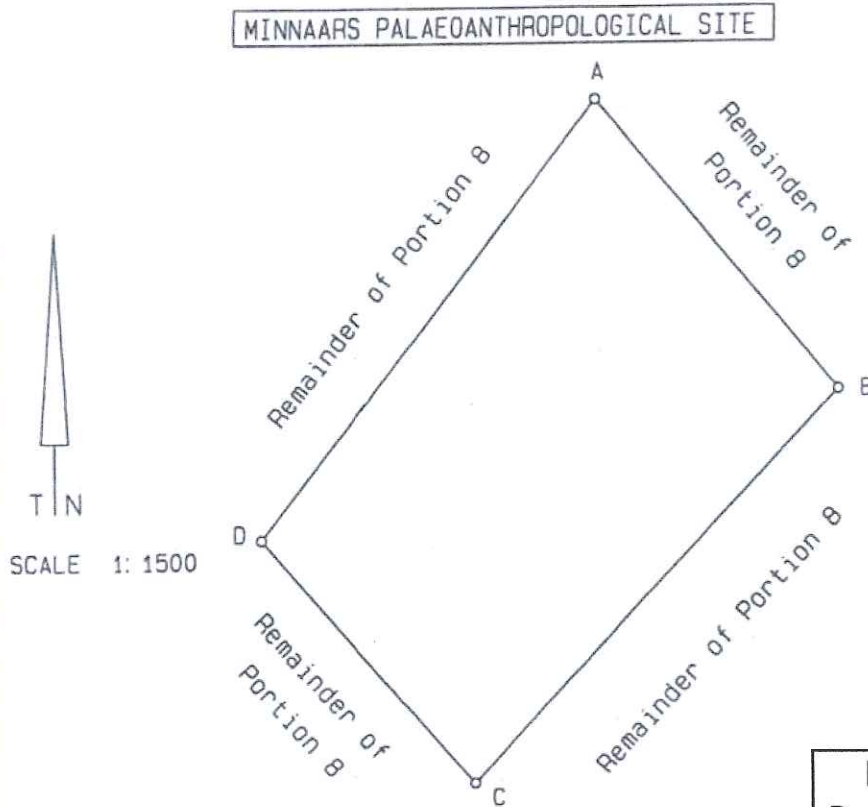
*J.S. Weyers*  
J.S. WEYERS

for  
SURVEYOR-  
GENERAL

2004-04-16

TRIGONOMETRICAL BEACONS		
STERKFORTEIN B	84 Δ	-75 558, 23   +74 089, 49
KRUG 117	412 Δ	-69 559, 89   +81 488, 68

BEACON DESCRIPTIONS  
A, B, C, D .. 20mm iron peg



**Figure 3**  
Proclamation  
diagram

The figure A B C D A represents 8592 square metres of land being a declared area over the Remainder of Portion B of the farm DANIELSRUST No. 518-JQ Province of Gauteng

Framed for National Heritage Site declaration purposes in terms of the National Heritage Resources Act No 25 of 1999

Surveyed in January 2004

by me P.H. KOHRS  
Professional Land Surveyor PLS0314

This diagram is annexed to No. d.d. i.f.o.  PTA Registrar of deeds	The original diagram is No. A 6948/1969 Transfer No. T25870/1975 Grant C.C.T.	File -/4 S.R. No. 922/2004 T.P. Comp. IQND - 2
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# 1 INTRODUCTION

The Minnaar's Site is a little-known site on the north bank of the Blaauwbank River between Sterkfontein and Kromdraai, about 3kms from the latter. The site is north-east facing, but looking south, across the Sterkfontein tar road, the green workers' huts at Kromdraai and the position of Cooper's site can be seen.

## 1.1 Objectives

- To preserve the full range of natural and cultural heritage values, the site significance and authenticity of the Minnaar's fossil site
- To identify and understand the issues that threaten site significance and to provide management measures and monitoring to address them
- To balance opportunities for research, education and tourism without compromising the integrity of the site or the aspirations of the landowner, and considering the needs of residents on site
- To recommend appropriate infrastructure and management strategies to achieve the above goals
- To preserve as much as possible of site context and sense of place in an area that is subject to unprecedented development. Minnaar's is an interesting hillside property with a number of collapsing caves and sinkholes, which were exploited for lime in the early part of the last century.
- To foster and maintain communication links between management bodies, landowners and researchers as partners in management and conservation of the fossil site.

## 1.2 Method

- Consultation with landowners, researchers, repository institutions and support institutions to reveal concerns, contentious issues, requirements and future plans
- Research and understand the full range of natural, cultural, scientific, educational and ecological values of the site. Collation of information gained from a series of fossil site inspections has been incorporated.
- Provide an updated list of site values
- Refresh statement of site significance, in consultation with scientists
- Provide an illustrated status quo report against which change can be assessed
- Update the list of risks and threats
- Identify desired states and suggest management strategies to achieve these
- Provide a new management table with management strategies backed, where possible, by operational guidelines for use in the field
- Monitor and evaluate progress at each fossil site inspection, review management strategies where necessary

## 1.3 Administrative information and legal status

<b>Site:</b>	Minnaar's (Figs. 1, 2)
<b>Farm Name &amp; No.:</b>	Portion 8 of Danielsrust 518- JQ
<b>Owner:</b>	Mr A van Rooy
<b>Contact Details:</b>	P O Box 156, Krugersdorp, 1740 011 953 5006, fax 011 953 4884
<b>Legal Status:</b>	National Heritage Site, November 2004; World Heritage Site 1999
<b>Boundaries:</b>	A rough rectangle, A.B.C.D marked with 20mm iron pegs and



	enclosing 8592 sq metres.
<b>Co-ordinates:</b>	26.00.38,7 S; 27.44.20,1 E, see proclamation diagram Fig. 3
<b>Altitude:</b>	1540m asl
<b>Area:</b>	8592 sq metres
<b>Permit Holder:</b>	No permit holder
<b>Access to Public:</b>	Not open

