

APPOINTMENT

The consultant was appointed by MVD Kalahari to conduct a botanical survey for the following properties:

Portion 16 MIDDLE CAMP of the farm Roodepan no. 70, in extent 241,2917 hectares.

Portion 42 of the farm Roodepan no. 70, in extent 123,3406 hectares.

Remainder of portion 30 of the farm Roodepan no. 70, 17,5275 hectares in extent.

Portion 62, Portion of Portion 30 of the farm Roodepan no. 70, in extent 1,8997 hectares.

The consultant is registered as a Professional Natural Scientist at the South African Council for Natural Scientific Professions in terms of Section 20(3)(a) of the Natural Scientific Professions Act, 2003.

STUDY AREA

The study area was Portion 16 MIDDLE CAMP of the farm Roodepan no. 70, in extent 241,2917 hectares.

Portion 42 of the farm Roodepan no. 70, in extent 123,3406 hectares.

Remainder of portion 30 of the farm Roodepan no. 70, 17,5275 hectares in extent.

Portion 62, Portion of Portion 30 of the farm Roodepan no. 70, in extent 1,8997 hectares.

The property is approximately 384,1 hectares in size. Maps are attached as Appendix A to indicate the locality of the area.

RELEVANT LEGISLATION

Nature Conservation Ordinance, Ordinance 19 of 1974

National Environmental Management Biodiversity Act, Act 10 2004

National Water Act, Act 36 of 1998.

Hazardous Substances Act, Act 15 of 1973.

Environmental Impact Assessment Regulations, (2006) Version 1 as listed in Government Notice no 386 of 2006.

Environment and Conservation Act, Act 73 of 1989.

National Heritage Resources Act, Act 25 of 1999.

National Environment Management: Air quality Act. Act 39 of 2004.

Occupational Health and Safety Act, Act 85 of 1993.

Fertilizers, Farm Feeds, Agricultural Remedies Act, Act 36 of 1947.

National Forests Act, Act 84 of 1998.

Fencing Act, Act 31 of 1963.

Atmospheric Pollution Prevention Act, Act 45 of 1964.

National Environmental Management Act, Act 107 of 1998 as amended.

Conservation of Agricultural Resources Act, Act 43 of 1983.

HYDROLOGY

This property lies over the Dwyka formation that contain tillite with subordinate sandstone, mudstone and shale intruded by dolerite dykes and sheets. The nature of the water-bearing formations is dominantly compact argillaceous strata.

“Compact” means a lack of significant primary porosity (Vegter, 1995).

The probability of drilling a successful borehole is less than 40%. The exploitability of finding water stronger than 2 l/s is 30 – 40% (Vegter, 1995).

The depth to groundwater level is 10 - 20 meters (Vegter, 1995)

VELD TYPE DESCRIPTION

The veld type is described as SVk 4 Kimberley Thornveld by Mucina & Rutherford (2006). It occurs in three provinces namely, North-West, Northern Cape and Free State. Its altitude varies between 1050 – 1400 metres. It has a well-developed tree layer with *Acacia erioloba*, *A. tortilis*, *A. karroo* and *Boscia albitrunca* and well-developed shrub with occasional dense stands of *Tarchonantus camphoratus* and *A. mellifera*. The grass layer is open with much uncovered soil.

The geology and soils are andesitic lavas of the Allanridge formation in the north and west and fine-grained sediments from the Karoo Supergroup in the north and east. Deep (0,6 – 1,2 m) sandy to loamy soils of the Hutton soil form (Ae and Ah land types) on slightly undulating sandy plains.

It rains mainly in summer and autumn with dry winters. Mean annual precipitation varies from 300 mm in the southwest to about 500 mm in the northeast. Frost is frequent in winter. A map of the study area in relation to Mucina & Rutherford (2006) veld type classification and a climate diagram for SVk 4 Kimberley Thornveld is attached as Appendix B. The important taxa listed by Mucina and Rutherford (2006) is attached as Appendix C.

