NAME OF APPLICANT: AUTUMN SKIES RESOURCES AND LOGISTICS (PTY) LTD

REFERENCE NUMBER: (NC) 10038 MR

ENVIRONMENTAL IMPACT ASSESSMENT AND ENVIRONMENTAL MANAGEMENT PROGRAMME

MARCH 2014 – VERSION 1

**SUBMITTED FOR AN APPLICATION
FOR A MINING RIGHT
IN TERMS OF SECTION 39 AND OF
REGULATIONS 50 AND 51 OF THE MINERAL
AND PETROLEUM RESOURCES DEVELOPMENT
ACT, 2002,
(ACT NO. 28 OF 2002) (the Act)**

mineral resources

Department:
Mineral Resources
REPUBLIC OF SOUTH AFRICA

STANDARD DIRECTIVE

All applicants for mining rights are herewith, in terms of the provisions of Section 29(a) and in terms of Section 39(5) of the Mineral and Petroleum Resources Development Act, directed to submit an Environmental Impact Assessment, and an Environmental Management Programme strictly in accordance with the subject headings herein, and to compile the content according to all the sub items to the said subject headings referred to in the guideline published on the Departments website, within 30 days of notification by the Regional Manager of the acceptance of such application.

FULL PARTICULARS OF THE APPLICANT

ITEM	COMPANY CONTACT DETAILS
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ITEM	CONSULTANT CONTACT DETAILS (if applicable)
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SECTION 1
ENVIRONMENTAL IMPACT ASSESSMENT

REGULATION 50(a)

1. Description of the baseline environment

1.1. Concise description of the environment on site relative to the environment in the surrounding area.

1.1.1. Air Quality:

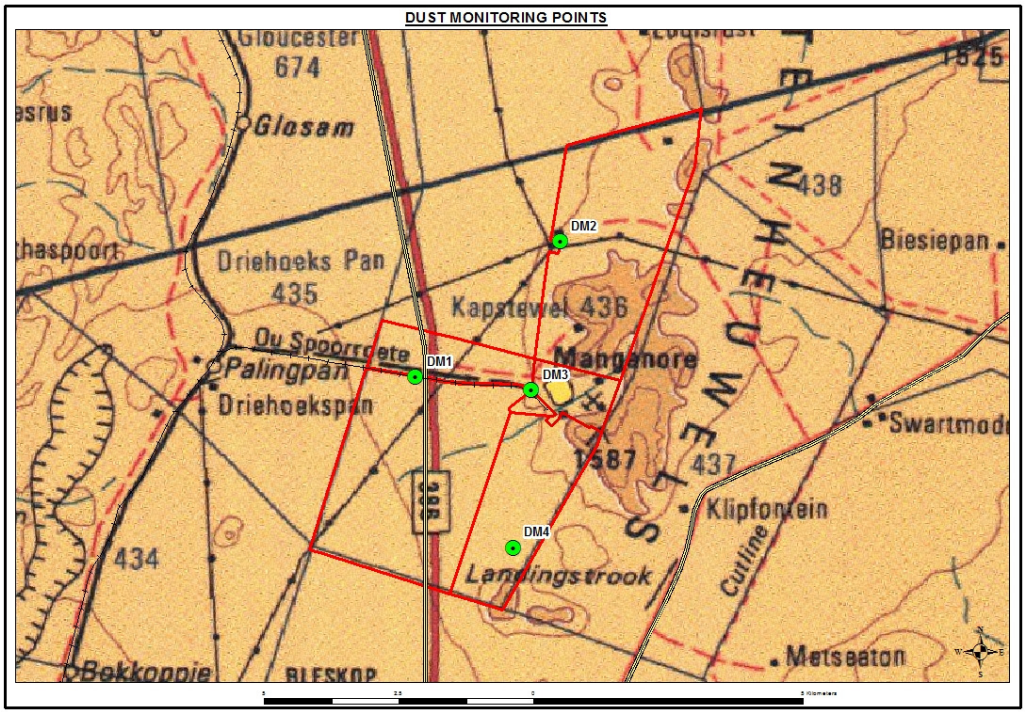

Figure 1 - Bucket monitoring points

Dustwatch, Dust Monitoring Specialists, compiled a baseline dust fall-out monitoring report for the period 1 February 2014 – 1 March 2014, to establish the baseline fall-out levels on the application area. Find attached hereto as Annexure 'A' the baseline report. A single bucket monitoring system was implemented to measure the baseline air quality of the application area. The report of Dustwatch covers a 28-day period with the buckets changed twice.

The baseline dust monitoring points were located at the following coordinates:

Coordinates		
	East	South
SB1	23°4'46.743"	28°09'08.827"
SB2	23°6'13.992"	28°07'47.249"
SB3	23°5'56.978"	28°09'17.116"
SB4	23°5'46.072"	28°10'50.909"

The fall-out dust standards from National Dust Control Regulations, 2013.

Restriction Areas	Dustfall rate (D) (mg/m^2/day) – averaged over 30 days	Permitted frequency of exceeding dust fall rate
Residential area	D < 600	Two within a year, not sequential months.
Non-residential area	600 < D < 1200	Two within a year, not sequential months.

Unit No. 1 yielded 57 and 46_mg/m^2/day, collected in the first and second cycle respectively. The results are low and well below 1200_mg/m^2/day.

Unit No. 2 yielded 366 and 9_mg/m^2/day, collected in the first and second cycle respectively. The results are not a concern.

Unit No. 3 yielded 66 and 28_mg/m^2/day, collected in the first and second cycle respectively. The results are well below 1200_mg/m^2/day.

Unit No. 4 also yielded low results in this period with all of the results being below 200_mg/m^2/day.

None of the monthly average results exceeded 1200_mg/m^2/day or 600_mg/m^2/day and the results are not a concern.

Unit name	Residential or Non-residential Area	Applicable Compliance - Dustfall rate (D) (mg/m^2/day) – averaged over 30 days.	Non-compliant or compliant. Two within a year, not sequential months.*
Unit 1 (SB1)	(Non-residential)	600 < D < 1200	Compliant
Unit 2 (SB2)	(Non-residential)	600 < D < 1200	Compliant
Unit 3 (SB3)	(Non-residential)	600 < D < 1200	Compliant
Unit 4 (SB4)	(Non-residential)	600 < D < 1200	Compliant

To ensure that Autumn Skies Resources and Logistics (Pty) Ltd's (hereinafter referred to as Autumn Skies) mining operation adheres to the Management Standards as set out in the Air Quality Act 2004 (Act 39 of 2004), the Regulations to the Mineral and Petroleum Resources Development Act (Act 28 of 2002) and the Mine, Health and Safety Act (Act 29 of 1996), Autumn

Skies will appointed an accredited company to continuously monitor the air quality of the operation.

1.1.2. Archaeological, cultural and heritage environment:

G&A Heritage Management Consultants was appointed to conduct an assessment of the archeological, cultural and heritage environment on the application area. Find attached hereto as Annexure 'B' the report.

- **Site 1:**
  This site contains the remains of an old mining complex. There are various prospecting trenches, mine buildings and an ore crushing facility. Scrap metals, building rubble and old vehicle parts scatter the area. The site is probably less than 60 years of age and is deemed of low significance.

  The site is located at:

28,13266°E	**23,11854°S**

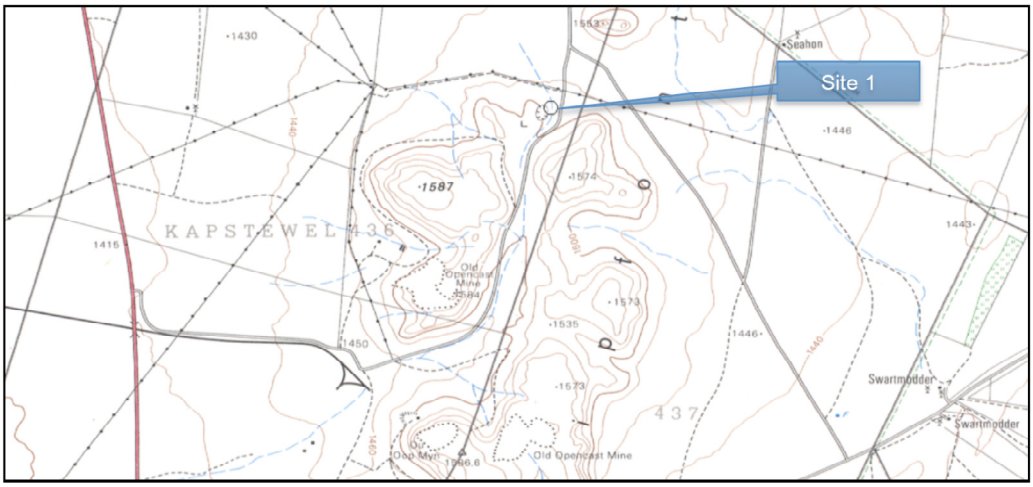

Figure 2 – Locality of site 1

- **Site 2:**
  This is a site with some low stone walled features, possibly dating to either the Iron Age or to earlier Later Stone Age hunter-gatherers. There are at least 3 circular and semi-circular features that might represent either windbreaks for shelters or dwellings. No artifacts were identified. The exact function or age of these features is unknown at this state, and more investigation is needed. The site is deemed to be of medium to high significance, and some mitigation measures need to be implemented should mining operations take place in this area.

