PROPOSED OPENING OF EK KRAAL QUARRY, KAROO HOOGLAND LOCAL MUNICIPALITY, NORTHERN CAPE PROVINCE

BIODIVERSITY ASSESSMENT

Ecological Assessment and Wetland Assessment for the proposed Ek Kraal Quarry

Compiled by

FLORI SCIENTIFIC SERVICES

MARCH 2018

PROJECT TITLE: Proposed Opening of Ek Kraal Quarry, Karoo Hoogland Local Municipality, Northern Cape Province

STUDY NAME: Ek Kraal Quarry: Biodiversity Impact Assessment

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1 EXECUTIVE SUMMARY

Background

It is the intention of Concor Infrastructure to open a quarry approximately 40km north of Matjiesfontein on the Farm Ek Kraal 199-RD, in the Karoo Hoogland Local Municipality. The quarry will be less than 5ha in extent, with crushing facilities.

Flori Scientific Services cc was appointed as the independent consultancy to conduct a strategic (desktop) biodiversity assessment, which includes a terrestrial ecological assessment and a wetland assessment, for the study site. No field investigations were conducted by the author of the report, but by other specialists involved in the project.

Location of the study area

The study site is located on the Farm Ek Kraal in the Karoo Hoogland Local Municipality, Namakwa District of the Northern Cape Province. The study area is situated 40km north of Matjiesfontein and 1,5km west of the R354 in the Roggeveld region of the Karoo Hoogland Local Municipality of the Namakwa District Municipality of the Northern Cape Province.

TERRESTRIAL ECOLOGY

Vegetation

Category Description	Classification
Biome	Fynbos
Bioregion	Renosterveld (Karoo Renosterveld)
Sub-Bioregion	Shale Renosterveld
Vegetation Types	Central Mountain Shale Renosterveld

AQUATIC ECOLOGY

Watercourses in the study area

There are no watercourses in the study area, or within 100m of the outer boundary of the study area.

Drainage areas

Level	Category
Primary Drainage Area (PDA)	J
Quaternary Drainage Area (QDA)	J11D
Water Management Area (WMA) –	Gouritz

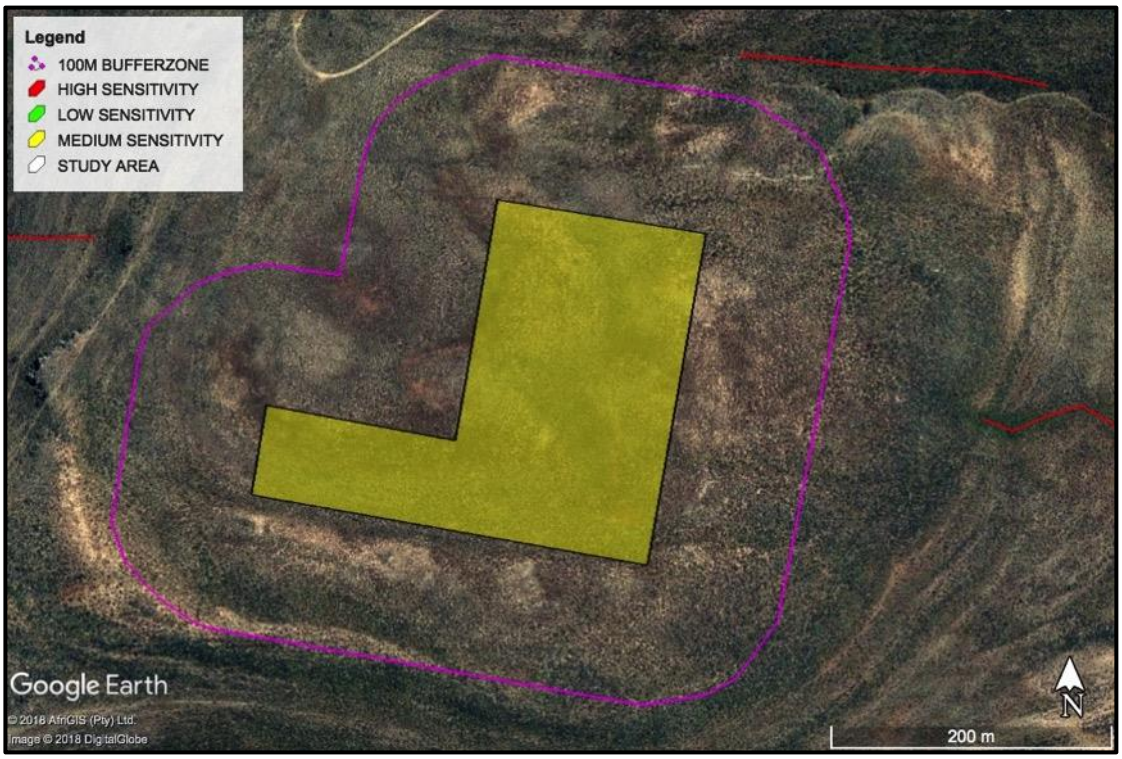
Previous / Old	
Water Management Area (WMA) – New (as of Sept. 2016)	Breede-Gouritz
Sub-Water Management Area	Groot
Catchment Management Agency (CMA)	Breede-Gouritz