It falls within the *Least threatened* category that they assign to veld types. Only 2% is statutorily conserved in Vaalbos National Park (which is in the process of being de-proclaimed as a National Park), Sandveld, Bloemhof Dam and S.A. Lombard Nature Reserves. Some 18% is transformed by cultivation. Erosion is low and the area is mostly used for cattle or game farming. Overgrazing leads to encroachment of *Acacia mellifera* subsp. *detinens* (Mucina & Rutherford, 2006).

METHODOLOGY

Satellite imagery (Appendix D) was employed to see whether different vegetation types existed in the study area. Thereafter the study area was visited several times to describe the vegetation and draw up plant lists to get an indication of the condition

of the veld. Photographs were also taken for the purpose of the report (see photoseries .1-4).

VELD TYPE

The veld type is indeed an open savannah, with a well-developed tree layer of mostly *A. tortilis*. Many of trees are very large (> 5 m) in size. A small section in the northernmost corner of the study area is camel thorn savannah, but for this report can be described as mixed umbrella thorn/camel thorn savannah. The shrub layer is poorly developed, possibly because the Hutton soil form is thicker than their habitat requirements. Although the characteristic *A. mellifera* subsp. *detinens* and *Tarchonantus camphoratus* (see plant species list) do occur on the property, they have not formed thickets as often happens with these two species. The grass layer is open and there are strong indications that this area was heavily utilized by cattle in the past.

Five field visits were paid to the study area and plant species lists were drawn up for the study area. The plant species recorded on the study area are listed in Appendix E.

Although the study area falls within the SVk 4 Kimberley Thornveld vegetation type, there are distinct vegetation units that are easily identifiable from the combination of satellite imagery and ground-truthing. These vegetation units are identified in Appendix D and include the two savannah types (umbrella thorn & camel thorn) and a vegetation unit that could be termed pan fringe or drainage line into a pan system.

The agricultural carrying capacity of this area is given as 12 hectares per large-stock unit (ha/LSU) by the Department of Agriculture, Northern Cape Province. The consultant disagrees with this appraisal. Furthermore there are signs of disturbance immediately adjacent to old watering troughs and small camps. Generally the veld is in a moderate condition and the carrying capacity is probably 18 –20 ha/LSU, thus being able to carry approximately 19 – 21 LSU.s. Assuming there are two bulls and 19 cows then cows at a calving percentage of 80% delivers R 45 600-00 gross income per year at R 3 000-00 per weaner. This indicates that the size of the

property is not an economical agricultural unit and has to a part-time farming operation. It is therefore that the farm needs to overgrazed to make the farming venture look and perform better.

In tabular form the occurrence of the factors that are used in assessing the veld condition are as follows:

ELEMENT	LOW	MEDIUM	HIGH
% BARE PATCHES		X	
BUSH THICKENING	X		
BUSH ENCROACHMENT	X		
GRASS COVER		X	
TREE DENSITY	X		
SHRUB DENSITY			X
DWARF SHRUB DENSITY	X		
BRIDGING SHRUBS	X		
EROSION		X	
POISONOUS PLANTS	X		
PEDESTALLING	X		
MONOCULTURES	X		
ALIEN SPECIES		X	
DISTURBANCE		X	
CHEMICALS	X		
LAND RECLAMATION	X		

There are however two areas that were pointed out by the geo-technical report that contain too high levels of clay for conventional building techniques and these were all zoned as “Public Open Space” for town planning purposes.

SENSITIVE HABITATS

The main drainage area towards Kamfersdam is regarded as moderately sensitive. Fortunately the area is regarded as unsuitable for the construction of houses in a

“normal” fashion because of the presence of clays that will make construction exorbitantly expensive, but where flooding of infrastructure will probably be inevitable. It is also in this area where one of the protected species, the vlei lily occurs.