The site is located at:

28,14171°E	**23,11661°S**

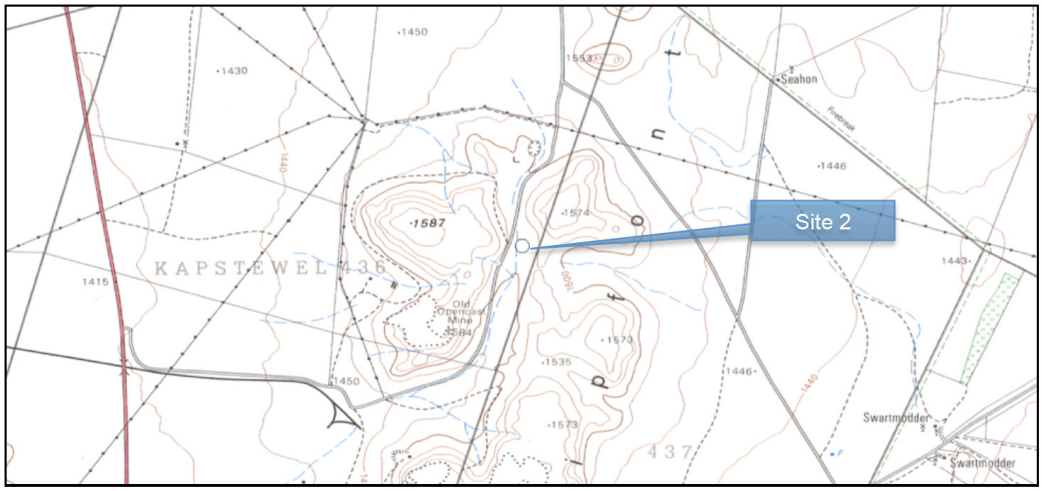

Figure 3 – Locality of Site 2

- **Site 3:**
  This is a possible grave. It is a stone packed, rectangular-shaped feature with no visible headstone. Some pieces of undecorated porcelain were found near to it. If this is indeed an unknown grave it is of high significance. If the mining operations are to impact directly on this area, this will have to be taken into consideration and the mining plans will have to be altered in order to avoid disturbing the grave. If not possible, the grave will have to be exhumed and relocated after all necessary processes related to graves have been undertaken.

  The site is located at:

28,14229°E	**23,11664°S**

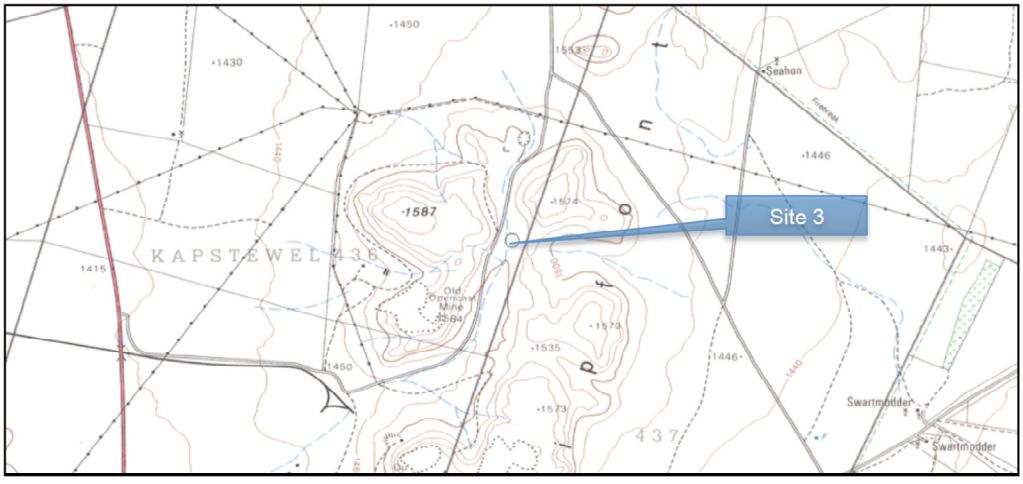

Figure 4 – Locality of Site 3

- **Site 4:**

  The site contains at least 9 circular (stone-lined) depressions, stretched in a row along an old mine prospecting road. The function or exact age of these features is unknown, but it is possible that it is related to the recent historic mining activities in the area and that it represents a mine camp where tents were pitched. The linear layout of the site does not conform to the Iron Age and its location next to the road does seem to favor the mine camp conclusion. Bottles and other cultural material found in the vicinity also seems to date the site to the 1960's/70's. The site has low significance, as it most probably is less than 60 years of age.

  The site is located at:

28,14735°E	**23,11530°S**

- **Site 5:**

  This is an old farmstead, with a number of buildings and features on it. It is less than 60 years of age and not very significant.

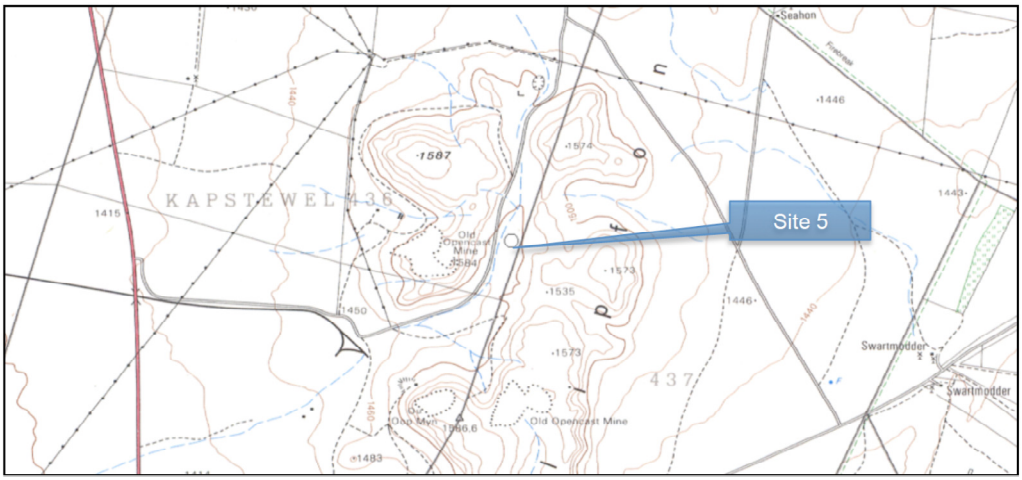

Figure 5 – Locality of Site 5

- **Site 6 & 7:**

  This site represents the old mine offices and complex of the old SAMANCOR Manganore mining operations. It contains various buildings and features. This could be re-used for the new mining operations. It is less than 60 years of age. It has low cultural heritage significance.

  The site is located at:

28,14735°E	**23,11530°S**

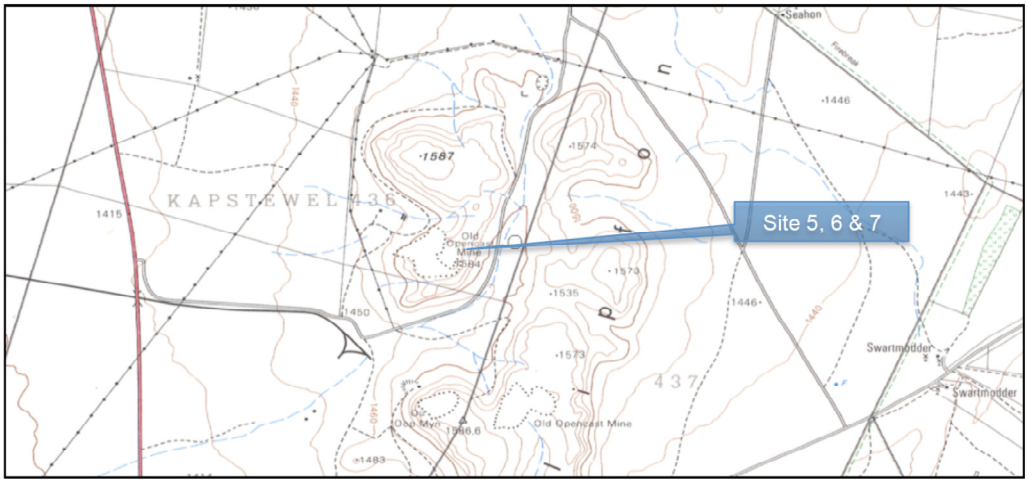

Figure 6 – Localities of Sites 6 & 7

- **Site 8:**

  These are the remains from the SAMANCOR Manganese Mine originally developed by AMMOSAL. Although the site was abandoned in the early 1970's it is possible that some of the structures date back to the 1930's when the South African Manganese Company Ltd initiated prospecting on the farm Kapstewel. The remains consist mainly of some industrial mining structures such as conveyor belts and several dilapidated buildings. Some of the multi-story buildings seem to be in danger of imminent collapse.

  The site is located at:

28,16111°E	**23,10186°S**

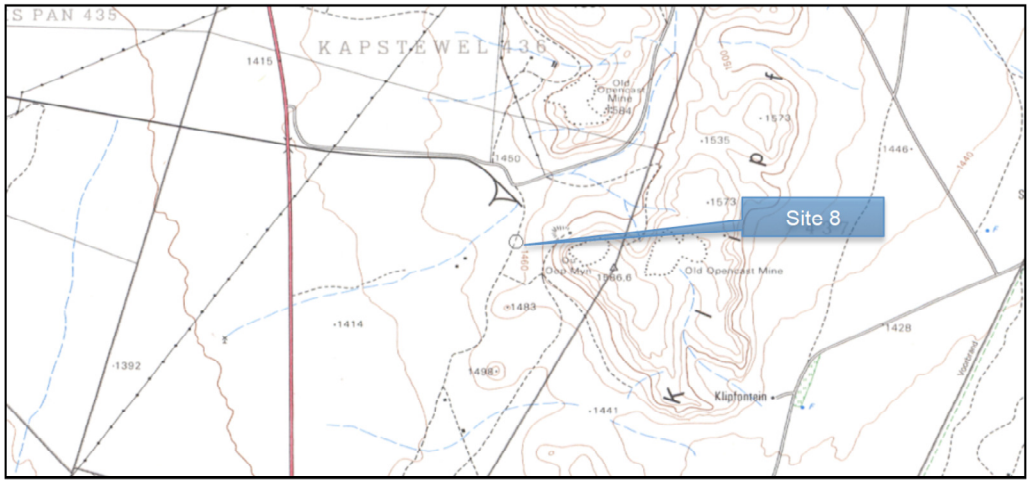

Figure 7 – Locality of Site 8

1.1.3. Climate:

- **Regional:**

  The area is located in a semi-arid region, receiving on average about 250mm of rain per annum. It is situated within the Sn climate region. The rainfall is largely due to showers and thunderstorms falling in the summer months October to march. The peak of the rainy season is normally March or February. The summers are very hot with cool winters.

