

Report on the floristic and ecological assessment of the proposed expansion of the Alheit graveyard, Northern Cape Province.

October 2012

Prepared by:

Darius van Rensburg

The logo for H2ON Environmental Specialists features the text 'H2ON' in large, white, bold letters on a green background with a map of South Africa. To the right, the words 'Environmental Specialists' are written in a green, serif font. Below this, contact information is provided in a smaller green font.

21• Dromedaris Street • Dan Pienaar • Bloemfontein
Suite 158 • Private Bag X01 • Brandhof • 9324
darius@h2on.co.za

Tel: 051 4444 700 • Fax: 086 6976 132

Prepared for:

MDA Environmental Consultants
9 Barnes Street
Westdene
9301

Table of contents

Vegetation and ecological assessment.

1. Introduction	3
2. Scope and limitations	4
2.1 Vegetation	
2.2 Fauna	
2.3 Limitations	
3. Methodology	4
3.1 Desktop study	
3.2 Survey	
3.3 Criteria used to assess sites	
3.4 Biodiversity sensitivity rating (BSR)	
4. Ecological overview of the site	8
4.1 Overview of vegetation	
4.2 Overview of fauna	
5. Site specific results	9
6. Biodiversity sensitivity rating (BSR) interpretation	11
7. Discussion and conclusions	11
8. Recommendations	11
9. References	12
Annexure A: Maps and Site photos	14

Vegetation and ecological assessment.

1. Introduction

Natural vegetation is an important component of ecosystems. Some of the vegetation units in a region can be more sensitive than others, usually as a result of a variety of environmental factors and species composition.

South Africa has a large amount of endemic species and in terms of biological diversity ranks third in the world. This has the result that many of the species are rare, highly localised and consequently endangered. It is our duty to protect our diverse natural resources.

South Africa contains 19 known centres of endemism. These areas contain a high number of species endemic to this specific area. Due to the limited range of most of these species many are rare, protected or endangered. The proposed graveyard is situated on the eastern border of the Gariep Centre of Endemism. Many species occurring within this centre is unique and localised to this area. Development in such centres of endemism should be done with careful investigation of the biodiversity and species composition of the area. Areas with rare, endangered or endemic species and areas with a high biodiversity should be avoided when planning a development.

Though vegetation may seem to be uniform and low in diversity it may still contain species that are rare and endangered. The occurrence of such a species may render the development unviable. Should such a species be encountered the development should be moved to another location or cease altogether.

Development around cities and towns are necessary to accommodate an ever growing population. Areas along the boundaries of cities and towns are usually in a degraded state due to the impact of the large population these areas house. Though this may be the case in most situations there may still be areas that consist of sensitive habitats such as water courses, wetlands or rare vegetation types that need to be conserved. These areas may also contain endangered fauna and flora.

An ever increasing population is accompanied by an ever increasing fatality-rate. This necessitates the expansion or establishment of graveyards. These graveyards should be located in areas of low slope to prevent the erosion of graves and should also not occur near water courses where graves may be exposed by floods.

For the above reasons it is necessary to conduct a vegetation and ecological assessment of an area proposed for development.

The proposed expansion of the Alheit graveyard is situated on the southern boundary of the Alheit settlement (Map 1). The settlement is situated on the south of the N14 National Road. The graveyard is situated at the c/o Burger and Wylen Streets.

The report together with its recommendations and mitigation measures should be used to minimise the impact of the proposed development.

2. Scope and limitations

- To evaluate the present state of the vegetation and ecological functioning of the site proposed for development.
- To identify possible negative impacts that could be caused by the proposed graveyard expansion.

2.1 Vegetation

Aspects of the vegetation that will be assessed include:

- The vegetation types of the region with their relevance to the proposed site.
- The overall status of the vegetation on site.
- Species composition with the emphasis on dominant-, rare- and endangered species.

The amount of disturbance present on the site assessed according to:

- The amount of grazing impacts.
- Disturbance caused by human impacts.
- Other disturbances.

2.2 Fauna

Aspects of the fauna that will be assessed include:

- A basic survey of the fauna occurring in the region using visual observations of species as well as evidence of their occurrence in the region (burrows, excavations, animal tracks, etc.).
- The overall condition of the habitat.
- A list of species that may occur in the region (desktop study).