ENDANGERED PLANT SPECIES

No endangered plant species were recorded in the study area.

PROTECTED PLANT SPECIES

The only protected plant species in terms of the Forests Act (Act 84 of 1998) that was recorded in the area was the camel thorn tree, *Acacia erioloba*. If any of these trees need to be removed for the realization of the project, permits will have to be obtained from the Department of Water Affairs and Forestry to make this possible. Camel thorn trees and *Nerine laticoma* (protected species in terms of the Nature Conservation Ordinance no 19 of 1974) these species were geo-referenced and their GPS-references are given in Appendix F.

One other species that is declared as “Protected” by the Nature Conservation Ordinance (no. 19 of 1974) is *Aloe grandidendata*, the “bontaalwyn”. All *Aloe* spp. is protected in the Northern Cape Province. It is not impossible that another protected species such as *Boophane distacha* may also occur, but these were not recorded during the survey.

ALIEN, INVADER PLANTS AND WEEDS

There are three categories of alien and invasive plants in terms of The Conservation of Agricultural Resources Act, Act 43 1983.

Category 1: Weeds: prohibited invader plants, which must be controlled or eradicated.

Category 2: Declared invader plants with commercial value – allowed in demarcated areas under controlled conditions.

Category 3: Ornamental plants – alien plants presently growing in, or having escaped from gardens. No further planting is allowed except with special permission (Bromilow, 2001; Copper Sunset Trading 100) Pty) Ltd, 2005)

Three indigenous weeds occur on the property and herbicides are registered for their control and/or eradication. These species are *Tribulus terrestris*, *Senecio* sp. and *Citrullus lanatus*.

There are ten exotic species that are potentially invasive on the property:

Species	Category	Herbicide registered	Biological control
<i>Opuntia ficus-indica</i>	1	Y	Y
<i>Opuntia imbricata</i>	1	Y	Y
<i>Xanthium spinosum</i>	1	Y	N
<i>Datura ferox</i>	1	Y	N
<i>Argemone ochroleuca</i>	1	Y	N

Species	Category	Herbicide registered	Biological control
<i>Prosopis glandulosa</i>	2	Y	Y
<i>Tagetes minuta</i>	-	Y	N
<i>Bidens bipinnata</i>	-	H	N
<i>Chenopodium album</i>	-	H	N
<i>Alternanthera pungens</i>	-	N	N

OTHER THREATS

Camel thorn trees have always been protected in terms of the Forestry Act but these measures got stricter with an amended Act 84 of 1998. This basically brought a stop to the legal and illegal trade in camel thorn wood in South Africa. Black thorn wood (*Acacia mellifera* subsp. *detinens*) was also a very sought-after wood because of its excellent braaiwood qualities. It has been in the market for years. It does however have the reputation of being the culprit to cause bush encroachment and bush thickening as a result of overgrazing. This resulted in the action that many

landowners took to chemical control in these situations. Firstly, the bush thickening occurs in monocultures of black thorn shrubs with almost no decent braaiwood (pencil-thickness). Secondly, black thorn braaiwood cut from shrubs or decently sized trunks of black thorn after chemical treatment lack its magnificent braai-qualities. It is as though it loses its bark quicker and the rot sets in much faster than with untreated stumps.

It is for this reason that the bulk of braaiwood in Kimberley for probably the past two years consists of the umbrella thorn (*Acacia tortilis*). Fortunately, members of the informed public and regular barbecue specialists have realized that it a useless braaiwood, but it is alarming that so much of it is being sold in Kimberley.

EFFECT OF THE DEVELOPMENT ON THE BOTANY OF THE AREA

There will certainly be a loss of local biodiversity in this area if the development goes ahead and this also could contribute to habitat fragmentation. Most of the natural vegetation will be destroyed for the planned urban development. Some of the larger trees will probably be retained (mitigation measure) to serve as shade trees in an area where shade is of the utmost importance to man and beast.