- **Mean monthly & annual rainfall:**

Year	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1999	59.2	3.0	28.4	32.2	51.0	0.4	0.0	0.0	0.0	50.8	0.0	209.4
2000	52.6	136.0	77.0	26.2	0.0	0.0	2.2	2.6	43.2	1.2	17.2	62.6
2001	16.2	47.8	121.8	165.0	4.2	17.6	1.2	3.2	35.2	9.6	95.2	58.4
2002	48.2	24.4	32.4	44.4=	36.2	35.6	0.0	37.8	1.8	5.8	34.6	45.0
2003	38.6	100.4	17.8	27.0	1.4	0.0	0.0	5.2	22.8	3.6	25.0	13.4
2004	109.0	40.4	36.0	43.8	0.0	1.0	0.0	0.8	27.0	0.2	2.2	20.8
2005	35.2	83.4	41.2	7.0	11.4	1.8	0.0	0.0=	0.0	22.8	49.6	11.0
2006	80.6	84.2	26.6	63.8	55.6	17.2	8.0	12.8	0.0	9.6	9.0	34.2
2007	2.6=	7.2=	52.0	59.6	0.6	7.4	0.8	0.2	6.8=	48.0	11.2=	26.8=
2008	74.2	51.6=	33.4=		45.0=	39.0	1.0	0.2	0.0	37.8	37.6	21.0
2009	75.4	51.9	15.6=	9.6	10.2	4.8	3.8	0.0	0.0	19.4	25.8	30.6
2010	192.4	117.6	47.2	28.6	0.6	0.0	0.0	0.0	0.2=		6.6=	2.4
2011	40.8	58.6	56.2	35.4	28.8	27.8	1.8					

Source: South African Weather Service
Station [0311107] - Postmasburg WO
Measured at 08:00 in mm
= indicates that the average is unreliable due to missing daily values

- **Mean monthly & annual maximum temperatures:**

Year	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1999	33.2	34.3	31.9	27.0	20.1	19.5	19.4	20.8	23.4	27.1	32.4	
2000	27.5	30.4	28.3	24.2	21.6	20.5	18.5	23.5	23.0	29.8		32.9
2001	33.1	31.7	30.4	23.9	21.7	18.7	16.2	19.1	21.5	29.0	27.7	30.5
2002	32.0	32.4	30.1	27.9=	21.2	16.9	17.1	20.6	25.1	29.6	28.7	31.4
2003	33.3	31.0	29.8	26.7	21.4	18.3	19.9	17.8	23.9	27.5	30.3	32.5
2004	31.3	31.0	28.7	24.3	24.3	18.7	16.8	22.0	23.1	26.9	32.2	33.2
2005	32.5	30.6	27.3	23.0	21.4	19.5	21.2	20.3=	26.6	28.0	29.1	31.8
2006	30.5	27.8	26.3	23.5	17.5	18.7	19.1	18.9	25.1	28.5	29.9	32.1
2007	32.1=		28.8=	26.5	21.7	17.9	18.6	21.3	27.8=	25.8	28.6=	28.4=
2008	32.6	29.8	27.4=		19.4=	18.5	18.4	22.1	24.4	30.7	32.1	34.0
2009	33.1	29.5	26.2=	26.3	21.6	17.8	17.4	22.6	28.0	29.9	30.9	35.0
2010	29.9	31.9	30.3	26.1	23.2	19.6	20.5	23.5	28.4	28.4	30.6	31.8
2011	30.7	29.5	29.0	24.7	21.0	17.3	17.3	21.8	27.2	28.0	30.1	31.6=

Source: South African Weather Service
Station [0311107] - Postmasburg WO
Measured at 08:00 in °c
= indicates that the average is unreliable due to missing daily values

- **Mean monthly & annual minimum temperatures:**

Year	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1999	17.6	18.0	17.3	11.3	7.8	3.1	4.7	3.4	7.1	13.0	15.2	
2000	14.5	16.7	16.1	10.0	4.2	2.8	0.9	4.5	5.8	12.0		16.1
2001	15.2	15.8	15.9	11.9	6.5	3.7	0.4	1.0	5.0	11.6	13.6	14.0
2002	15.0	15.2	13.8	11.7=	5.0	1.1	-0.2	4.0	7.1	10.6	11.3	14.5
2003	15.4	15.8	12.9	11.8	4.4	-0.2	1.1	0.6	6.5	10.5	14.3	13.5=
2004	15.7	15.7	14.0	9.3	6.6	1.1	-0.8	3.2	5.6	10.7	14.4	15.4
2005	16.2	16.0	13.1	8.3	4.8	1.6	1.6	4.0=	7.2	10.4	11.9	13.6
2006	16.7	15.6	11.8	8.8	2.6	1.1	0.9	2.7	6.1	11.0	13.0	15.0
2007	16.5=		13.5=	12.8	3.7	1.3	0.8	2.7	8.8=	11.2	10.8=	15.8=
2008	19.3	16.8	15.1=		7.8=	3.1	2.1	4.5	4.2	11.1	13.4	16.1
2009	16.2	17.4	16.1=	10.6	5.3	4.1	1.1	4.8	7.0	13.6	13.4	15.5
2010	18.1	16.5	16.3	11.8	6.9	1.9	3.9	3.7	10.0	10.5	13.5	16.2
2011	17.5	16.9	16.1	10.7	6.8	0.8	0.2	3.3	7.3	8.8	10.2	15.7=

Source: South African Weather Service
Station [0311107] - Postmasburg WO
Measured at 08:00 in °c
= indicates that the average is unreliable due to missing daily values

- **Annual evaporation:**

The Northern Cape is characterized by a harsh climate with minimal rainfall and prolonged droughts. The area's arid climate is accompanied by high evaporation due to the intense heat of the summer months. The mean annual temperature is 17.4 °c. The mean annual precipitation is approximately 300mm in the area. The mean annual evaporation is approximately 2350 in the area.

- **Wind direction and speed:**

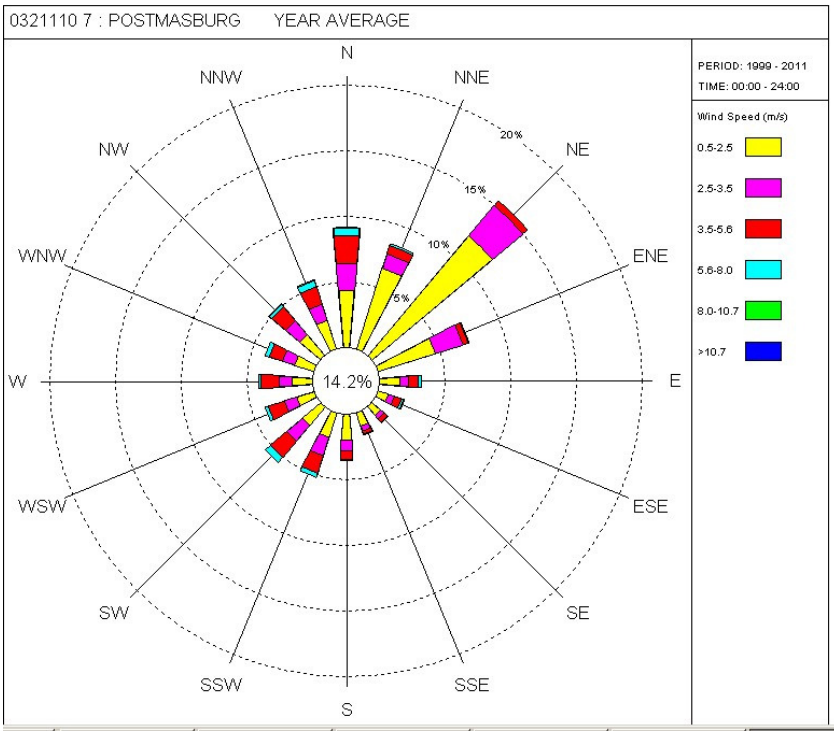

Figure 8 - Wind rose for the period 1999 - 2011
Source: South African Weather Service
Station [0311107] - Postmasburg WO

PRD	0.5-2.5	2.5-3.5	3.5-5.6	5.6-8.0	8.0-10.7	>10.7	TOTAL
N	4118	2000	2046	543	82	4	8793
NNE	6192	1114	644	124	15	0	8089
NE	11402	2841	483	36	2	0	14764
ENE	4306	2126	394	65	7	0	6898
E	1454	598	654	256	48	2	3012
ESE	744	442	522	211	38	3	1960
SE	774	366	291	84	5	0	1520
SSE	963	331	285	74	4	0	1657
S	1811	803	603	89	9	0	3315
SSW	1784	1465	1327	268	8	0	4852
SW	1686	1533	1600	441	25	0	5285
WSW	1346	912	1267	243	4	0	3772
W	1497	918	1321	170	2	0	3908
WNW	1488	910	1040	299	19	0	3756
NW	1960	1339	1324	273	38	0	4934
NNW	2177	1262	1342	480	64	2	5327
TOTAL	43702	18960	15143	3656	370	11	

Source: South African Weather Service
Station [0311107] - Postmasburg WO
Measured in m/s
Time range: 00:00 - 24:00
Year: 1999 - 2011

- **<u>Incidence of extreme weather conditions:</u>**
  Fog and snow are unlikely to occur in the area, and thunder showers irregularly occur in the summer months from October to March. The period during which frost can be expected lasts for about 120 days (May to August). With extreme minimum temperatures to below -8°C at night in the winter, frost development can be severe.

  Hail is sometimes associated with thunderstorms and mainly occurs in early to late summer (November to February). It occurs on average three times a year and although these storms may sometimes be severe and cause much damage, they usually impact on a relatively small area.

  High winds, in excess of 8,0 m/s, are likely to occur at a frequency of 0,6% (i.e. once in every 22 days of the year). This is common in the months of September and October.

  Excessive temperatures (i.e. above 45 °C) can occur in the months of December and January. These frequently correlate with an excessively dry humidity score.

  Rainfall in excess of 36 mm during a 60-minute period does not frequently occur.

Droughts are common and may vary from mild to severe. During these periods dust storms sometimes occur, depending mainly on denudation of the surface.

1.1.4. Fauna:

Professional Natural Scientist, Mr. B.H. Erasmus, was appointed to conduct an assessment of the fauna on the application area. Find attached hereto as Annexure 'C' the report as compiled by him.

Herewith a summary of the information as contained in the said specialist report:

The SVk 10 Kuruman Mountain Bushveld and SVk 9 Kuruman Thornveld were grouped together for the faunal species as these are mobile and the veld types occur next to each other. The possibility of vertebrate species occurring in both veld types is very high.

The following fauna could potentially occur in the area according to literature and own research:

- **Herpetofauna**

  A total of 37 reptile and seven amphibian species, none of which appear in the current Red Data Book for "Endangered species", may be encountered at the study area. There are man-made ground dams in the area. Furthermore, some of the historical prospecting and mining areas hold water periodically. No amphibian species were recorded, whilst one reptile species was sighted. All tortoise species currently enjoy protected status.