#### 1.4 Existing site management

- There is little in the way of actual hands-on site management taking place at present.
- There are several management functions that are normally the domain of the landowner, such as rangeland management, fire and erosion management and clearance of alien vegetation and monitoring for traps.
- There is no perimeter fence around the heritage site and no fence around the boundary of the host property adjacent to the access road to the site. Unauthorized persons can and do enter. The unauthorized access could pose a threat to fossiliferous breccia lying around as well as to any fossils exposed in the excavation walls.
- There is no sanctioned access to the general public, and few people know of the existence or whereabouts of this site except for the caving fraternity. However, there is evidence that unauthorized visitation is occurring.
- The high level of infestation with *Pyracantha*, *Opuntia* and other invasive alien species suggests that alien vegetation is not controlled. The subterranean caves are almost impenetrable because of *Pyracantha* and *Opuntia*. The old kiln is choked with *Pyracantha*, and vegetation, both indigenous and invasive, is slowly destroying the kilns.
- Uncontrolled fires sweep through the site on an almost annual basis
- A SAHRA Permit Committee member inspects the excavation site and any ongoing excavations on a bi-annual basis, particularly with a view to assessing compliance with terms and conditions of the permit. At the moment, there is no active excavation (July 2008).
- The site inspection team, including COH WHS MA, SAHRA and GDACE officials, plus a contracted specialist service provider, inspects the entire site on a bi-annual basis, monitoring the management criteria noted in the generic site management plan (see Table 1, generic management plan) and particularly the monitoring criteria in Table 1 of this document. Inspections are carried out regardless of whether or not there is an active excavation in progress.
- The COH WHS MA monitors development within the surrounding COH WHS properties with a view to protecting heritage values such as sense of place and visual aesthetics.
- A site safety inspection has been provided for. This is meant to take place on an annual basis. The subterranean environment at Minnaar's may be unstable and dangerous. The cave was probably made even more unsafe by blasting operations in the quest for travertine by lime miners. However, the subterranean part of the cave is not at present being excavated and for safety reasons should be off-limits to any site visitors.
- GDACE is available for advice to landowners regarding erosion control, fire management, alien vegetation and weed clearance, and preservation of biodiversity. The Minnaar's site, like many fossil sites in the COH WHS, is infested with invasive species, notably *Opuntia* and *Pyracantha*.
- The landowner and surrounding landowners burn firebreaks from time to time, but uncontrolled fires often occur.
- The Heritage Agreement and appended MOU between landowners and permitted scientists who may wish to work on site, addresses issues of mutual management

concern and is an important management tool. The terms of the SAHRA permit require that such an agreement be implemented.

## **2 SITE VALUES AND SIGNIFICANCE**

The fossil site management plan adopts a values-based approach and seeks to ensure that the many and various values of the site are conserved. Site values extend beyond those formally recognized as being of 'universal value' and this section seeks to provide an updated list of old, new and previously unrecorded or unrecognized values (2.2). Section 2.3 provides an updated statement of site significance which was prepared in consultation with permitted scientists working on site.

### **2.1 General site description**

The site comprises a series of dolomitic caves and sinkholes which were exploited for calcite in the early part of the last century. The lime workers exposed deposits of fossiliferous breccias during the course of their mining activities, and from these, fossils were collected in the 1930s and 1940s by Dr Robert Broom, who described an extinct form of jackal amongst other fossil material. No hominin remains have yet been recovered from the site, but the fossil fauna suggests that the deposits are of an equivalent age to the deposits elsewhere in the COH WHS.

Although the scientific significance of the site is as yet unproven, there is therefore good reason to suppose that the fossiliferous breccias exposed at the site will be just as valuable as those elsewhere in the Cradle of Humankind.

The site was named by Dr Broom after Mr. Abraham de Villiers who lived on the farm in the 1930s when active lime-mining disclosed the fossils that were studied by Dr Broom.

The fossil locality comprises four inter-leading caverns and a series of excavation pits. The caverns have been mapped by cavers. The entrance fissure to the uppermost cave has been bricked up to provide the support for an interesting lime-burning kiln. At the bottom end of the site is a loading area with a flattened substrate of calcined lime. From here the wagons would have removed lime for sale in Johannesburg and Krugersdorp.

Just across a shallow drainage line at the lower end of the site is a small but well-filled informal graveyard. This is probably just outside the gazetted area of the fossil site but nevertheless, care should be taken to avoid the graveyard (which is still tended, with graves dating to the 1920s) should any development in the area be contemplated.

### **2.2 Site values**

Certain values, particularly the World Heritage Values are well documented but others have not been sufficiently recognized until now. Six sets of values have been identified: landscape values, palaeontological and archaeological values, mining and historical values, research values, biodiversity and ecological values and finally, educational and tourism values. The relative importance of these values differ – there are several that have allowed for World Heritage Status and National Heritage Site status while others are of a more regional or local value.

### 2.2.1 Landscape: Geological and geomorphological values

- Nearby outcrops preserve good specimens of stromatolites, mainly biscuit forms. There are ripple marks and interesting surface-weathered dolomite outcrops with chert bands, and layers of oolites.
- The geology, mode of origin and sedimentation within dolomitic caves can be well demonstrated on this site. The sequence of formation, fill, collapse and weathering can also be shown
- Bone accumulating agents can be realistically discussed and some of these agents, notably porcupines and owls, are still present on site.
- There are excellent view from the crest of the landform to the west of the site, and across the valley, the Kromdraai and Cooper's sites can be seen. Westwards, there is a view back towards Sterkfontein and Swartkrans.