Sensitivity analyses

The ecological sensitivity of the study area is determined by combining the sensitivity analyses of both the floral and faunal components. The highest calculated sensitivity unit of the two categories is taken to represent the sensitivity of that ecological unit, whether it is floristic or faunal in nature.

Ecological sensitivity analysis

Ecological community	Floristic sensitivity	Faunal sensitivity	Ecological sensitivity	Development Go-ahead
Renosterveld	Medium	Medium	Medium	Go-But
Watercourse	Medium	Medium/High	Medium/High	Go-But



Sensitivity map

Fatal flaws

There are no fatal flaws.

Priority areas

The study area is situated within the general NPAES focus area of the Western Karoo only, and not within any other priority areas. Priority areas include formal and informal protected areas (nature reserves); important bird areas (IBAs); RAMSAR sites; National fresh water ecosystem priority areas (NFEPA) and National protected areas expansion strategy (NPAES) areas.

Conclusions

The following are conclusions of the study:

- There are no fatal flaws.
- The study area is not within any threatened veldtype of ecosystem.
- The study area is not within any critical biodiversity area (CBA) or ecological support area (ESA).
- There are no watercourses present in the study area, including wetlands.
- No red data listed (RDL) fauna or flora species were observed to be present and / or breeding with the study area boundaries.
- Recommended mitigating measures should be implemented if the findings of this report are to remain pertinent.
- The sum of the existing and potential impacts, with the implementation of mitigating measures is assessed to be low.
- Site investigations were conducted during the summer months but the findings and availability of field data is sufficient to reached acceptable findings and outcomes from the assessment.

Review and Approval

Name	Title	Signature	Date
Johannes Maree	Flori Scientific Services cc (Specialist and Author)		**29/03/2018**
Josephine Bothma	Chameleon Environmental Consultants (Pty) Ltd (Project Facilitator)		**06/04/2018**

ACKNOWLEDGEMENTS

The author/s Chameleon Environmental Consultants and other role players for their assistance with project information, as well as responding to technical queries related to the project.

2 EXPERTISE AND EXPERIENCE OF SPECIALIST

The experience and expertise of the Specialist to conduct the study, in this case the author of the report, is summarised below:

Name: Johannes Oren Maree

- 2 Masters degrees (MSc & MBA).
- Diplomas in both business and public speaking.
- SAQA accreditation and qualifications in training, assessing & service provision (AgriSeta).
- The specialist is registered with the South African Council for Natural Scientific Professions (SACNASP) since 1991. Registration number: 400077/91
- 21 years' experience in technical and managerial positions.
- 18 years' experience in project management and consultancy.
- 18 years' experience in writing of articles, books, training material, training & presentations, proposals.
- 12 years direct experience in EIAs.
- Have conducted hundreds of field investigations and compiled hundreds of technical specialist reports for EIAs, including ecological (fauna& flora), wetland assessments and avifauna impact assessments.
- Studies include working on linear and modular projects.
- Projects involved in include power lines, roads, quarries, housing developments, mines and wind farms.