  The herpetofauna that potentially could occur at the study sight are listed below, whilst an asterisk indicates species that were observed or identified by other means.

  - **AMPHIBIANS**

Scientific name	Common name
Xenopus laevis	**Common platanna**
Bufo gariepensis	**Karoo toad**
Bufo gutturalis	**Guttural toad**
Bufo garmani	**Olive toad**
Tomopterna cryptotis	**Tremolo sand frog**
Rana angolensis	**Common river frog**
Rana fuscigula	**Cape river frog**

- **REPTILES**

Scientific name	Common name
Psammobates tentorius	Tent tortoise
Pelomedusa subrufa	Marsh terrapin
Geochelone pardalis	Leopard tortoise
Typhlops lalandei	Delalande's blind snake
Leptotyphiops conjunctus	Cape thread snake
Lamprophis fuligonosus	Brown house snake
Pseudaspis cana	Mole snake
Prosymna sundevalli	Sundevall's shovel-snout
Dipsina multimaculata	Dwarf beaked snake
Psannophis notostictus	Karoo sand snake
Psammophis leightoni	Cape sand snake
Dasypeltis scabra	Common egg eater
Telescopus beetzii	Namib tiger snake
Dispholidus typus	Boomslang
Naja nivea	Cape cobra
Bitis arietans	Puffadder
Bitis caudalis	Horned adder
Zygaspis qaudrifrons	Kalahari round-headed worm lizard
Monopeltis capensis	Cape spade-snouted worm lizard
Mabuya capensis	Cape skink
Mabuya occidentalis	Western three-striped skink
Mabuya sulcata	Western rock skink
Mabuya variegata	Variegated skink
Nucras intertexta	Spotted sandveld lizard
Pedioplanis lineoocellata	Spotted sandveld lizard
Pedioplanis namaquensis	Namaqua sand lizard
Gerrhosaurus flavigularis	Yellow-throated plated lizard
Cordylus polyzonus	Karoo girdled lizard
Varanus excanthematicus	Rock monitor
Varanus niloticus	Water monitor
**Agama aculeata*	Ground agama
Agama atra	Southern rock agama
Chamaeleo dilepis	Flap-necked chamaeleon
Pachydactylus bibronii	Bibron's gecko
Pachydactylus capenis	Cape gecko
Pachydactylus mariquensis	Marico gecko
Ptenopus garrulus	Common barking gecko

- **BIRDS**

  According to available literature a total of 169 bird species could be encountered at the study site. A total of nine species were recorded during the field visit (see asterisks). No Red Data species was

encountered. It must be kept in mind, however, that all raptor (birds of prey) species, over and above a possible RDB species, are categorized as protected wild animals in the Northern Cape Province.

The following species potentially occur in the study area:

Scientific name	Common name
Bubulcus ibis	**Cattle egret**
Ciconia ciconia	**White stork**
Bostrychia hagedash	**Hadeda ibis**
Alpochen aegyptioaca	**Egyptian goose**
Aquila pennatus	**Booted eagle**
Buteo rufofuscus	**Jackal buzzard**
Buteo vulpinus	**Steppe buzzard**
****Melierax canorus***	**Southern pale chanting goshawk**
Milvus migrans	**Black kite**
Milvus parasitus	**Yellow-billed kite**
Elanus caerulens	**Black-shouldered kite**
Polihierax semitorquatos	**Pygmy falcon**
Melierax gabar	**Gabar goshawk**
Falco biarmicus	**Lanner falcon**
Falco peregrinus	**Peregrine falcon**
Falco naumanni	**Lesser kestrel**
Falco rupicollis	**Rock kestrel**
Falco rupicoloides	**Greater kestrel**
Scleroptila levaillantoides	**Orange river francolin**
Numidea meleagris	**Helmeted guineafowl**
Struthio camelus	**Common ostrich**
Coturnix coturnix	**Common quail**
Turnix sylvaticus	**Small buttonquail**
Anthropoides paradisceus	**Blue crane**
Sagittarius serpentarius	**Secretary bird**
Ardeotis kori	**Kori bustard**
Neotis ludwigii	**Ludwig's bustard**
Eupodotis vigorsii	**Karoo korhaan**
****Eupodotis afraoides***	**Northern black korhaan**
Vanellus coronatus	**Crowned lapwing**
Burhinus capensis	**Spotted thick-knee**
Cursorius temminckii	**Temminck's courser**
Cursorius rufus	**Burchell's courser**
Rhinoptilus africanus	**Double-banded courser**
****Pterocles namaqua***	**Namaqua sandgrouse**
Columba guinea	**Speckled pigeon**
Columbia livia	**Rock dove**
Streptopelia semitorquata	**Red-eyed dove**
Streptopelia capicola	**Cape turtle dove**
Streptopelia senegalensis	**Laughing dove**

***Oena capensis**	**Namaqua dove**
***Chrysocoxxyx caorius**	**Diderick cuckoo**
***Bubo lacteus**	**Verreaux's eagle owl**
***Bubo africanus**	**Spotted eagle owl**
***Tyto alba**	**Barn owl**
***Caprimulgus europaeus**	**European nightjar**
***Caprimulgas rufigena**	**Rufous-cheeked nightjar**
***Tachymorptis melba**	**Alpine swift**
***Apus apus**	**Common swift**
***Apus barbatus**	**African black swift**
***Apus affinus**	**Little swift**
***Apus horus**	**Horus swift**
***Apus caffer**	**White-rumped swift**
***Cypsiurus parvus**	**African palm swift**
***Urocolius indicus**	**Red-faced mousebird**
***Colius striatus**	**Speckled mousebird**
***Colius colius**	**White-backed mousebird**
***Merops apiaster**	**European bee-eater**
***Merops bullochoides**	**White-fronted bee-eater**
***Merops hirundineus**	**Swallow-tailed bee-eater**
***Caracias garrulus**	**European roller**
***Tockus nasutus**	**Afican grey hornbill**
***Phoeniculus purpereus**	**Green wood hoopoe**
***Rhinopomatus cyanomelas**	**Common scimitarbill**
***Upupa africana**	**African hoopoe**
***Indicator minor**	**Lesser honeyguide**
***Tachyphonus vaillantii**	**Crested barbet**
***Tricholaena leucomelas**	**Acacia pied barbet**
***Dendropicos fuscescens**	**Cardinal woodpecker**
***Mirafra fasciolata**	**Eastern clapper lark**
***Calendulauda sabota**	**Sabota lark**
***Mirafra africanoides**	**Fawn-coloured lark**
***Calandrella cinerea**	**Red-capped lark**
***Spizocorys conirostris**	**Pink-billed lark**
***Eremopterix leacotis**	**Chesnut-backed sparrowlark**
***Eremopterix verticalis**	**Grey-backed sparrowlark**
***Chersomanes albofasciata**	**Spike-heeled lark**
***Hirundo spilodera**	**South-African cliff swallow**
***Hirundo cucullata**	**Greater striped swallow**
***Hirundo rustica**	**Barn swallow**
***Hirundo albigularis**	**White-throated swallow**
***Hirundo dimidiata**	**Pearl-breasted swallow**
***Delichon urbicom**	**Common house martin**
***Riparia riparia**	**Sand martin**
***Riparia paludicola**	**Brown-throated martin**
***Hirundo fuligula**	**Rock martin**
***Dicrurus adsimilis**	**Fork-tailed drongo**

Oriolus oriolus	**Eurasian golden oriole**
****Corvus albus***	**Pied crow**
Corvus capensis	**Cape crow**
Parus cinerescens	**Ashy tit**
Pycrionotus nigricans	**African red-eyed bulbul**
Turdus smithi	**Karoo thrush**
Monticola breviceps	**Short-toed rock thrush**
Cercomela familiaris	**Familiar chat**
Cercomela sinuata	**Sickle-winged chat**
Oenanthe monticola	**Mountain wheatear**
Oenanthe pileata	**Capped wheatear**
Saxicola torquatus	**African stonechat**
****Myrmecocichla formicivora***	**Southern ant-eating chat**
Cassypha caffra	**Cape robin-chat**
****Cercotricas paena***	**Kalahari scrub robin**
Cercotricas coryphoeus	**Karoo scrub robin**
Phylloscopus trochilus	**Willow warbler**
Eromomela icteropygialis	**Yellow-bellied eremomela**
Anthoscopus minutus	**Cape penduline tit**
Stenostira scita	**Fairy flycatcher**
Parisoma layardi	**Layard's tit-babbler**
Parisoma subcaeruleum	**Chestnut-vented tit-babbler**
Sylvietta rufescens	**Long-billed crombec**
Cisticola juncidis	**Zitting cisticola**
Cisticola aridulus	**Desert cisticola**
Cisticola fulvicapilla	**Neddicky**
Cisticola subruficapilla	**Grey-backed cisticola**
Cisticola tinnicus	**Levaillant's cisticola**
Phragmacia substriata	**Namaqua warbler**
Malcorus pectoralis	**Rufous-eared warbler**
Prinia flavicans	**Black-chested prinia**
Musicapa striata	**Spotted flycatcher**
Sigelus silens	**Fiscal flycatcher**
Bradornis infuscatus	**Chat flycatcher**
Bradornis mariquensis	**Marico flycatcher**
Terpsiphone viridis	**African paradise flycatcher**
Zosterops capensis	**Cape white-eye**
Batis pririt	**Pririt batis**
Motacilla capensis	**Cape wagtail**
Anthus cinnamomeus	**African pipit**
Anthus vaalensis	**Buffy pipit**
Macronyx capensis	**Cape longclaw**
Laniarius atrococcineus	**Crimson-breasted shrike**
Corvinella melanoleuca	**Magpie shrike**
Lanius collurio	**Red-backed shrike**
Lanius minor	**Lesser grey shrike**
Lanius collaris	**Common fiscal**

Tchraga australis	**Brown-crowned tchagra**
Telephorus zeylonus	**Bokmakierie**
Nilaus afer	**Brubru**
Lamprotornis nitens	**Cape glossy starling**
Onynchognathus nabouroup	**Pale-winged starling**
Onithognathus moris	**Red-winged starling**
Creaophors cinerea	**Wattled starling**
Cinnyris fuscus	**Dusky sunbird**
Passer domesticus	**House sparrow**
Passer melanurus	**Cape sparrow**
Passer diffusus	**Southern grey-headed sparrow**
Plocepasser mahali	**White-browed sparrow weaver**
Philetairus socius	**Sociable weaver**
Ploceus valatus	**Southern-masked weaver**
Quelea quelea	**Red-billed quelea**
Euplectes orix	**Southern red bishop**
Vidua macroura	**Pin-tailed whydah**
Vidua regia	**Shaft-tailed whydah**
Logonosticta senegala	**Red-billed firefinch**
Granatina granatina	**Violet-eared waxbill**
Estrilda erythronotus	**Black-faced waxbill**
Estrilda astrild	**Common waxbill**
Amadina erythrocephala	**Red-headed finch**
Sporopipes squamifrons	**Scaly-feathered finch**
Ortygospiza atricollis	**Afican quailfinch**
****Serinus flaviventris***	**Yellow canary**
Serinus atrogularis	**Black-throated canary**
Serinus canicollis	**Cape canary**
Alario alario	**Black-headed canary**
Alario leucoleuma	**Damara canary**
Serinus albogularis	**White-throated canary**
Emberiza tahapisi	**Cinnamon-breasted bunting**
Emberhiza flaviventris	**Golden-breasted bunting**
Emberhiza impetuani	**Lark-like bunting**
Emberhiza capensis	**Cape bunting**

- **Mammals**

  Available literature and own research records list a total composition of 61 mammal species for the study area. A number of 13 of these species were observed directly or indirectly during the survey of the study area (asterisks). No Red Data Book (RDB) species were recorded during the survey. The aardvark, previously listed as "Vulnerable", was removed from the RDB list in 2004.