### 2.2.2 Palaeontological and archaeological values

- The site has value in that the fossils indicate an age in keeping with the other COH fossil sites, and the possibility certainly exists to find additional fossil material including hominins and artefacts.
- The site has yielded the remains of an extinct species of jackal

### 2.2.3 Mining and historical values

- There is evidence of mining in the form of abandoned blocks of calcite, calcite chips, small dumps of breccia, and prospecting excavations
- There are the remains of an old lime-burning kiln but this is falling into disrepair mainly because of disruption by plant roots.
- There is a loading area at the lower end of the workings which is paved with calcined lime.
- There is a thin scatter of occupational debris, mainly in the form of metal artefacts

### 2.2.4 Research values

- Fossils recovered so far indicate an age similar to that of other fossiliferous sites in the cradle of Humankind and therefore there is potential research value on a par with any of the other sites. Potential only becomes realised with intensive scientific investigation and the discovery of fossils.

### 2.2.5 Biodiversity and ecological values

Due to its small size, there is no particular ecological value that can be attached to the fossil site as opposed to the greater area in which it falls. A task of the broader management of the COH WHS will be to develop a better understanding of all the ecological values of the fossil sites.

- The site is very small, only 8592 sq.m. and there is no particular ecological importance that can be attached to the site per se, as opposed to the setting in which it occurs.
- The sheltered environments of the sinkhole entrances provide microhabitats for a number of medicinal and toxic species, notably *Scadoxus* and *Boophane* (Figs. 4 and 5)
- There are a number of interesting edible, medicinal and toxic species elsewhere on the site
- Owls have been disturbed from roosts within cave entrances

- Porcupines are still present
- Small game are still reported from time to time
- Because there has been no field studies of any kind, the biological values of the site are as yet poorly understood



*Fig 4: Boophane disticha or gifbol, an important medicinal plant, growing at Minnaar's Site*



*Fig 5: Scadoxus puniceus, a medicinal plant used for coughs, growing at Minnaar's Site*

### **2.2.6 Educational, tourism and economic values**

- There is low tourism value to the site except in that it could easily linked to other nearby fossil sites and in this way add value to a tourist experience.

- The educational values are not outstanding, however, and these are diminished by the fact that there is no active dig on site at present, a situation which may of course change in future.
- There is little at this site that cannot be demonstrated equally well at Cooper's or Sterkfontein.
- There are few opportunities for this site apart from a tantalizing scientific potential, and the possibility of finding further extinct species of mammal and perhaps hominin fossils. Given the fact that there are many sites with greater opportunities which are more visually attractive, it is unlikely that Minnaar's Site will offer much for tourism, except for special interest tours for visiting academics, and as an add-on site in a hiking route that includes the nearby more significant sites of Kromdraai, Coopers and Sterkfontein.

### **2.3 Original statement of site significance (J Deacon, 2002)**

In the absence of an updated statement of site significance (there has not been any active scientific work at this site), the original statement is provided, as submitted in support of National Heritage Site Status:

*"The fossil site known as Minnaars is a potentially important component of the Cradle of Humankind although no hominins have been found there as yet. Fossils discovered during lime mining in the 1930s include a small extinct jackal, *Thos antiquus*, which indicates that the deposits are in the same time range as those at Sterkfontein, Kromdraai, Coopers and Swartkrans.*

*It was recommended by ICOMOS in 1999 that the fossil sites in the Cradle of Humankind be declared a World Heritage Site because they "contain an exceptionally large and scientifically significant group of sites which throw light on the earliest ancestors of humankind. They constitute a vast reserve of scientific information, the potential of which is enormous."*

*In terms of the criteria set out in Section 3(3) of the National Heritage Resources Act (Act No. 25 of 1999), and specified for Grade I national heritage resources in the draft SAHRA Regulations on Grading System and Heritage Resources Assessment Criteria, Minnaars qualifies for national heritage status because of its:*

- Importance in the pattern of South Africa's history.*** Minnaars has the potential to contribute to the significance of fossils found in the Cradle of Humankind.
- Possession of uncommon, rare or endangered aspects of South Africa's natural or cultural heritage.*** An extinct jackal was found amongst the fossils at Minnaars by Robert Broom.
- Potential to yield information that will contribute to an understanding of South Africa's natural or cultural heritage.*** The finds made so far indicate that the deposits are of similar age to sites with hominins in the Cradle of Humankind.
- Importance in demonstrating the principal characteristics of a particular class of South Africa's natural or cultural places or objects.*** The full potential of Minnaars has not been reached and its characteristics are not yet known.
- Importance in exhibiting particular aesthetic characteristics valued by a community or cultural group.*** The aesthetic qualities of Minnaars have not been established.
- Importance in demonstrating a high degree of creative or technical achievement at a particular period.*** No stone or bone tools have been found at Minnaars.
- Strong or special association with a particular community or cultural group for social, cultural or spiritual reasons.*** Minnaars is important to all South Africans who are interested in the history of our species and the way in which fossil deposits are formed.

- (h) **Strong or special association with the life or work of a person, group or organisation of importance in the history of South Africa.** No special association has yet been established.
- (i) **Significance relating to the history of slavery in South Africa.** The age of the deposits at Minnaars places it well before the time period of slavery in South Africa." (J Deacon, 2002)

### **3 SITE ANALYSIS: STATUS QUO, THREATS AND RISKS, JULY 2008**

In order to provide a basis against which change can be assessed, a status quo report is necessary. Ideally, change is assessed by means of comparison of 'fixed point photography' and such fixed points are in the process of being selected and installed. For the purposes of the status quo report for this site, fixed point photography is almost unnecessary at the present time: there is no active work on site and little changes from year to year. The only exception is the alien vegetation, which occurs in some heavy infestations and fixed point monitoring will be set up to assess changes to the situation.