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3 ACRONYMS

asl	Average height above sea level
CBA	Critical Biodiversity Areas
CMA	Catchment Management Agencies
DACE	Department of Agriculture, Conservation and Environment
DEA	Department of Environment Affairs
DWA	Department of Water Affairs (Old name for DWS)
DWS	Department Water and Sanitation
EIS	Ecological Importance & Sensitivity
EMC	Environmental Management Class
EWR	Ecological Water Requirements
HGM	Hydrogeomorphic
IBA	Important Bird Area(s)
IUCN	International Union for Conservation of Nature
MAP	Mean Annual Precipitation
NFEPA	National Freshwater Ecosystem Priority Areas
NPAES	National Protected Areas Expansion Strategy
PES	Present Ecological State
PDA	Primary Drainage Area
QDA	Quaternary Drainage Area
REC	Recommended Ecological Category (or Class)
REMC	Recommended Ecological Management Category (or Class)
SANBI	South African National Biodiversity Institute
SWSA	Strategic Water areas of South Africa
WMA	Water Management Areas
WUL	Water Use Licence
WULA	Water Use Licence Application

4 BACKGROUND

4.1 Project overview

It is the intention of Concor Infrastructure to open a quarry approximately 40km north of Matjiesfontein on the Farm Ek Kraal 199-RD, in the Karoo Hoogland Local Municipality. The quarry will be less than 5ha in extent, with crushing facilities.

Flori Scientific Services cc was appointed as the independent consultancy to conduct a strategic (desktop) biodiversity assessment, which includes a terrestrial ecological assessment and a wetland assessment, for the study site. No field investigations were conducted by the author of the report, but by other specialists involved in the project.

4.2 Scope of work

The scope of work was understood to be as follows:

- Conduct a background, desktop (strategic) assessment for the study site;
- Obtain relevant field investigation data from the relevant specialists, project facilitator, landowner, etc. to be used in the report along with the background data.
- Compile a biodiversity report, including fauna & flora and wetland assessments.
- Determine if there are any fatal flaws.
- Conduct an impact assessment.
- Provide recommendations and mitigating measures, where necessary.

4.3 Quality and age of base data

The latest data sets were used for the report and conclusions reached, in terms of background information for veldtypes, ecosystems, threatened ecosystems, red data listed (RDL) fauna and flora species.

The data used is of high quality and was sourced from the same data sets that are nationally used and approved by all consultants and governmental organisations. This include the South African National Biodiversity Institute, which is the standard for all EIAs and specialist studies and assessments conducted in South Africa.

The source, data and age of data included the following:

- Threatened ecosystems: Latest SANBI updated website (www.bgis.sanbi.org).

- RDL species: Red List of South Africa Plants (latest update) – (www.redlist.sanbi.org).
- Veldtypes and ecosystems: Mucina & Rutherford, 2006, 2010. Updated 2012
- SANBI data sets – latest updated website data (www. bgis.sanbi.org)
- Plants of Southern Africa: 2012 - (www.posa.sanbi.org).
- Northern Cape Critical Biodiversity areas: 2016.
- Field investigation data: February 2018.

4.4 Assumptions and limitations

The following assumptions and limitations were made during the assessment:

- The information regarding the proposed project, study area and other relevant information provided by the client are accurate.
- Predictions in this study are based on solid base data and experience of the specialists involved. Project impacts can be predicted with a reasonable amount of certainty.
- Site investigations were limited to a few days only, namely 19 & 20 February 2018.
- Site investigations were only conducted in the summer season.
- The season and duration of site visits, along with background data and information was sufficient to come to accurate and reliable conclusions. However, findings can never be totally comprehensive.
- Severe drought conditions in the Western Cape and Northern Cape will have created some limitations and gaps in the data obtained during field investigations.

4.5 Consultation process for the study

The specialists that conducted the actual site visits were contacted and consulted via telephone and email and information received from them, which was included in the report. This also included photographs and other relevant information such as field conditions.

Landowners were not directly contacted or consulted, but relevant information was obtained through the specialists that did the initial field investigations and negotiations with the landowners.

5 METHODOLOGY

5.1 Desktop assessment

A literature review was conducted regarding the main vegetation types and fauna of the general region and of the specific study area. The primary guidelines used were those of Mucina & Rutherford (eds) (2006), Low & Rebelo (1996) and Acocks (1988). Background data regarding soils, geology, climate and general ecology were also obtained from existing datasets and relevant organisations. These are useful in determining what species of fauna and flora can be expected or possibly present within the different habitats of the study area.