The possible species occurrence at the study area and the observed mammals are as follows:

Scientific name	Common name
Crocidura cyaneae	**Reddish-grey musk shrew**
Erinaceus frontalis	**SA hedgehog**
Chlorotalpa sclateri	**Sclater's golden mole**
Macroscelides proboscideus	**Round-eared elephant-shrew**
Elaphantulus rupestris	**Smith's rock elephant shrew**
Elephantulus myurus	**Rock elephant-shrew**
Eidolon helvum	**Straw-coloured fruit bat**
Tadarida aegyptiaca	**Egyptian free-tailed bat**
Myotis lesueuri	**Lesueur's hairy bat**
Eptesicus capensis	**Cape serotine bat**
Nycteris thebaica	**Common slit-faced bat**
Rhinolophus clivosus	**Geoffroy's horseshoe bat**
Rhinolophus denti	**Dent's horseshoe bat**
Papio ursinus	**Chacma baboon**
Cercopithecus pygerythrus	**Vervet monkey**
Manis temminnkii	**Pangolin**
Lepus capensis	**Cape hare**
****Lepus saxatilis***	**Scrub hare**
****Pronolagus rupestris***	**Smith's red rock rabbit**
****Cryptomys hottentotus***	**Common molerat**
****Hystrix africaeaustralis***	**Porcupine**
****Pedetes capenis***	**Springhare**
Graphiurus ocularis	**Spectacled dormouse**
****Xerus inauris***	**Ground squirrel**
Parotomys brantsii	**Brant's whistling rat**
Parotomys littledalei	**Littledalei's whistling rat**
Otomys unisulcatus	**Bush karoo rat**
Rhabdomys pumilio	**Striped mouse**
Mus musculus	**House mouse**
Mus minutoides	**Pygmy mouse**
Praomys natalensis	**Multimammate mouse**
****Aethomys namaquensis***	**Namaqua rock mouse**
Aethomys chrysophilus	**Red veld rat**
Rattus rattus	**House rat**
Desmodillus auricularis	**Short-tailed gerbil**
Gerbillurus paeba	**Hairy-footed gerbil**
Tatera leucogaster	**Bushveld gerbil**
Tatera brantsii	**Highveld gerbil**
Saccostomus campestris	**Pouched mouse**
Malacothrix typica	**Large-eared mouse**
Proteles cristatus	**Aardwolf**
Felis caracal	**Caracal**
Felis sylvestris	**African wild cat**

Felis nigripes	**Small spotted cat**
Otocyon megalotis	**Bat-eared fox**
Vulpes chama	**Cape fox**
Canis mesomelas	**Black-backed jackal**
Mellivora capensis	**Honey badger**
Ictonyx striatus	**Striped polecat**
Genetta genetta	**Small-spotted genet**
Suricata suricatta	**Suricate**
****Cynictis penicellata***	**Yellow mongoose**
****Galerella sanguinea***	**Slender mongoose**
Galerella pulverulenta	**Small grey mongoose**
Atilax paludinosis	**Water mongoose**
****Oryctoropus afer***	**Aardvark**
****Procavia capensis***	**Rock dassie**
Oreotragus oreotragus	**Klipspringer**
Damaliscus dorcas phillipsii	**Blesbok**
****Raphicerus campestris***	**Steenbok**
****Thagelaphus strepciceros***	**Kudu**

1.1.5. Flora:

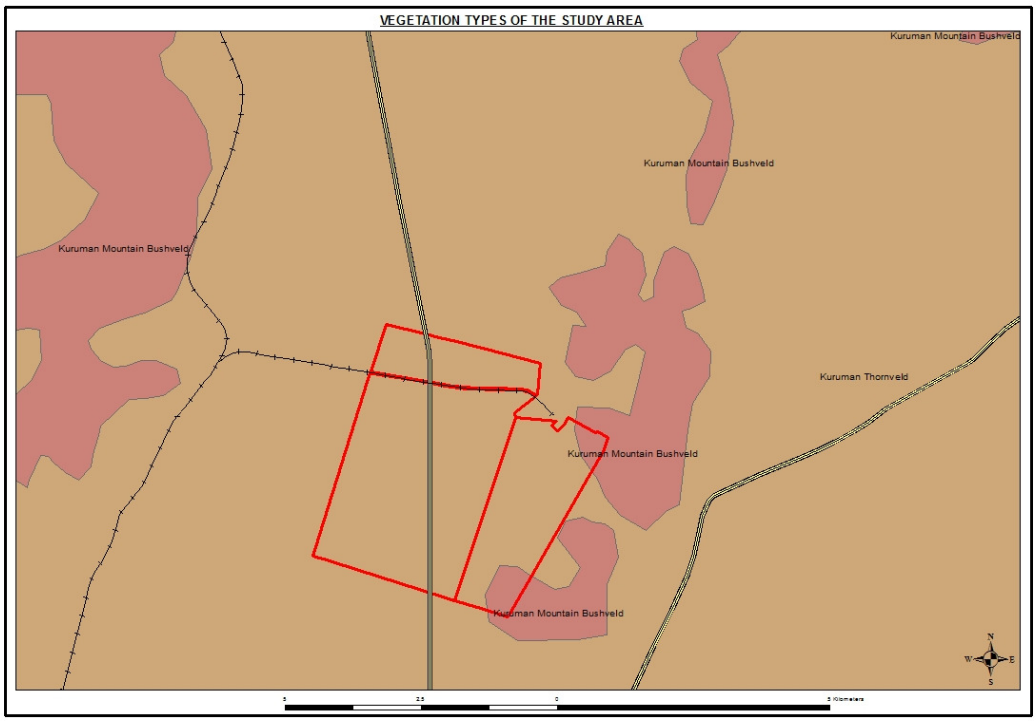

Figure 9 - Vegetation map of the application area

Professional Natural Scientist, Mr. B.H. Erasmus, was appointed to conduct an assessment of the flora on the application area. Find attached hereto as Annexure 'C' the report as compiled by him.

Herewith a short summary of the findings contained in the report:

Two veld types occur in the study area, namely the SVk 10 Kuruman Mountain Bushveld and the SVk 9 Kuruman Thornveld. Both of these veld types fall within the Savannah biome (Mucina & Rutherford, 2006).

SVK 9 Kuruman Thornveld
The landscape consists of flat rocky plains and some sloping hills with a very well developed closed shrub layer and a well-developed tree stratum of camel thorn trees (Mucina & Rutherford, 2006).

The geology consists of some Campbell Group dolomite and chert and mostly younger, superficial Kalahari Group sediments with red deep wind-blown sand. Locally rock pavements are formed in places. The Hutton soil form is most common.

The veld type falls within the "Least threatened" category with a target of 16% being set for conservation. None of it is presently conserved in statutory conservation areas. Only 2% is transformed. Erosion is very low (Mucina & Rutherford, 2006).

Findings in the veld type:
The study area is indeed a closed shrubland with two species dominating the terrain. These are blackthorn and camphor bush. Overgrazing in the past has caused blackthorn to form almost impenetrable thickets in places. The study area is atypical in the sense of the general description of the veld type, in that a camel thorn tree layer is totally absent. This is because the substrate of the study area is totally dolomitic with very shallow soils. It does thus not have the deep Hutton soils that camel trees require to survive.

It is a mixed medium height shrubland with common plant species. Only two protected tree species, the wild olive (*Olea europaea)* and the shepherd's tree (*Boscia albitrunca*) were observed in the study area. If any of these are to be removed a permit must be obtained from the Department of Forestry.

The dominant plant species were recorded:

- **Dominant woody species**

Tarchonantus camphoratus	**Camphor bush**
Acacia mellifera	**Blackthorn**
Rhus tridactyla	**Taaibos**
***Protasparagus* sp.**	**Wild asparagus**
Boscia albitrunca	**Shepherd's tree**
Lebeckia macrantha	**Pendoring**
Chrysocoma tenuifolia	**Bitter bush**
Ehretia rigida	**Puzzle bush**
Tapinanthus oleifolius	**Mistletoe**
Cadaba aphylla	**Swartstorm**
Thesium hystrix	**Porcupine bush**
Grewia flava	**Raisin bush**
Rhus ciliata	**Sour karee**
Olea europaea	**Wild olive**
Ziziphus mucronata	**Buffalo thorn**
Euclea undulata	**Guarri**
Pterotrix spinescens	**Voëltjie-kan-nie-sit-nie**
Maytenus heterophylla	**Pendoring**
Thesium hystrix	**Porcupine bush**

- **Dominant grass species**

Chrysopogon serrulatus	**Golden beard grass**
Heteropogon contortus	**Spear grass**
Eragrostis lehmanniana	**Lehmann's love grass**
Sporobulus fimbriatus	**Drop seed grass**
Digitaria eriantha	**Finger grass**
Cymbopogon plurinodis	**Turpentine grass**
Ennepogon desvauxii	**Wonder grass**
Eragrostis pseudo-obtusa	**Kleinweeluisgras**
Themeda triandra	**Red grass**
Elionurus mutica	**Copper wire grass**
Eragrostis rigidior	**Curly leaf grass**

- **Other species**

Kleinia longiflora	**Sambokbos**
Geigeria ornativa	**Vermeerbos**
Solanum supinum	**Bitter apple**
Helichrysum argyrosphaerum	**Wild everlasting**

- **Protected species**

  Two protected species in terms of the Forestry Act occur on these properties and may not be cut and/or removed without the necessary permits from this authority. These species are the following:

Olea europaea	**Wild olive**
Boscia albitrunca	**Shepherd's tree**

- **Sensitivity analysis**

  Mucina & Rutherford (2006) have various criteria that they evaluated in terms of the status of the 433 vegetation types that they mapped. The SVk 9 Kuruman Thornveld rates as follows in terms of these criteria:

Red-listed species	**None**
Protection status	**None**
Ecosystem status	**Least threatened**
Protection levels	**None**
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 in this area.