In order to assess the management strategies that may be necessary in order to preserve site values, threats and risks to site values have been analysed as part of the status quo, and the next section (Section 4) describes desired states and management outcomes.

#### **3.1 Physical Environment: Surface**

This section addresses the status quo of seven elements of the physical environment, namely physical and legal access to the property, rangeland or veld condition, erosion, fire management, rare plants and animals, alien invasive species and visual aesthetics.

##### **3.1.1 Access**

Status quo:

- Visits to the site are by appointment only.
- There is no control on physical access to the site – anyone may walk in as there is no fence
- Access to the site is via a farm track which branches off from the Sterkfontein tar road at a point opposite the eastern extremity of that site.
- Visitors park their cars on the side of the track and walk across country to reach the site about 250m away

Risks and threats:

- Risk that exposed fossils may be removed
- Sinkholes have been used as a convenient dumping site

##### **3.1.2 Rangeland**

Status quo:

- Minnaar's is situated in a patch of Highveld grassland which shows signs of having been overgrazed at some stage, and which appears to suffer uncontrolled burns on an almost annual basis. The soils are shallow in places as indicated by the presence of

'bobbejaanstert' (*Xerophyta* formerly *Vellozia retinervis*), which has a preference for seasonally waterlogged soils. There are also many species of *Hypoxis* which have tuberous rootstocks and many of which are eagerly sought after as a source of food. They have a preference for rocky deeper soils and their yellow flowers are conspicuous after burns. They are also the favoured food of many species of animal such as warthogs, porcupines and baboons, as well as humans. The relatively high incidence of the aloe *A. greatheqadii var. davyana*, which often forms dense stands in overgrazed areas of grassland, indicates that the veld is or has been overgrazed in the past.

- The grassland is species- rich and over 500 species are known to occur in this part of the Highveld (Mogg 1975). Many of these are important plants because they are edible (like *Hypoxis*, *Grewia*, *Brachystelma*), medicinal (like *Scadoxus* and *Boophane* – Figs 4 and 5) or toxic (like *Boweia*, the arrow poison), but there is as yet no record of plant species and of where significant plants are located on the landscape. Many species are the target of traditional medicine users and impacts on their numbers through harvesting cannot be assessed without a field survey. It is one of the outstanding pieces of research work in the COH WHS generally.
- The ecological values of the rangeland and contextual area around Minnaar's Site are as yet poorly understood

Risks and Threats:

- Biological values of the site poorly or at best incompletely understood
- No means of assessing impacts of fire and plant utilization

### 3.1.3 Erosion

Status quo:

- There are no man-made interventions on the site which are causing or exacerbating erosion
- Erosion is not a problem at present and needs no fixed point photographic monitoring

Risks and threats:

- None at present

### 3.1.4 Fire management

Status quo:

- Fire management is a landowner responsibility
- There are many informal settlements and the cottages of farm workers nearby. Uncontrolled fires escaping from domestic heating and cooking fires is an ongoing problem. Fires also start along adjacent roads and spread rapidly over the grassland. Because there is no sustained grazing of the Minnaar's site, there is usually considerable fuel build-up and fires sweep through the site regularly.
- Repeated and over-frequent burning causes rangeland deterioration, and the loss of fire-sensitive species
- The heritage assets are not at risk from fire, but its prevalence places restrictions on the sort of structures that can be contemplated, should development of the site ever reach that stage.

Risks and Threats:

- No framework for assessing the impact of fire as yet exists. This is a generic issue relevant to the whole of the COH WHS.

- Uncontrolled fires entering the property from outside continue to pose a threat to property and rangeland.

### 3.1.5 Red Data Species, rare plants and animals

#### Status quo:

- Many rare species of plant and animal are not on the Red Data list. The rare bat species *Miniopterus natalensis* is known to occur at Minnaar's.
- There are no plant or animal checklists and little can be said concerning rare and endangered plants and animals
- See "Rangeland" at 3.1.2 above

#### Risks and threats:

- There is no up-to-date list or mapping of vegetation – over 500 species are known to occur in the Sterkfontein area (Mogg 1975) in this type of Highveld grassland. Rare and endangered species cannot be protected if not located and mapped.
- Edible, medicinal and toxic plant species not recorded – full values of site not clearly understood

### 3.1.6 Alien vegetation

#### Status quo:

- Almost without exception, the avens, sinkholes, pits and cave entrance areas are thickly choked with alien species. The open grassland is not good tree habitat because of frequent fires which destroys young saplings when they are still tender, and heavy winter frosts and cold winds which kill young plants. The fire and frost-protected habitat within sinkholes and at the entrances to avens and caves allows trees to grow, the commonest of the large trees being the white stinkwood, *Celtis africana*. However, this same habitat is favoured by alien invasive species and in particular, *Pyracantha*, the fire-thorn. It is a declared invader, with a 'transformer' invasive status. This plant has robust stiff spiny stems and branches and forms impenetrable thickets. This prevents access and impedes visibility. Clearance and prevention of re-infestation is a long-term management challenge. The seeds are poisonous to humans, and the pricks from the spines cause an irritating burning sensation, hence the name 'fire-thorn'. *Opuntia*, which is mainly baboon and human spread, is also problematic.
- There are numerous other declared weeds and invasive species but at the time of reporting, no list of species has yet been drawn up, either for this or any other of the COH WHS.
- Infestations have not been plotted and mapped, nor have they been prioritized for clearance. Clearance is a landowner responsibility.
- At the time of reporting, no wider plan to contain or eradicate invasive species from the COH WHS has yet been devised
- GDACE is available for technical advice on clearance of invasive species