Habitat transformation, from natural veld to other uses, takes place through cultivated areas, forestry, mines, urban development, grazing, soil erosion, fire, roads, alien species and harvesting of natural resources. An area of uncertainty in veld type change or alteration is the effect of overgrazing (in most cases) or disturbance of the veld type. Mucina & Rutherford (2006) state that they do not have sufficient data to be able to presently map the influence of grazing on the veld types.

Mucina & Rutherford (2006) have various criteria that they evaluated in terms of the status of the 433 vegetation types that they mapped. The SVk 4 Kimberley Thornveld rates as follows under these systems:

Red-listed species	None
Protection status	Poorly
Ecosystem status	Not mentioned (no threat)

Protection levels	Not mentioned (no problem)
Irreplaceability analysis	Lowest (no threat)

One of the crucial ways of maintaining biodiversity is to focus conservation efforts on areas where Red-listed species (plants and animals) occur (Wilcove *et al*, 1998). There are no Red-listed plants on this site.

There are no red data plants in the study area and conservation efforts then emphasize plant species diversity and turnover and habitat transformation. The emphasis then shifts to matters like ecosystem functioning (pollination, nutrient cycling) and in plant species diversity at the landscape scale. Vegetation types were classified based on the extent of remaining area (currently not transformed) of each vegetation type (Mucina & Rutherford, 2006).

The SVk 4 Kimberley Thornveld as a whole is thus not regarded as vulnerable or under threat by a variety of potential threats.

VULNERABILITY AND DEGRADATION ASSESSMENT

An added number of criteria were also introduced by Mucina & Rutherford (2006) and the concept of “Land Use Vulnerability” of vegetation types of South Africa was introduced. In this classification the vegetation types are scored on a scale of “Very low”, “Low”, “Medium”, “High” and “No natural habitat left”.

The SVk 4 Kimberley Thornveld falls into the following categories for the following categories under “Land Use Vulnerability”:

Crop potential	Very low
Afforestation potential	Very low
Mining potential	Very low
Population density increase	Very low
Alien plant invasion suitability	Low
Habitat fragmentation index	Very low

The SVk 4 Kimberley Thornveld as a whole is thus not regarded as vulnerable or under threat by a variety of potential threats.

The SVk 4 Kimberley Thornveld was also measured against categories under a section of “Degradation Vulnerability”:

Land use vulnerability	Very low
Degradation vulnerability	Very low
Overall vulnerability	Very low

The SVk 4 Kimberley Thornveld as a whole is thus not regarded as vulnerable or under threat by a variety of potential threats.

ENVIRONMENTAL IMPACT ASSESSMENT

The evaluation method used in the assessment of the development on the botany of the study area is the method published by Hacking (1998).

The list of identified impacts are evaluated hereunder in terms of the following criteria:

SEVERITY	<ul style="list-style-type: none">- Low negative impact- Medium negative impact- High negative impact
DURATION	<ul style="list-style-type: none">- Short-term- Medium-term- Long-term
SPATIAL SCALE	<ul style="list-style-type: none">- Localised- Fairly widespread- Long-term
CONSEQUENCE	<ul style="list-style-type: none">- Low consequence- Medium consequence- High consequence
SIGNIFICANCE	<ul style="list-style-type: none">- Low overall significance- Medium overall significance- High overall significance

Evaluations are done in terms of the impacts being managed to reduce environmental damage.