When there are no red data plants in the study area then conservation efforts 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 9 Kuruman Thornveld as a whole are not regarded as vulnerable or under threat by a variety of potential threats.

SVK 10 Kuruman Mountain Bushveld

The landscape consists of rolling hills with generally gentle to moderate slopes and hill pediment areas with open shrubland. *Lebeckia macrantha* is prominent in places and the grass layer is well developed.

The geology consists of banded ironstone with jaspelite, chert and riebeckite-asbestos of the Asbestos Hills Subgroup of the Griqualand-West Supergroup. Shallow sandy soils of the Hutton form occur. Rainfall occurs in summer and autumn and the winters are very dry. Frost is frequent in winter.

The veld type falls within the "Least threatened" category with a target of 16% being set for conservation. None of it is presently conserved in statutory conservation areas. Very little is transformed. Erosion is very low to low. Parts of the veld type in the north are heavily utilized for grazing (Mucina & Rutherford, 2006).

Findings in the veld type:
The veld type is typical of the Kuruman Hills.

The dominant plant species were recorded:

- **Woody species**

Euclea crispa	**Guarri**
Rhus burchelli	**Kuni bush**
Rhus tridactyla	**Karee besembos**
Boscia albitrunca	**Shepherd's tree**
***Protasparagus* sp.**	**Wild asparagus**
Putterlickia pyrecantha	**Firethorn**
Lebeckia macrantha	**Pendoring**
Chrysocoma tenuifolia	**Bitter bush**
Tarchonantus minor	**Small camphor bush**
Cadaba aphylla	**Swartstorm**
Ehretia rigida	**Puzzle bush**
***Viscum* sp.**	**Mistletoe**
Thesium hystrix	**Porcupine bush**
Acacia mellifera	**Blackthorn**
Rhigozum obovatum	**Wild pomegranite**
Grewia flava	**Raisin bush**

- **Grass species**

Aristida diffusa	**Hard stick grass**
Melinis repens	**Natal red top**
Cymbopogon plurinodis	**Turpentine grass**
Eragrostis lehmanniana	**Lehmann's love grass**
Enneapogon desvauxii	**Wonder grass**

Cenchrus ciliaris	**Blue buffalo grass**
Stipagrostis uniplumis	**Silky bushman grass**
Heteropogon contortus	**Spear grass**
Aristida congesta congesta	**White stick grass**
Aristida adscensionis	**Stick grass**
Fingerhuthia africana	**Thimble grass**

- **Other species**

Hermannia comosa	**Kapokkie**
***Hermannia* sp.**	**Species unknown**
Salvia sp.	**Wild salvia**
Geigeria ornativa	**Vermeerbos**
Asclepias burchelli	**Milkweed**
Felicio muricata	**Bloublommetjie**
Barleria rigida	**Thistle**

- **Sensitivity analysis**

Mucina & Rutherford (2006) have various criteria that they evaluated in terms of the status of the 433 vegetation types that they mapped. The SVk 10 Kuruman Mountain Bushveld rates as follows in terms of these criteria:

Red-listed species	**None**
Protection status	**None**
Ecosystem status	**Least threatened**
Protection levels	**None**
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 in this area.

When there are no red data plants in the study area then conservation efforts 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 10 Kuruman Mountain Bushveld as a whole are not regarded as vulnerable or under threat by a variety of potential threats.

1.1.6. Geology:

A document named 'Review of the Geology and Manganese / Iron Ore potential on Kapstewel' was compiled by Bomato Trading CC for Misty Falls 45 (Pty) Ltd. The information contained in this document was used for the compilation of this section of the EIA/EMPR. Please find attached hereto as Annexure 'D' the said report.

Mr. J.F. Grobbelaar compiled a geological report. This report, which contains a resource statement, is attached hereto as Annexure 'E'.

Millennium Geoconsulting compiled a geological report, titled 'Report on the Kapstewel Iron-Manganese Project, Hay District, Northern Cape, South Africa'. This report is attached to hereto as Annexure 'F'.