2.3 Limitations

Some of the bulbous species may have been overlooked. Many species have a spring/summer flowering period.

Some species may have been overlooked due to an annual cycle.

Some animal species may not have been observed as a result of their nocturnal and/or shy habits.

3. Methodology

3.1 Several literature works were used for additional information.

Vegetation:

Red Data List (Raymondo *et al.* 2009)

Vegetation types (Mucina & Rutherford 2006)

Field guides used for species identification (Adams 1976, Coates-Palgrave 2002, Court 2010, Hartmann 2001, Le Roux 2005, Roberts & Fourie 1975, Van Oudtshoorn 2004, Van Rooyen 2001, Manning 2009, Van Wyk & Van Wyk 1997).

Terrestrial fauna:
Field guides for species identification (Smithers 1986).

3.2 Survey

The site was assessed by means of transects and sample plots.

Noted species include rare and dominant species.
The broad vegetation types present on the site were determined.
The state of the environment was assessed in terms of condition, grazing impacts, disturbance by humans, erosion and presence of invader and exotic species.

Animal species were also noted as well as the probability of other species occurring on or near the site according to their distribution areas and habitat requirements.
The state of the habitat was also assessed.

3.3 Criteria used to assess sites

Several criteria were used to assess the site and determine the overall status of the environment.

Vegetation characteristics

Characteristics of the vegetation in its current state. The diversity of species, sensitivity of habitats and importance of the ecology as a whole.

Habitat diversity and species richness: normally a function of locality, habitat diversity and climatic conditions.

Scoring: Wide variety of species occupying a variety of niches – 1, Variety of species occupying a single nich – 2, Single species dominance over a large area containing a low diversity of species – 3.

Presence of rare and endangered species: The actual occurrence or potential occurrence of rare or endangered species on a proposed site plays a large role on the feasibility of a development. Depending on the status and provincial conservation policy, presence of a Red Data species can potentially be a fatal flaw.

Scoring: Occurrence actual or highly likely – 1, Occurrence possible – 2, Occurrence highly unlikely – 3.

Ecological function: All plant communities play a role in the ecosystem. The ecological importance of all areas though, can vary significantly e.g. wetlands, drainage lines, ecotones, etc.

Scoring: Ecological function critical for greater system – 1, Ecological function of medium importance – 2, No special ecological function (system will not fail if absent) – 3.

Degree of rarity/conservation value:

Scoring: Very rare and/or in pristine condition – 1, Fair to good condition and/or relatively rare – 2, Not rare, degraded and/or poorly conserved – 3.

Vegetation condition

The sites are compared to a benchmark site in a good to excellent condition. Vegetation management practises (e.g. grazing regime, fire, management, etc.) can have a marked impact on the condition of the vegetation.

Percentage ground cover: Ground cover is under normal and natural conditions a function of climate and biophysical characteristics. Under poor grazing management, ground cover is one of the first signs of vegetation degradation.

Scoring: Good to excellent – 1, Fair – 2, Poor – 3.

Vegetation structure: This is the ratio between tree, shrub, sub-shrubs and grass layers. The ratio could be affected by grazing and browsing by animals.

Scoring: All layers still intact and showing specimens of all age classes – 1, Sub-shrubs and/or grass layers highly grazed while tree layer still fairly intact (bush partly opened up) – 2, Monolayered structure often dominated by a few unpalatable species (presence of barren patches notable) – 3.

Infestation with exotic weeds and invader plants or encroachers:

Scoring: No or very slight infestation levels by weeds and invaders – 1, Medium infestation by one or more species – 2, Several weed and invader species present and high occurrence of one or more species – 3.

Degree of grazing/browsing impact:

Scoring: No or very slight notable signs of browsing and/or grazing – 1, Some browse lines evident, shrubs shows signs of browsing, grass layer grazed though still intact – 2, Clear browse line on trees, shrubs heavily pruned and grass layer almost absent – 3.

Signs of erosion: The formation of erosion scars can often give an indication of the severity and/or duration of vegetation degradation.