LEGEND FOR TABLE

Se = Severity
 D = Duration
 SP= Spatial scale
 C = Consequence
 P = Probability

L = Low negative impact
 M = Medium negative impact
 H = High negative impact
 pos = Positive impact

EVALUATION

ACTIVITY	DESCRIPTION	Se	D	SP	C	P	Si
1. CONSTRUCTION PHASE IMPACTS							
Construction	Construction of roads	M	M	L	M	H	M
Construction	Installation of bulk services	M	M	L	L	H	M
Construction	Blasting	M	L	L	L	M	M
Construction	Noise generation	M	M	L	L	H	M
Construction	Air pollution (Dust generation)	M	M	L	L	M	M
Construction	Topographical change	L	L	L	L	L	L
Construction	Soil pollution	L	L	L	L	L	L
Construction	Ground water effects	L	L	L	L	L	L
Construction	Land capability	M	M	L	L	H	M
Construction	Geological degradation	L	L	L	L	L	L
Construction	Loss/destruction of plants	M	M	L	L	H	M
Construction	Effect on animals	M	M	L	M	H	M
Construction	Loss of archaeological items	L	L	L	L	L	L
Construction	Sensitive areas	L	L	L	L	L	L
Construction	Visual impact	L	L	L	L	L	L
2. OPERATIONAL PHASE IMPACTS							
Urban area	Geological degradation	L	L	L	L	L	L
Urban area	Topographic change	L	L	L	L	L	L
Urban area	Noise generation	L	L	L	L	L	L
Urban area	Soil pollution	L	L	L	L	L	L
Urban area	Depressed water table	L	L	L	L	L	L
Urban area	Problem plant invasion	L	L	L	L	L	L
Urban area	Effect on animals	L	L	L	L	L	L
Urban area	Air quality (Dust and emissions)	L	L	L	L	L	L
Urban area	Noise generation	L	L	L	L	L	L
Urban area	Visual area	L	L	L	L	L	L
Urban area	Loss of archaeological items	L	L	L	L	L	L
3. DECOMMISSIONING PHASE IMPACTS							
Not applicable							
4. RESIDUAL IMPACTS AFTER CLOSURE							
Not applicable							

It is clear that the environmental impacts are primarily during the construction phase where after the relatively peaceful urban area phase takes over.

The development as planned will have a medium to low impact on the SVk 4 Kimberley Thornveld but not significantly affect the Kimberley Thornveld as a whole.

RECOMMENDATIONS

The only mitigating measure than can be suggested is that as many of the trees, but especially large trees, of all species be retained to retain some biodiversity and to maintain some aesthetic appeal.

There are also alien and invasive species that occur on the property and these need to be eradicated before construction commences. Disturbance of soil causes these species to proliferate and it is imperative that these species are removed from the ecosystem.

No development must take place in the drainage line system as it is regarded as moderately sensitive.

A permit is required from the Department of Water Affairs & Forestry if camel thorn trees are to be removed.

REFERENCES

Adams, J. 1976. Wild flowers of the Northern Cape. Provincial Administration of the Cape of Good Hope, Cape Town

Bromilow, C., 2001. Problem plants of South Africa. Briza Publications, Pretoria.

Low, A.B. & A.G. Rebelo, 1996. Vegetation of South Africa, Lesotho and Swaziland. Dept Environmental Affairs & Tourism, Pretoria

Copper Sunset Trading 100 (Pty) Ltd., 2005. Control of unwanted plants. XACT INFORMATION

Hacking, T. 1998. An innovative approach to structuring Environmental Impact Assessment Reports. AATS – Envirolink, Anglo American Corporation. Internal Report.

Moll, E. J., 1977. Trees of Southern Africa. C. Struik Publishers, 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.

Palgrave, K.C., Trees of Southern Africa. C. Stui Publishers, Cape Town.

Van Oudtshoorn, F.P., 1991. Guide to the grasses of South Africa. Briza Publications, Arcadia.

Van Rooyen, N., 2001. Flowering plants of the Kalahari. Ekotrust CC, Pretoria. 216pp.

Vegter, J.R., 1995. Groundwater resources of South Africa: An explanation of a set of national groundwater maps. Water Research Commission.

Wilcove, D.S., Rothstein, D., Dubow, D., Phillips, A. & Losos, E. 1998. Quantifying threats to imperiled species in the United States. *BioScience* 48. : 607 – 615.