#### Risks and Threats:

- There is no list of invasive alien species present, or of weeds present on the site.
- Occurrence and density of invasive alien species has not been mapped or prioritized, making management and control difficult
- There is no agreed plan of management or budget for the control and/or clearance of invasive species within the fossil site



- Field operational guidelines for appropriate eradication treatments for different species of invasive species are not yet available
- There is no comprehensive or integrated action plan to address the problem of invasives within the broader COH WHS – re-infestation from outside sources is a problem

### **3.1.7 Visual aesthetics, site context**

#### **Status quo:**

- The site is pleasantly situated on an undeveloped east-facing grassy slope on the north bank of the Blaauwbank River. There are good views across the valley towards Cooper's Site and Kromdraai (Fig 6) and, if one climbs to the top of the nearby hill, eastwards towards Swartkrans and Sterkfontein.
- The COH WHS MA scrutinizes and monitors all new development in the cradle in the attempt to curb inappropriate development and visually intrusive structures without encroaching on the landowners' rights. However, this is an ongoing battle as relentless development mushrooms and infill buildings increase each year.
- Presently the scale of development is unnoticeable in the landscape and the natural groupings of indigenous trees provide opportunities to conceal small scale developments in that vicinity.
- There are no derelict structures or redundant infrastructure which require removal from the Minnaar's site

#### **Risks and threats:**

- Development within the viewshed has the potential to destroy or impair 'sense of place'.



Fig 6: View, looking south, across the Blaauwbank Valley towards Kromdraai and Coopers. The green huts at Kromdraai can be seen on the left, in the middle distance, above the cypress trees.

### **3.2 Physical Environment: Subterranean**

Status quo;

- There are several subterranean caves but these are only frequented by the caving fraternity at this stage. The caves *per se* are not of interest to the researchers at present
- There are no excavations in subterranean situations at present
- Cave environments are not being disturbed by researchers and there are no impacts from this quarter
- Site safety of the subterranean environments is not a management issue at present

Threats and risks:

- Use of subterranean environments by feral domestic animals such as cats and dogs (especially females with litters) is an increasing problem in the area generally
- The subterranean environments make convenient dumping grounds

### **3.3 Infrastructure**

#### **3.3.1 Access roads, culverts, bridges, etc.**

Status quo:

- The existing access road that gives access to the site is also an access road to private residents north-west of the Minnaar's Site. It is a branch road giving off the Sterkfontein Tar road, at a point almost opposite the eastern extremity of the latter site
- The road crosses the Blaauwbank River as well as a small drainage line north of this. It is important that this drainage line is maintained in its free flow and not obstructed by inefficient river crossings by the road. The maintenance of any culvert under the road at this crossing is important.

**Risks and threats:**

- None on the site itself at present

### **3.3.2 Fencing and gates**

**Status quo:**

- The fossil site property is not adequately fenced and unauthorized access is possible and in fact takes place as attested by fresh litter left on site
- There is no gate or boom
- The fossil sites themselves are not fenced but are not attractive to local passers-by
- The sinkholes have been used to dump rubbish
- The sites are open to all who chose to come that way
- There are no close neighbours who could provide an element of surveillance
- A perimeter fence around the fossil sites would have to enclose a small area of 8592 sq m., a length of some 482 metres of fencing.

**Risks and threats:**

- Unauthorized visitation could place exposed fossils at risk and littering of sinkholes has occurred

### **3.3.3 Parking**

**Status quo:**

- Visitors have to leave their cars parked at the side of the farm track and walk about 250 m across country to reach the site
- There is no formally defined car park and turning cars is problematic.

**Risks and threats:**

- None at present

### **3.3.4 Built environment**

**Status quo:**

- There is no built environment of any kind at Minnaar's Site
- There is no signage, either the site plaque providing recognition of its World or National Heritage Site Status or signage related to site interpretation.
- There are no formal pathways
- The site has been left as is since the lime workers left

- The erection of a site plaque commemorating the status of the site needs to be further debated – is such a plaque necessary or desirable?

Risks and Threats:

- None at present

### **3.3.5 Waste Management**

Not an issue at present

### **3.3.6 Energy**

There is no energy supply to the site

### **3.3.7 Water**

There is no water supply to the site

### **3.3.8 Telecommunications**

Cellphone reception only

## **3.4 Research Environment**

There are no permitted scientists working on site at present. There is thus no research environment to inspect and monitor.

### **3.4.1 Previous and ongoing research and excavations**

Status quo:

The site was briefly explored by Dr Robert Broom in the 1930's when the first fossils from the site were collected. The site has not been actively worked since then and no exploration or excavation is being carried out at the site at present.

Risks and Threats:

- None at present

### **3.5 Site safety and security**

Site Safety and security needs to be considered from a number of perspectives: Firstly, the physical stability of the valuable site fabric itself, and then from the perspective that site stability (or instability) impacts on the safety of researchers and those visiting the site. The safety of surface features, infrastructure and the special safety risks of subterranean environments all need special consideration.

Site Stability is affected by two different threat sources: Firstly, by natural causes which include the ongoing weathering and decalcifying processes, and secondly from man-made influences such as the alteration of surface drainage and poor excavation techniques, or by mining activities which create unstable voids, and blasting, which shatters rock and created fractures. However, it

is only by the inherently destructive twin processes of mining and excavation that site significance was or can be realised.

Site security refers to man-made threats to personal and property safety, such as crime.

### **3.5.1 Physical safety**

Status quo:

- Ever since the attack and assault of an excavator at Swartkrans nearby, personal safety cannot be taken for granted and surveillance is necessary. There are, however, no management steps that can be taken to prevent crime on this site.
- The site and road is isolated and parked cars and lone workers are vulnerable

Risks and threats;

- Personal safety could become a factor, as it is everywhere in the province

### **3.5.2 Safety of surface and built environment**

Not applicable at this stage

### **3.5.3 Safety of excavation area**

Not applicable

### **3.5.4 Subterranean safety**

Status quo:

The extensive subterranean environment should be defined as a no –go area for site visitors and researchers. The sinkhole entrances are not negotiable without ropes and caving equipment.