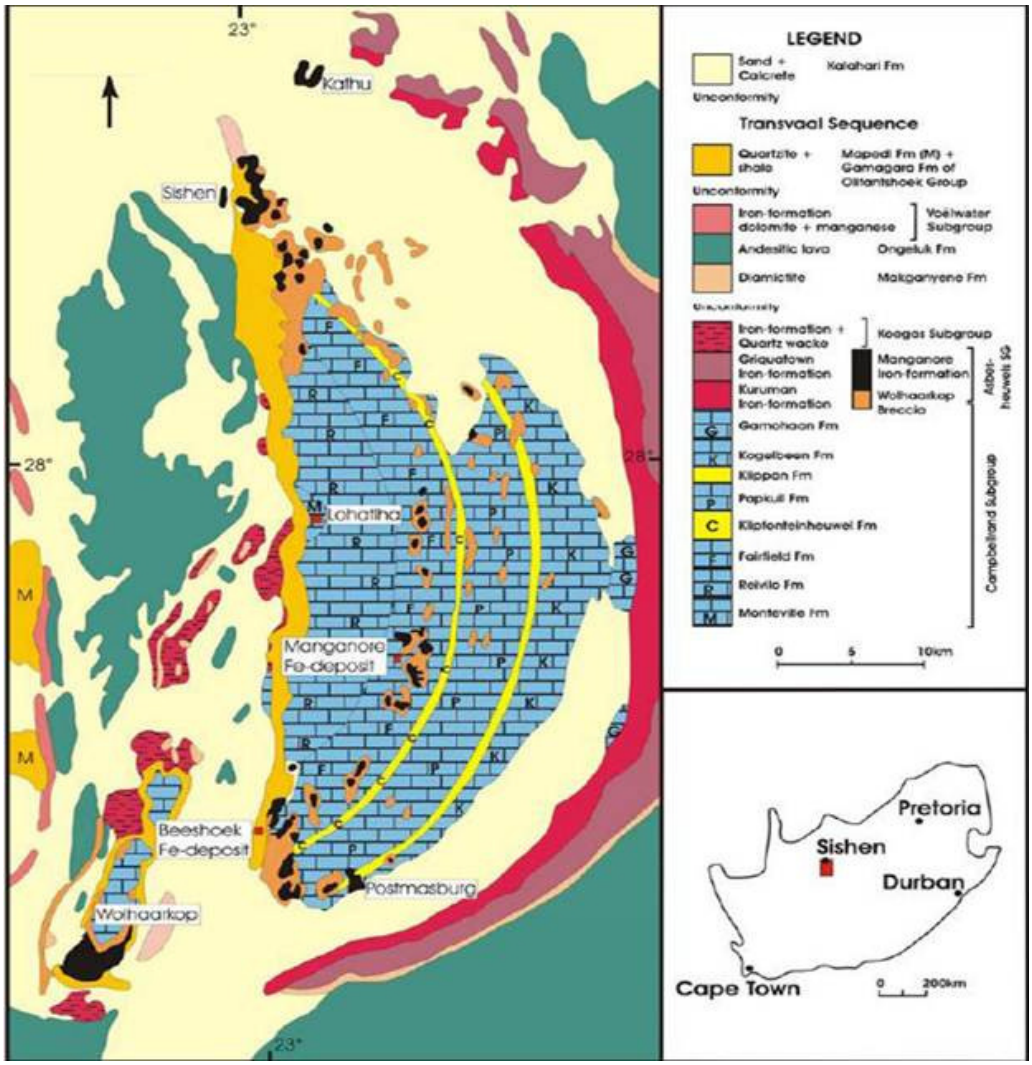

Figure 10 - Regional geology map

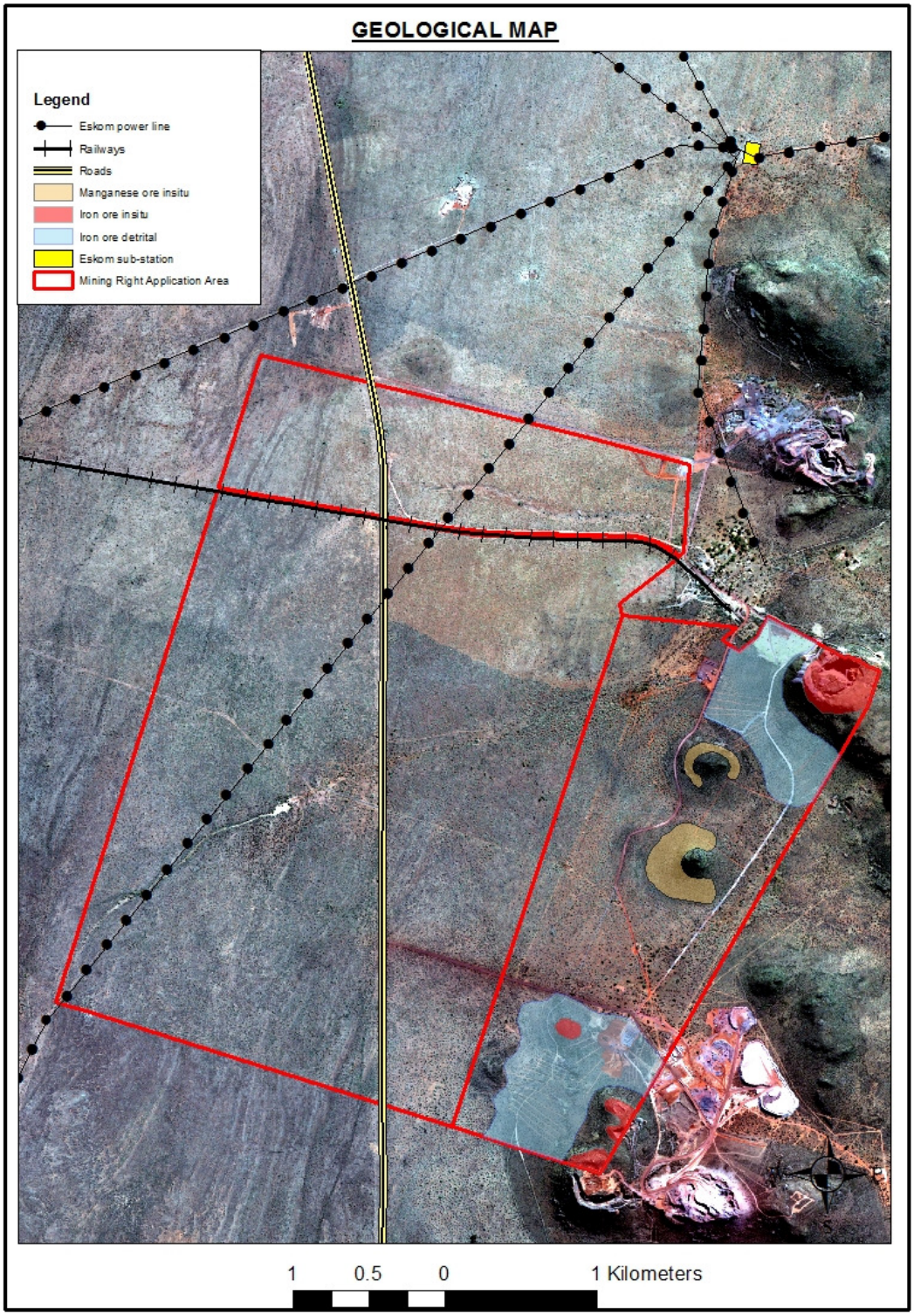

Figure 11 - Geology map of the mining area

The following section describes the mineralized lithological units of the Postmasburg area and which has reference to Kapstewel. The descriptions are taken from Schalkwyk (2005).

Wolhaarkop Breccia

The Wolhaarkop Breccia is developed only in areas where the Manganore iron formation is underlain by unusually siliceous dolomite units of the Klipfonteinheuwel and Klippan Formations and the Rockwood chert layer of the Kogelbeen Formation (Beukes, 1978). The average thickness of the Wolhaarkop Breccia ranges between 20 and 30 meters, but it varies considerably from zero to more than 50m.

The Wolhaarkop Breccia appears massive, with crude bedding planes developed. Soft sediment deformation occurs and locally upward coarsening sequences can be recognized. The Wolhaarkop Breccia is mostly matrix supported with mm- to cm-sized angular to sub rounded quartz fragments. The amount of siliceous clasts varies considerably both laterally but also vertically. The matrix is constituted of variable amounts of very fine-grained quartz, hematite, and braunite. Thin and laterally discontinuous shale lenses and irregular pods constituted of fine-grained braunite (siliceous Mn ore, Gutzmer & Beukes, 1996) occur locally with this matrix. Towards the top, immediately below the Manganore iron formation, the matrix becomes more hematite rich and more siliceous.

Manganore iron formation

Intensely brecciated iron ore of the Manganore iron formation is typically found covering irregular bodies of Wolhaarkop Breccia. Oxidized but poorly enriched iron formation occurs only in areas where the Manganore iron formation has not been intensely brecciated. The brecciated ore grades up into laminated iron ore.

Brecciated ore

Brecciated ore is known locally as Blinkklip Breccia. It consists of poorly sorted clasts of enriched laminated iron ore in a hematite-rich matrix. Brecciated iron ore is found most commonly immediately overlying the Wolhaarkop Breccia, but brecciated units of iron ore can be recognized throughout the Manganore iron formation. The clast-supported brecciated ore often defines upward fining sequences.

Laminated ore

The laminated ore consists of alternating layers of massive, porous and microbanded hematite bands, between 2 and 15mm thick. Porous bands often contain relicts of chert and drusy hematite platelets, supporting silica leaching out of banded iron formations as the process responsible for enrichment.

Massive ore

Massive hematite ore is formed at the expense of hematite lutites of the upper part of the Manganore iron formation. The ore is typically massive to very poorly bedded and composed of microplaty hematite with remnants of chert.

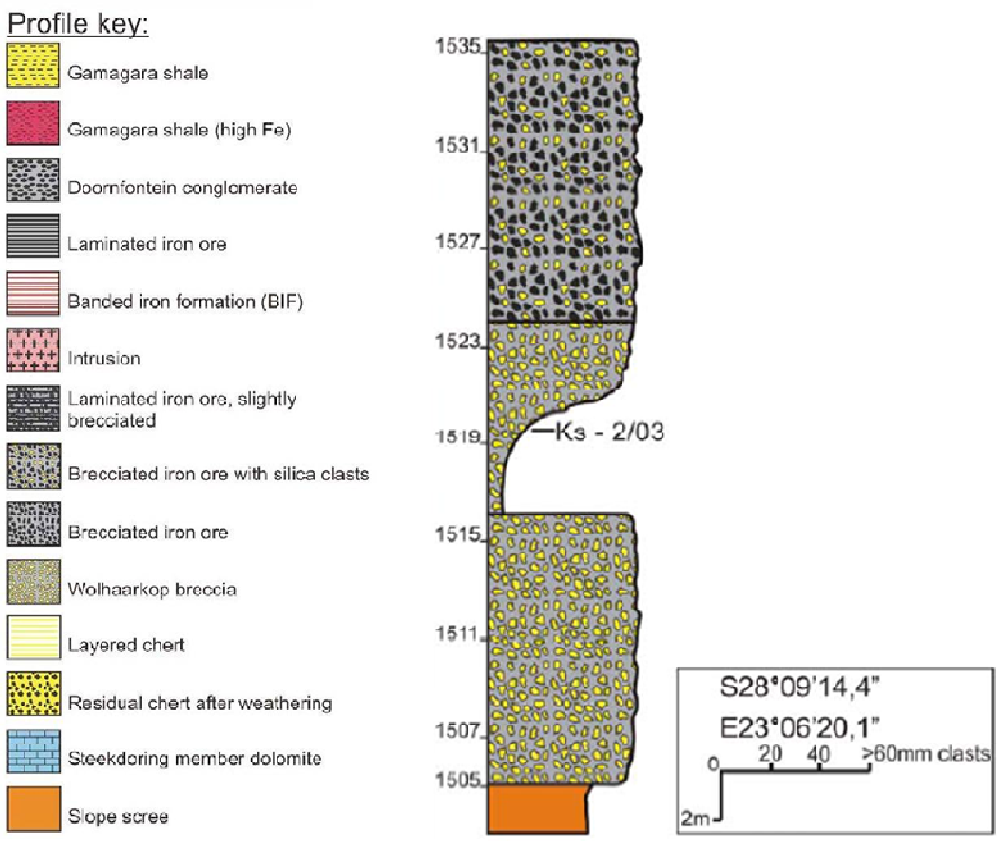

Figure 12 - Profile constructed from outcrop at Kapstewel (after Schalkwyk, 2005).

Typical Section

Schalkwyk (2005) gave the following description of a succession on Kapstewel and constructed a typical section (Fig. 12) from outcrop and exposed pit walls.

The Campbellrand dolostones form the base of the succession, which consists of two upwards coarsening successions of Wolhaarkop Breccia. The top succession is Mn-rich, and the silica content decreases towards the top. The breccia is overlain by brecciated iron ore of the Manganore iron formation containing rare quartz clasts.

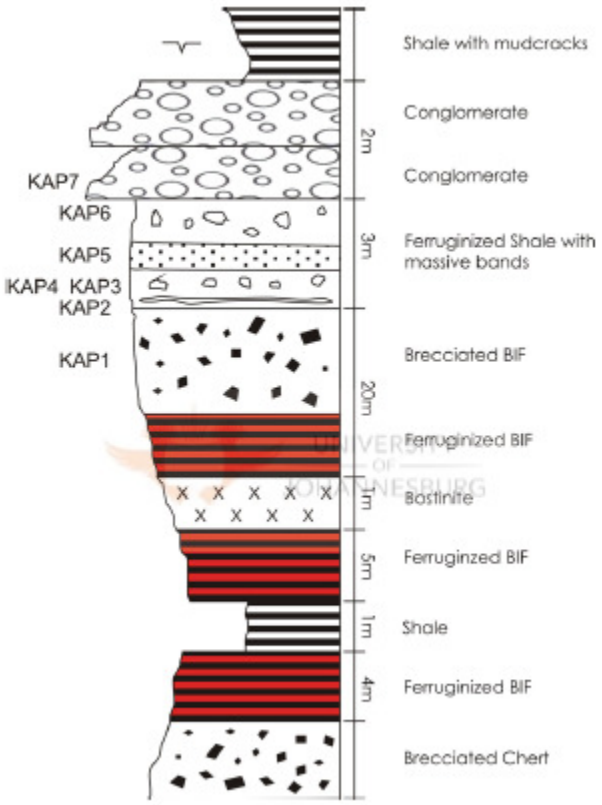

Figure 13 - Van der Venter constructed the following general profile for the Kapstewel area.