Scoring: No or very little signs of soil erosion – 1, Small erosion gullies present and/or evidence of slight sheet erosion – 2, Gully erosion well developed (medium to large dongas) and/or sheet erosion removed the topsoil over large areas – 3.

Faunal characteristics

Presence of rare and endangered species: The actual occurrence or potential occurrence of rare or endangered species on a proposed site plays a large role on the feasibility of a development. Depending on the status and provincial conservation policy, presence of a Red Data species or very unique and sensitive habitats can potentially be a fatal flaw.

Scoring: Occurrence actual or highly likely – 1, Occurrence possible – 2, Occurrence highly unlikely.

3.4 Biodiversity sensitivity rating (BSR)

The total scores for the criteria above were used to determine the biodiversity sensitivity ranking for the sites. On a scale of 0 – 30, six different classes are described to assess the suitability of the sites to be developed. The different classes are described in the table below:

Table 1: Biodiversity sensitivity ranking

BSR	BSR general floral description	Floral score equating to BSR class
Ideal (5)	Vegetation is totally transformed or in a highly degraded state, generally has a low level of species diversity, no species of concern and/or has a high level of invasive plants. The area has lost its inherent ecological function. The area has no conservation value and potential for successful rehabilitation is very low. The site is ideal for the proposed development.	29 – 30
Preferred (4)	Vegetation is in an advanced state of degradation, has a low level of species diversity, no species of concern and/or has a high level of invasive plants. The area's ecological function is seriously hampered, has a very low conservation value and the potential for successful rehabilitation is low. The area is preferred for the proposed development.	26 – 28
Acceptable (3)	Vegetation is notably degraded, has a medium level of species diversity although no species of concern are present. Invasive plants are present but are still controllable. The area's ecological function is still intact but may be hampered by the current levels of degradation. Successful rehabilitation of the area is possible. The conservation value is regarded as low. The area is acceptable for the proposed development.	21 – 25
Not preferred (2)	The area is in a good condition although signs of disturbance are present. Species diversity is high and species of concern may be present. The ecological function is intact and very little rehabilitation is needed. The area is of medium conservation importance. The area is not preferred for the proposed development.	11 – 20
Sensitive (1)	The vegetation is in a pristine or near pristine condition. Very little signs of disturbance other than those needed for successful management are present. The species diversity is very high with several species of concern known to be present. Ecological functioning is intact and the conservation importance is high. The area is regarded as sensitive and not suitable for the proposed development.	0 - 10

4. Ecological overview of the site

4.1 Overview of ecology and vegetation types (Mucina & Rutherford 2006)

The vegetation in the area consists of Bushmanland Arid Grassland (Nkb 3). The vegetation type is characterised by the dominance of white grasses (*Stipagrostis spp.*) and may contain a large degree of annual herbs after periods of high rainfall.

The topography is relatively flat and sloping slightly towards the east. Large areas of the site have recently been cleared of vegetation. This has severely degraded the site. The site is bordered on the north by the Alheit settlement. The west of the site is bordered by the existing graveyard. The east of the site is bordered by commercial vineyards. The south of the site consists of natural areas. Due to the surrounding settlement the site is severely degraded.

The area contains sandy soils covered by recent alluvium, calcrete and superficial deposits of the Kalahari Group. Bedrock is shallow in many areas of the site. This creates a free draining area which may become susceptible to erosion.

Two ephemeral drainage lines cross the site. These drainage lines flow from west to east. They have been severely degraded by the adjacent settlement. Although in a degraded condition they remain vital water transporting bodies and therefore are regarded as sensitive areas. They should be excluded from the graveyard and a buffer zone of 10 meters should be afforded to the drainage lines.

The region is very arid with a very low Mean Annual Precipitation (MAP) of 124mm. Rain occurs mainly in the form of summer thunderstorms and these may periodically cause flash floods. The soils of the area are loose, freely draining soils that are easily mobilised by surface water flow. As a result the areas on the site adjacent to the drainage lines would be subjected to water erosion. This must be kept in mind throughout the design of the graveyard. The implementation of erosion measures should be investigated.