Risks and threats:

- Subterranean safety is not a management factor at present

## **3.6 Presentation of site values**

The presentation of site values to a wider public and the organization of educational programmes is a requirement of the WHC. Giving heritage a meaning in the lives of the general population and resident communities is a requirement of the NHRA.

### **3.6.1 Site interpretation**

Status quo:

- The site is not open to the general public
- As one of the smaller and less attractive sites, Minnaar's is little visited, even by the scientific fraternity.
- There is no site interpretation either on site or off.

Risks and threats:

- Lack of presentation of site values to a wider audience prevents information concerning site significance from reaching public psyche
- Potential funders might not know about site significance
- Public not educated about full range of COH WHS values

### 3.6.2 Visitor numbers

Status quo:

- There is no formal mechanism for recording visitor numbers and the annual number is unknown.

Risks and threats:

- None at present - formal visitation is negligible

## 4 MANAGEMENT OBJECTIVES; DESIRED OUTCOMES

This section notes desired states and management outcomes, and the section and Table that follow (Section 5) describe the management strategies required to achieve such outcomes. The management objectives have the preservation of all site values as a goal.

### 4.1 Physical environment, surface

Desired management outcomes include the following:

*Rangeland:*

- To ensure that contextual veld conditions and rangeland in immediate vicinity of fossil site is maintained in as good a condition as possible.

*Erosion:*

- To ensure that the fossil site and its environs are free from active erosional problems and that existing areas of erosion are analysed, remedied, rehabilitated and monitored for follow-up action if necessary

*Fire management:*

- To ensure that a proper fire regime appropriate to Bankenveld is maintained on the fossil site.
- To ensure that fossil site users (when the site is active) are aware of fire hazards and can control on-site fires.
- To ensure that the fossil site does not constitute a fire hazard and that activities taking place there do not create fire hazards
- To ensure that the basic data necessary to assess the long-term impact of frequent fires is available, which information is necessary to feed back into appropriate fire management

*Biodiversity, rare plants and animals:*

- To ensure that a database of plant and animal species present on site is available, because biological values are as yet poorly understood
- To assess which of these are target species for use as food, medicines, economic reasons, etc., and to what extent they are being collected
- To identify, record and map special species in order to ensure their protection

*Alien vegetation:*

- Desired outcome is a fossil site which is free from alien invasive species, and, as far as possible, from weeds

Visual aesthetics:

- Desired outcome is protection of viewshed and contextual environment

#### ***4.2 Physical environment, subterranean***

Desired outcomes include

- a subterranean environment which, if it is being visited or excavated, is safe for all site users.
- A further desired outcome is a subterranean environment in which the substrate, geological features and micro- and macrobiota are properly conserved. This implies a thorough knowledge of the subterranean environment.

#### ***4.3 Infrastructure, built environment***

There is no built environment of any kind at Minnaar's

#### ***4.4 Research environment***

Desired outcomes include the following:

- To ensure that lack of funding does not inhibit research opportunities and prevent site potential from being realised
- To ensure that the Management Authority has in-house heritage expertise which allows for the follow-up of fossil site inspection observations and recommendations

#### ***4.5 Site safety and security***

- Desired outcomes include the provision of safety interventions recommended by the professional site safety officer after inspection of the surface and subterranean environment has taken place to ensure safe working and visiting conditions

#### ***4.6 Presentation of site values***

Desired outcomes include:

- To ensure that the many heritage and natural values of the site are interpreted and made available to as wide a public as possible
- To ensure that the old mining relics are properly recorded descriptively and in the form of measured drawings, photographs and mapping

### **5 MANAGEMENT AND MONITORING TASKS**

The following are operational management tasks and issues that need to be addressed now or in the future as part of on-going management actions. Their funding is still problematic.

The development of research at the fossil sites has been limited by the unfortunate perceptions that the State may not fund development on privately owned property and that the scientists are 'site-users'. This needs to change as it must be seen as the responsibility of the authorities to foster research and necessary associated development on these sites. It is recommended that in future, scientists be viewed rather as 'value adders' and thus eligible for some easement for the funding of heritage site management interventions which they are currently expected to fund, for

example, fencing. In effect, the state has been expecting others to finance the protection of the COH WHS fossil sites.

Sites which have no active scientist are generally neglected – this is an indication of the positive influence which scientists have on fossil sites.

The following table has been drawn up with the specific aim of clarifying who should do what, and when, on the heritage site. The Table also provides some indication of priority ratings. It has been constructed in such a way as to incorporate all the key management issues, strategies and monitoring criteria so that it may be used independently of the text.

The relative priority of the management measures has been identified based on ICCROM definitions as follows:

- Immediate – to be attended to urgently as it constitutes a danger to the public or a resource;
- Urgent - to be attended to urgently to protect the resource;
- Necessary - to be attended to, to protect the resource;
- Desirable to be attended to from a development perspective;
- Keep watch - to be monitored to see if the problem is serious.