1.1.7. Ground Water:

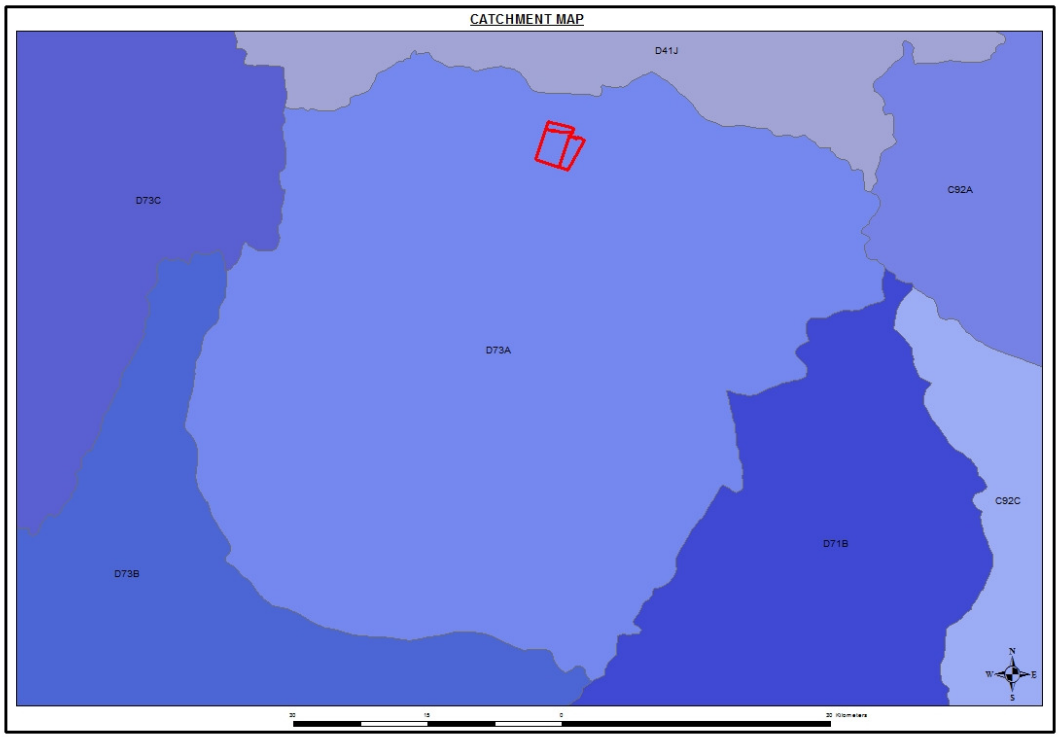

Figure 14 - Catchment Map

SRK Consulting is an independent international consulting practice that provides focused advice and solutions to clients, mainly for earth science, engineering and water resource industries. SRK Consulting conducted a hydrocensus of the application area and compiled a specialist report. Find attached hereto as Annexure 'G' the said report.

Herewith a short summary of the report:
Groundwater in this area occurs in mainly secondary (or fractured rock) aquifers. These are formed by jointing and fracturing of the otherwise solid bedrock. Joints and fractures are formed by faulting, cooling of magma outflows, intrusion of dolerite dykes, folding and other geological forces. Generally the harder rocks (banded ironstone, chert and dolerite) fracture more easily under stress to form superior aquifers compared to the softer sediments like shale which rather deform than fracture under stress. Joints and fractures in the dolomitic rocks were leached by slightly acidic rainwater over long periods of time to form solution cavities in these rocks. These cavities may collapse due to a significant drop in the groundwater level (e.g. mine dewatering) which reduces the groundwater pressure therein or when the roof becomes too weak to sustain the weight of the overlaying rocks.

Some examples of limited primary aquifers occur in the dolomitic areas east and south of the site where the groundwater level rises within the weathered zone. Here the groundwater levels are shallow (<15 mbgl) and within the weathered zone. Boreholes utilizing this aquifer are therefore shallow and only extract groundwater from a relative thin layer of weathered bedrock. All these result in a poorly developed primary aquifer that is vulnerable to droughts.

According to the 1:500 000 Hydrogeological map sheet of Kimberley the site is situated on a Karst aquifer and has expected yields ranging between 0.5 - 2°L/s as illustrated in Figure 15 .

Figure 16 indicates that the groundwater quality throughout the study area falls within the range of 70 - 300 mS/m and is generally suitable for human consumption according to SANS 241:2011.

The groundwater vulnerability of the site is indicated in Figure 17. The vulnerability is determined by evaluating seven parameters, namely:

- **Depth to groundwater;**
- **Recharge;**
- **Aquifer media;**
- **Soil media;**
- **Topography;**
- **Impact on vadose zone; and**
- **Hydraulic conductivity.**

Aquifer vulnerability is defined as the likelihood for contamination to reach a specified position in the groundwater system after being introduced at some point above the uppermost aquifer. The figure indicates that the groundwater source of the site is highly vulnerable to contamination from surface sources. Two small areas with medium groundwater vulnerability exist in the high laying areas along the eastern boundary of the property. These areas are less vulnerable to groundwater contamination mainly due to the deeper groundwater levels that exist here.

The mean annual recharge for the site decreases from north to south (Figure 18) with highest recharge of 8 - 9 mm/a in the northern part of the site, decreasing to 7 - 8 mm/a in the southern part.

Previous studies (SRK, 2013) indicate that the average storativity value (S) is in the order of 1.3 x 10^{-2} and Transmissivity (T) varies between 52 and 1,495 m^2/d for the fractured aquifer. The results obtained with the FC- and recovery analyses are summarized in the table below. These boreholes are situated southeast of the site.

Bh No	Coordinates		Depth (mbgl)	Rest Water Level (mbgl)	Available Draw Down (m)	Fractal Dimen-sion	Log Deri-vative	FC-Method Sustainable Yield		Rec Time (min)	Constant Discharge (ℓ/s)	Duration of CDT (min)	Recovery Safe Yield (m^3/d)	Recovery Safe Yield (ℓ/s @ 24h/d)	Ave S	Ave T (m^2/d)
	Latitude	Longitude						ℓ/s @ 24h/d	m^3/d							
W3	-28.18380	23.12167	102.0	35.20	12.5	2.17	0.17	4.4	380	10,000	18.14	4,320	473	5.47	4.73E-03	70.7
W4	-28.19145	23.11118	57.0	37.94	2.0	2.00	0.07	13.4	1,158	2,640	20.20	4,320	1,083	12.54	3.21E-02	1,495.5
SBE2	-28.18696	23.12161	101.1	32.79	17.7	2.01	0.12	2.6	225	6,500	10.17	4,320	351	4.06	1.77E-03	52.3
							TOTAL	20.4	1,763				1,907	22.07		

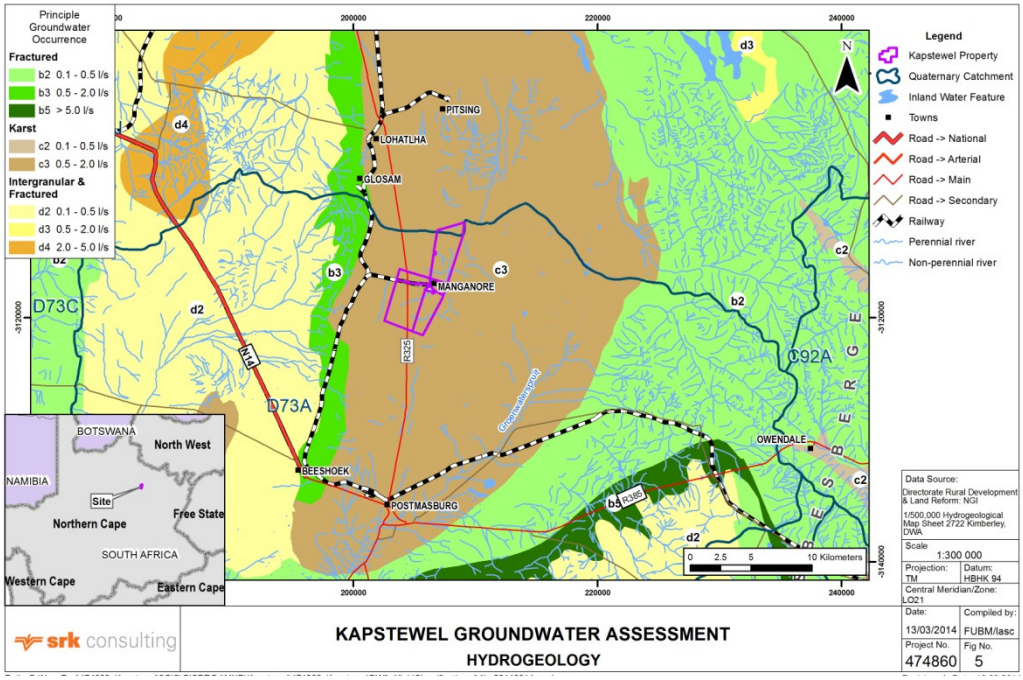

Figure 15 – Aquifer types in the Kapstewel area

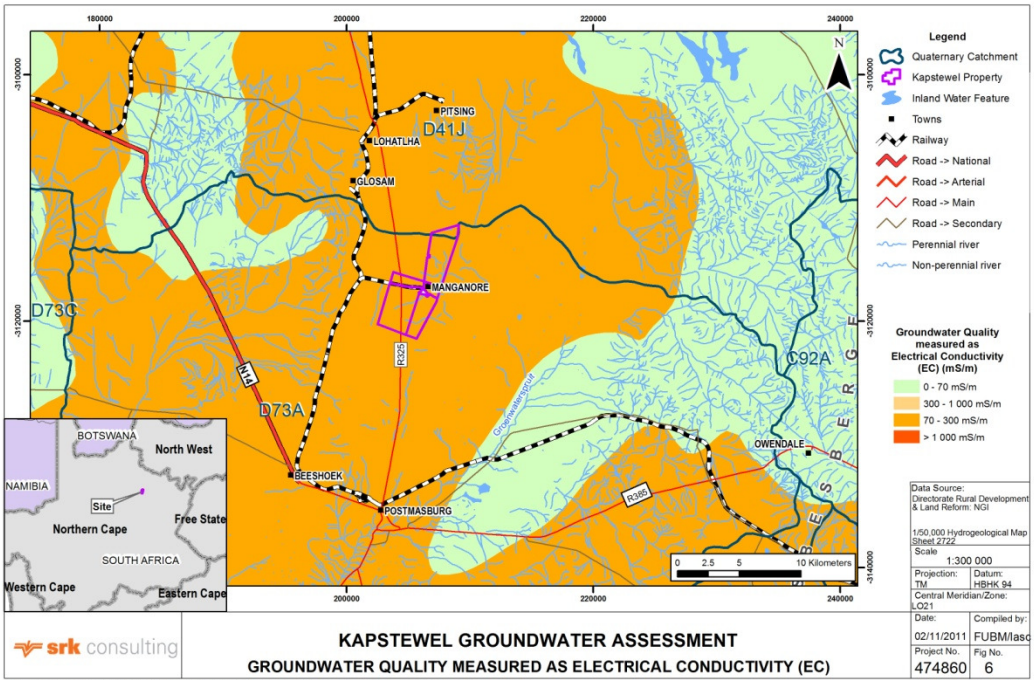

Figure 16 – Groundwater salinity of the Kapstewel area

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