Large portions of the vegetation on the site have been cleared. As a result the percentage vegetation cover is very low. Vegetation on the site consists of dwarf shrubs and succulents. Due to the arid climate and the time of season several annual grasses and herbs may not be present. Dwarf shrubs and succulents that were found on the site include *Blepharis mitrata*, *Monechma genistifolium* subsp. *genistifolium*, *Salsola tuberculata*, *Zygophyllum simplex* and *Psilocaulon junceum*.

Two succulent species were noted in the area. These are *Aloe claviflora* and *Avonia papyraceae*. These species are protected in the Northern Cape Province. Both species has a wide distribution area and is not regarded as rare. They are not of a concern to the development; however, a permit must be acquired if any of these species are to be removed from the site.

The drainage lines on the site are lined with small trees and shrubs. This is caused by the higher amounts of moisture that periodically flow through the drainage lines. Trees and shrubs along the drainage lines include *Parkinsonia africana*, *Phaeoptilum spinosum* and *Acacia melifera* subsp. *detinens*. *Tapinanthus oleifolius* is a common parasite plant on these trees.

Due to the clearance of the vegetation on the site as well as the adjacent settlement the area is severely degraded. The drainage lines occurring on the site are deemed as sensitive environments and must be excluded from the graveyard.

4.2 Overview of terrestrial mammals (actual & possible)

No rare or endangered mammals could be identified on the site.

As a result of the clearance of vegetation on the site as well as the proximity of the adjacent settlement and commercial vineyards no mammal species could be identified on the site. It is deemed highly unlikely that any species of concern would occur on or near the site.

List of some Red Data terrestrial mammals that could occur in the region:

Aardwolf	<i>Proteles cristatus</i>
Bat-Eared Fox	<i>Otocyon megalotis</i>
Striped Weasel	<i>Poecilogale albinucha</i>
Small Spotted Cat	<i>Felis negripes</i>
Antbear	<i>Orycteropus afer</i>

The likelihood that one or several of these endangered species may occur in this area is highly unlikely.

5. Site specific results

Habitat diversity and species richness:

The available habitat on the site has been severely degraded by the clearance of vegetation on the site as well as the proximity of the settlement. The drainage lines on the site do contribute to habitat diversity but as a consequence of the proximity of human settlement this is not deemed an important habitat for fauna. Species diversity on the site is low.

Presence of rare and endangered species:

No species of concern could be identified on the site. Due to the clearance of vegetation as well as the impact of the surrounding human activities it is considered highly unlikely that any species of concern would occur on the site.

Ecological function:

The ecological function of the site has been transformed. Large portions of the vegetation have been cleared and the area is not able to sustain a significant faunal population. The drainage lines on the site have been severely degraded but they provide a vital ecological function as water transporting bodies.

Degree of rarity/conservation value:

The vegetation type that is present on the site is regarded as being of Least Concern and it is not rare. The vegetation on the site has been severely degraded. The site is also located adjacent to the existing graveyard and settlement as well as commercial vineyards. These impacts on the site deem it to have a low conservation value. However, the drainage lines, although degraded, remain sensitive areas and the conservation value of these areas is considered to be high.

Percentage ground cover:

Due to the previous removal of the vegetation on the site the percentage ground cover is low.

Vegetation structure:

The vegetation structure consists of a dwarf shrub and succulent layer that has been severely degraded and altered.

Infestation with exotic weeds and invader plants:

No exotic species could be identified on the site. Due to the aridity of this area it is not susceptible to infestation by exotics. Care should be taken not to introduce the exotic Mesquite Tree (*Prosopis glandulosa*) as a shade tree in the graveyard as this species readily forms infestations in this region.

Degree of grazing/browsing impact:

Grazing by domestic stock is regarded as moderate.

Signs of erosion:

Though erosion is present on the site this is considered moderate. Some erosion is present along the drainage lines on the site. This is caused by water erosion coupled with the arid climate and loose soils. This should be kept in mind in the design of the graveyard.

Terrestrial animals:

Due to the previous clearance of the vegetation on the site as well as the proximity of the site to the existing graveyard, settlement and commercial vineyards it is considered highly unlikely that any species of concern would occur on or near the site.