**TABLE 1 FOLLOWS:  
MANAGEMENT MEASURES AND MONITORING CRITERIA**



**TABLE 1 MANAGEMENT AND MONITORING TASKS FOR MINNAAAR'S SITE**

Issues	Threats or Risks	Desired Outcomes (*) and Management Measures	Priority	Responsibility	Monitoring Criteria	Monitoring frequency
<b>Surface environment</b>						
Access - legal access to property	<ul style="list-style-type: none"> <li>Compromised relations with landowner</li> </ul>	<ul style="list-style-type: none"> <li><b>Maintenance of cordial relations with landowners regarding access (*)</b></li> <li>Ensure that properly negotiated preferably written letters of permission are obtained by all site users or those in charge</li> </ul>	Necessary	All site users	<ul style="list-style-type: none"> <li>Check if access issue has been addressed in MOU's between landowner and research scientists</li> <li>Check if any tour operators or tourist guides have the same permissions</li> </ul>	Annual
Unauthorised access	<ul style="list-style-type: none"> <li>Removal of rock, fossils breccia and artefacts</li> <li>Removal of edible and medicinal plants</li> </ul>	<ul style="list-style-type: none"> <li><b>No unauthorised visitation to site (*)</b></li> <li>Inspection team, heritage inspectors and landowner to maintain surveillance</li> </ul>	Necessary	Official site users and landowner	<ul style="list-style-type: none"> <li>Check stockpiled breccia for tampering</li> <li>Check for signs of digging out of plants</li> <li>Check for removal of garden rock</li> </ul>	Ongoing
Rangeland condition	<ul style="list-style-type: none"> <li>Deterioration of rangeland due to overgrazing, trampling or too frequent fires</li> </ul>	<ul style="list-style-type: none"> <li><b>Rangeland in optimum condition (*)</b></li> <li>GDACE can advise</li> <li>Plan for acquiring baseline data against which impacts can be assessed</li> <li>Plant species list required, which notes potential target species</li> </ul>	Desirable	Landowner	<ul style="list-style-type: none"> <li>Check for trampled bare areas</li> <li>Check for loss of palatable grasses and forbs</li> <li>Check for removal or collection of target /economically significant species</li> </ul>	
Retention of topsoil, surface drainage, surface erosion	<ul style="list-style-type: none"> <li>Loss and dispersal of topsoil makes re-vegetation difficult</li> </ul>	<ul style="list-style-type: none"> <li><b>Fossil site free of erosion (*)</b></li> <li>Check for surface drainage and distribution of runoff over surface</li> <li>Check for signs of surface erosion</li> </ul>	Necessary	Landowner?	<ul style="list-style-type: none"> <li>Check for erosion gulleys</li> <li>Check for patches of exposed soil</li> </ul>	Ongoing

Issues	Threats or Risks	Desired Outcomes (*) and Management Measures	Priority	Responsibility	Monitoring Criteria	Monitoring frequency
Fire Management	<ul style="list-style-type: none"> <li>• Too frequent fires have a negative effect on vegetation</li> <li>• Fire is a threat to moveable property and to infrastructure</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Proper fire regime for Bankenveld maintained (*)</b></li> <li>• Implement a fire management policy – a generic fire management strategy for COH WHS is desirable</li> <li>• Record fire frequency and intensity</li> <li>• Take precautionary measures to contain domestic fires started on site</li> <li>• Brief residents on what to do in such a situation</li> <li>• Provide suitable beaters for research staff and farm workers</li> </ul>	Necessary	Landowner, GDACE	<ul style="list-style-type: none"> <li>• Set up rangeland study for base data against which fire impact can be assessed</li> <li>• Set up a fire frequency recording programme</li> <li>• Ensure that beaters are always on hand</li> </ul>	Ongoing
Red data species, rare and economically significant plants	<ul style="list-style-type: none"> <li>• Over-utilisation or loss of edible and medicinal plants. Many important plant species are not on RED DATA list.</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Preservation of biodiversity (*)</b></li> <li>• Surveillance of indigenous plant use</li> <li>• Draw up a species list of medicinal, poisonous, edible and economically significant species</li> <li>• Map occurrence and preferred microhabitats</li> <li>• Monitor collection and utilization</li> </ul>	Necessary	Landowner, GDACE, Heritage Inspectors	<ul style="list-style-type: none"> <li>• Check for signs of digging geophytes out by the roots</li> <li>• Check local roadside vendors for plants on sale</li> </ul>	Ongoing

Issues	Threats or Risks	Desired Outcomes (*) and Management Measures	Priority	Responsibility	Monitoring Criteria	Monitoring frequency
Invasive alien plant species.	<ul style="list-style-type: none"> <li>Invasion of avens and other habitats by alien species</li> <li>Loss of biodiversity</li> <li>Unattractive landscape</li> </ul>	<ul style="list-style-type: none"> <li><b>Fossil site free of invasive alien species(*)</b></li> <li>Make a list of all invasive plant species</li> <li>Map and prioritise infestations</li> <li>Determine best eradication or control programme: GDACE available for assistance</li> <li>Assess costs and find budget</li> <li>Begin control according to guideline provided in generic management plan</li> <li>Enlist expertise of GDACE</li> <li>Implement control and clearance programme</li> <li>Monitor and follow up as required</li> </ul>	Necessary	Landowner,	<ul style="list-style-type: none"> <li>Visual checks for infestations and incidence density</li> <li>Monitor with fixed point photography</li> </ul>	Ongoing
Weeds & shrub growth in fossil site	<ul style="list-style-type: none"> <li>Roots destabilize breccias in time</li> <li>Plants reduce visibility of noteworthy sections</li> <li>Weeds give a negative visual experience and project an air of dereliction</li> </ul>	<ul style="list-style-type: none"> <li><b>Weed-free fossil site or site in which weeds are not problematic (*)</b></li> <li>Pull troublesome weeds by hand, or 'skoffel'</li> <li>Destroy in a manner that does not spread seed further</li> <li>Weeds not a threat to heritage values at present</li> </ul>	Necessary	Landowner,	<ul style="list-style-type: none"> <li>Visual checks for weed infestations</li> <li>Fixed point photography for controls and monitoring when necessary</li> </ul>	Ongoing
Development in 'viewshed'	<ul style="list-style-type: none"> <li>Negative visual impact</li> </ul>	<ul style="list-style-type: none"> <li><b>Preservation of sense of place and natural qualities of viewshed (*)</b></li> <li>COH WHS to monitor all new development plans</li> </ul>	Necessary	COH WHS MA	<ul style="list-style-type: none"> <li>Check plans for visual impact on viewshed of site</li> </ul>	Ongoing