Table 2: Biodiversity Sensitivity Rating for the proposed graveyard expansion.

	Low (3)	Medium (2)	High (1)
Vegetation characteristics			
Habitat diversity & Species richness	3		
Presence of rare and endangered species	3		
Ecological function	3		
Uniqueness/conservation value	3		
Vegetation condition			
Percentage ground cover	3		
Vegetation structure	3		
Infestation with exotic weeds and invader plants or encroachers			1
Degree of grazing/browsing impact		2	
Signs of erosion		2	
Terrestrial animal characteristics			
Presence of rare and endangered species	3		
Sub total	21	4	1
Total		26	

6. Biodiversity sensitivity rating (BSR) interpretation

Table 3: Interpretation of Biodiversity Sensitivity Rating.

Site	Score	Site Preference Rating	Value
Alheit graveyard expansion	26	Preferred	4

7. Discussion and conclusions

The site has been rated as being Preferred for the proposed development.

The vegetation on the site has been severely degraded due to the previous removal of large portions of the vegetation. The site is also bordered by the existing graveyard, residential settlement and commercial vineyards. For these reasons the area does not have a high conservation value. Furthermore, the site does not form part of a natural area and this further lowers the conservation value of the site.

Two drainage lines cross the site from west to east. These drainage lines have been severely degraded by the adjacent settlement. However, they still function as water transporting bodies and are regarded as sensitive. The drainage lines should be excluded from the graveyard and a buffer zone of 10 meters from these drainage lines should be respected (Map 2). The banks of these drainage lines are susceptible to erosion and should be monitored periodically to ascertain if erosion has occurred. Progressive erosion of the banks will eventually lead to the erosion of the graves on the site. A buffer zone of 10 meters from the drainage lines may prevent erosion in this area. The implementation of erosion measures along these drainage lines should be investigated.

The area contains two protected succulent species, namely *Aloe claviflora* and *Avonia papyraceae*. These species are not rare and has a wide distribution area. However, permits should be acquired for those specimens on the site that are to be removed.

The area contains no visible exotic species. The region has a low susceptibility to exotic infestation due to the arid climate. However, the Mesquite Tree (*Prosopis glandulosa*) is adapted to this environment and causes infestation problems in many areas. This tree should not be used as a shade tree in the graveyard.

Several trees indigenous to the region may be considered as shade trees within the graveyard. This will contribute to a peaceful sense of place and will provide shade to visitors. These trees will also aid in stabilisation of the soil. Trees that should be considered include *Acacia erioloba* (Camel Thorn), *A. melifera* (Black Thorn), *Searsia lancea* (Karree) and *Parkinsonia africana* (Greenhair Tree).

The expansion of the proposed graveyard on this site would have a relatively low impact on the environment as long as the drainage lines on the site are excluded from the development.

8. Recommendations

- The drainage lines on the site should be excluded from the layout (Map 2).
- A buffer zone of 20 meters should be respected from these drainage lines (Map 2).

- The area should be monitored for signs of erosion. Should any erosion occur prevention measures should be put in place.
- The implementation of erosion measures along the drainage lines should be investigated.
- Permits should be acquired for any protected species, *Aloe calviflora* and *Avonia papyraceae*, on the site that must be removed prior to construction.
- The use of the Mesquite Tree (*Prosopis glandulosa*) as a shade tree should not be permitted.
- The use of indigenous shade trees should be investigated. This will also aid in stabilisation of the soil.
- No animals may be captured, hunted or harmed in any way during construction or operation of the facility.

9. References

Adams, J. 1976. Wild Flowers of the Northern Cape. The Department of Nature and Environmental Conservation of the Provincial Administration of the Cape of Good Hope, Cape Town.

Coates-Palgrave, M. 2002. Keith Coates-Palgrave Trees of Southern Africa, edn 3, imp. 4 Random House Struik (Pty.)Ltd, Cape Town.

Court, D. 2010. Succulent Flora of Southern Africa. Struik Publishers, Cape Town.

Germishuizen, G. & Meyer, N.L. (eds) 2003. Plants of Southern Africa: an annotated checklist. *Strelitzia* 14. National Botanical Institute, Pretoria.

Government of South Africa. 2008. National Protected Area Expansion Strategy for South Africa 2008: Priorities for expanding the protected area network for ecological sustainability and climate change adaptation. Government of South Africa, Pretoria.

Hartmann, H.E.K. 2001. Illustrated Handbook of Succulent Plants: Aizoaceae F-Z. Springer-Verlag, Berlin.

Le Roux, A. 2005. Namankwaland: Wild Flower Guide of South Africa Nr. 1. Botanical Society of South Africa, Cape Town.

Manning, J. 2009. Field Guide to Wild Flowers. Struik Nature, Cape Town.

Mucina, L. & Rutherford, M.C. (eds.) 2006. The Vegetation of South Africa, Lesotho and Swaziland. *Strelitzia* 19. South African National Biodiversity Institute, Pretoria.

Raymondo, D. Van Staden, L. Foden, W. Victor, J.E. Helme, N.A. Turner, R.C. Kamundi, D.A. Manyama, P.A. (eds.) 2009. Red List of South African Plants. *Strelitzia* 25. South African National Biodiversity Institute, Pretoria.

Roberts, B.R. & Fourie, J.H. 1975. Common grasses of the Northern Cape. Northern Cape Livestock co-Operative Limited, Vryburg.

Smithers, R.H.N. 1986. Land Mammals of Southern Africa. Macmillan, Johannesburg.

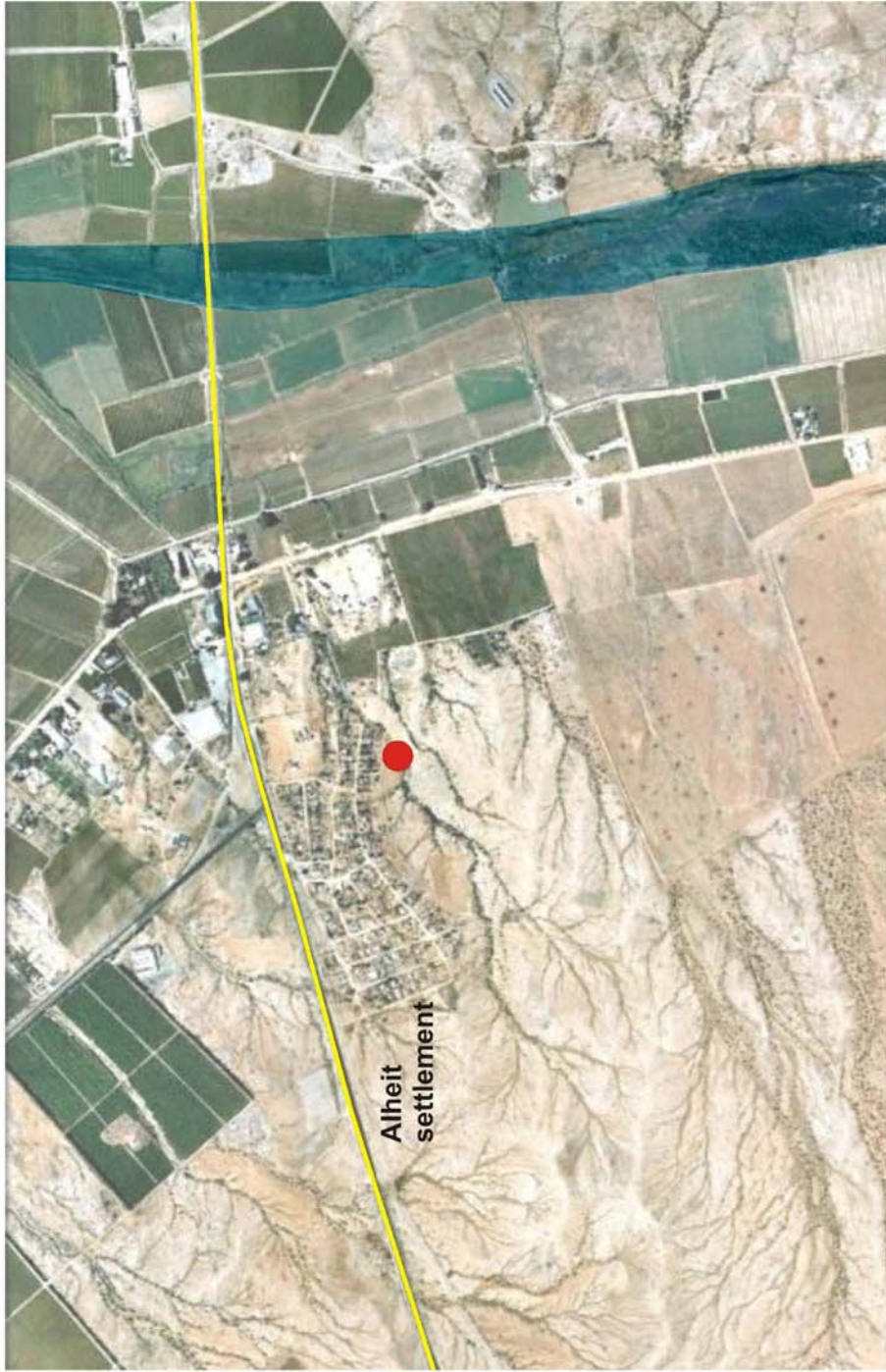
Van Oudtshoorn, F. 2004. Gids tot Grasse van Suider-Afrika. Briza Publications, Pretoria.