Issues	Threats or Risks	Desired Outcomes (*) and Management Measures	Priority	Responsibility	Monitoring Criteria	Monitoring frequency
Habitat protection: Removal of stromatolites.	<ul style="list-style-type: none"> <li>Loss of Heritage material and site significance.</li> <li>Loss of micro-habitats (mosaic of sunny and shady areas).</li> </ul>	<ul style="list-style-type: none"> <li><b>Preservation of Palmdaba Stone and fossil stromatolites and associated microhabitats (*)</b></li> <li>Landowner, Research scientists and field staff to maintain surveillance</li> <li>Heritage Monitors to be alerted</li> </ul>	Necessary	Landowner, Heritage Inspectors	<ul style="list-style-type: none"> <li>Check for signs of disturbed soil, exposed patches of soil, overturned and disturbed rock, places where rock has been removed</li> </ul>	Ongoing
<b>SUBTERRANEAN ENVIRONMENT – Not a safety issue at present</b>						
Presence of breeding colonies of bats	<ul style="list-style-type: none"> <li>Loss of colony – sensitive to human interference</li> <li>Species involved (Miniopterus natalensis) is declining in numbers</li> </ul>	<ul style="list-style-type: none"> <li><b>Preservation of rare bat species (*)</b></li> <li>Minimise risk of disturbing breeding colony</li> <li>Ensure that bats have free access into and out of cave</li> <li>GDACE can offer advice</li> </ul>	Necessary	GDACE to monitor	<ul style="list-style-type: none"> <li>GDACE to establish monitoring criteria for breeding colony</li> <li>Check for presence and numbers of bats</li> </ul>	Ongoing, breeding season
Porcupine lairs and owl roosts	<ul style="list-style-type: none"> <li>Disturbance and displacement of animals</li> <li>Porcupine lairs and owls are important as modern analogues for taphonomic processes of the past</li> </ul>	<ul style="list-style-type: none"> <li><b>Preservation of porcupine lairs and owl roosts for actualistic studies (*)</b></li> <li>Protect any porcupine lairs and owl roosts on site</li> <li>Encourage that their behavior and lair contents are studied without disturbing animals</li> </ul>	Necessary	All site users	<ul style="list-style-type: none"> <li>Check that porcupine lairs remain active – note presence of quills, droppings, gnawed bones</li> </ul>	Ongoing
<b>INFRASTRUCTURE – No infrastructure at Minnaar's at present</b>						

Issues	Threats or Risks	Desired Outcomes (*) and Management Measures	Priority	Responsibility	Monitoring Criteria	Monitoring frequency
Site plaque recognizing World Heritage Site status and National Heritage Site Status	<ul style="list-style-type: none"> <li>Plaque might draw attention to fossiliferous nature of the site</li> </ul>	<ul style="list-style-type: none"> <li><b>Recognition of special status of site (*)</b></li> <li><b>Consideration of advisability of erecting a site plaque (*)</b></li> <li><b>If deemed appropriate:-</b> <ul style="list-style-type: none"> <li>Select appropriate position, agreed by researchers and landowner</li> <li>Ensure wording appropriate and agreed, checked by SAHRA</li> <li>Ensure that both SAHRA and WHS logos appear</li> <li>Acquire budget</li> <li>SAHRA to install</li> </ul> </li> </ul>	Necessary	SAHRA	<ul style="list-style-type: none"> <li>Check plaque condition and safety (brass plaques liable to theft)</li> </ul>	Ongoing
<b>RESEARCH ENVIRONMENT – No research is being undertaken or planned for Minnaar's Site at present – see generic document for items that require monitoring</b>						
<b>SITE SAFETY, SECURITY AND STABILITY</b>						
Subterranean environments at Minnaar's	<ul style="list-style-type: none"> <li>Possible instability due to previous mining activities and blasting</li> <li>Natural instability</li> </ul>	<ul style="list-style-type: none"> <li><b>Subterranean areas safe or off-limits (*)</b></li> <li>No-go areas for researchers and visitors; specialist caving groups only</li> </ul>	Necessary	Landowner, Heritage Inspectors	<ul style="list-style-type: none"> <li>Check that no-go instruction is being obeyed</li> </ul>	Ongoing
Bees, "Kransbye", Wasps	<ul style="list-style-type: none"> <li>The numerous cavities and hollows are home to several bee hives and wasps' nests. Many people are allergic to bee stings in particular.</li> </ul>	<ul style="list-style-type: none"> <li><b>Site users and visitors suitably warned about hives of wasps and bees (*)</b></li> <li>Warn site users about wasps and bees in cave entrances</li> </ul>	Necessary	Heritage Inspectors, Site inspection team and landowner	<ul style="list-style-type: none"> <li>Monitoring should include checking the route for insect problems.</li> </ul>	Ongoing
Theft, crime	<ul style="list-style-type: none"> <li>The isolated situation makes the site vulnerable</li> </ul>	<ul style="list-style-type: none"> <li><b>Site safety, within reason (*)</b></li> <li>It is difficult to manage crime and surveillance is recommended</li> </ul>	Necessary	Landowner, site residents	<ul style="list-style-type: none"> <li>Security checks</li> </ul>	Ongoing

Issues	Threats or Risks	Desired Outcomes (*) and Management Measures	Priority	Responsibility	Monitoring Criteria	Monitoring frequency
<b>GENERIC ISSUES RELATING TO FOSSIL SITE EXCAVATIONS: No excavation in progress or planned – see generic management Plan for items monitored</b>						