Van Rooyen, N. 2001. Flowering plants of the Kalahari dunes. Ekotrust CC, Lynnwood.

Van Wyk, B. & Van Wyk, P. 1997. Field guide to trees of Southern Africa. Struik Publishers, Cape Town.




Annexure A: Maps and Site photos

Locality of the proposed expansion of the Alheit graveyard.



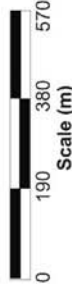
Prepared for:
MDA Consultants
9 Barnes Street
Bloemfontein
9301

Legend:

-  N14 National Road
-  Proposed graveyard
-  Hartbeesrivier River

Map Information

Spheroid: WGS 84
Topo Cadastre Sheet: T2820DC



Environmental Consultant
H2ON Environmental Specialists
Contact Darius van Rensburg at:
darius@h2on.co.za
Suite 158, P/Bag X01, Brandhof, 9324
Tel: 051 4444 700
Fax: 086 6976 132



Map 1: The location of the proposed expansion of the Alheit graveyard. The N14 National Road is indicated as well as the Hartbees River. Note the drainage lines that occur around the site.



Layout of the proposed expansion of the Alheit graveyard.



Prepared for:
MDA Consultants
9 Barnes Street
Bloemfontein
9301

Legend:

- Existing graveyard
- Proposed graveyard
- Drainage lines
- 10m buffer zone

Map Information

Spheroid: WGS 84
Topo Cadastre Sheet: T2820DC



Environmental Consultant
H2ON Environmental Specialists
Contact Darius van Rensburg at:
darius@h2on.co.za
Suite 158, P/Bag X01, Brandhof, 9324
Tel: 051 4444 700
Fax: 086 6976 132



Map 2: The approximate layout of the proposed expansion of the Alheit graveyard. The existing graveyard is also indicated. Note also the existing commercial vineyards to the east of the site. The drainage lines on the site is indicated in red and a buffer zone of 10m is also indicated along these drainage lines.



Figure 1: Panorama of the site as seen from the west towards the east. The southern drainage line is indicated in blue. Note the low percentage vegetation cover.



Figure 2: Panorama of the site as seen from the south towards the north west. Both drainage lines are indicated in blue. The existing graveyard is indicated in red.



Figure 3: Panorama of the site as seen from the south towards the east. Note the low percentage vegetation cover. The southern drainage line is indicated in blue.



Figure 4: The southern drainage line (blue line). Note the small trees that indicate increased moisture.



Figure 5: Area on the site that has been cleared of vegetation. The northern drainage line is indicated in blue.



Figure 6: The protected *Aloe claviflora* that is found in the area. A permit should be obtained for any specimens on the site that has to be removed prior to construction.



Figure 7: The protected *Avonia papyraceae* that is found in the area. A permit should be obtained for any specimens on the site that has to be removed prior to construction.