Lists of plant species for the relevant 1:50 000 base map grid references within which the proposed project is situated, were obtained from the database of the South Africa National Biodiversity Institute (SANBI). The lists represent all plant species that have been identified and recorded within the designated grid coordinates. The main aim was to determine if any protected species or Red Data species were known to occur in the study area or in the immediate vicinity of the study area.

Red data and protected species listed by the National Environmental Management: Biodiversity Act (Act No. 10 of 2004), as well as in other authoritative publications were consulted and taken into account. Alien invasive species and their different Categories (1, 2 & 3) as listed by the Conservation of Agricultural Resources Act (Act No. 43 of 1983) and the National Environmental Management: Biodiversity Act (Act No. 10 of 2004) were also consulted.

5.2 Field surveys

During field surveys, cognisance was taken of the following environmental features and attributes:

- Biophysical environment;
- Regional and site specific vegetation;
- Habitats ideal for potential red data fauna species
- Sensitive floral habitats;
- Red data fauna and flora species;
- Fauna and flora species of conservation concern; and
- Watercourses and water bodies.

Digital photographs and GPS reference points of importance where recorded.

5.3 Floristic Sensitivity

The methodology used to estimate the floristic sensitivity is aimed at highlighting floristically significant attributes and is based on subjective assessments of floristic attributes. Floristic sensitivity is determined across the spectrum of communities that typify the study area. Phytosociological attributes (species diversity, presence of exotic species, etc.) and physical characteristics (human impacts, size, fragmentation, etc.) are important in assessing the floristic sensitivity of the various communities.

Criteria employed in assessing the floristic sensitivity vary in different areas, depending on location, type of habitat, size, etc. The following factors were considered significant in determining floristic sensitivity:

- Habitat availability, status and suitability for the presence of Red Data species
- Landscape and/or habitat sensitivity
- Current floristic status
- Floristic diversity
- Ecological fragmentation or performance.

Floristic Sensitivity Values are expressed as a percentage of the maximum possible value and placed in a particular class or level, namely:

- High: 80 – 100%
- Medium/high: 60 – 80%
- Medium: 40 – 60%
- Medium/low: 20 – 40%
- Low: 0 – 20%

High Sensitivity Index Values indicate areas that are considered pristine, unaffected by human influences or generally managed in an ecological sustainable manner. Nature reserves and well-managed game farms typify these areas. Low Sensitivity Index Values indicate areas of poor ecological status or importance in terms of floristic attributes, including areas that have been negatively affected by human impacts or poor management.

Each vegetation unit is subjectively rated on a sensitivity scale of 1 to 10, in terms of the influence that the particular Sensitivity Criterion has on the floristic status of the plant community. Separate Values are multiplied with the respective Criteria Weighting, which emphasizes the importance or triviality that the individual Sensitivity Criteria have on the status of each community.

Ranked Values are then added and expressed as a percentage of the maximum possible value (Floristic Sensitivity Value) and placed in a particular class or level, namely:

- High: 80% – 100%
- Medium/high: 60% – 80%
- Medium: 40% – 60%
- Medium/low: 20% – 40%
- Low: 0% – 20%

5.4 GO, NO - GO Criteria

The sensitivity analyses are also expressed in terms of whether the “Go Ahead” has or has not been given for development in a specific area or ecological unit, with regards to the ecological sensitivity along with mitigating measures. The criteria are directly linked to all the other analyses used in the study and can be expressed as follows:

- GO: Areas of low sensitivity

These would typically be areas where the veld has been totally or mostly transformed.

- GO-SLOW: Areas of medium/low sensitivity

These would typically be areas where large portions of the veld has been transformed and/or is highly infested with alien vegetation and lacks any real faunal component. Few mitigating measures are typically needed, but it is still always wise to approach these areas properly and slowly.

- GO-BUT: Areas of medium and medium/high sensitivity

These are areas that are sensitive and should generally be avoided if possible. But, with the correct implementation of mitigating and management measures can be entered if need be.

- NO-GO: Areas of high sensitivity

These are areas of high sensitivity and should be avoided at all cost. In these areas mitigating measures are typically futile in limiting impacts.

The Precautionary Principle is applied throughout this investigation.

5.5 Floral Assessment – Species of Conservation Concern

Baseline data for the quarter degree grids in which the study area is situated were obtained from the SANBI database and were compared to the Interim Red Data List of South African Plant Species (Raimondo D. *et.al*., 2009) to compile a list of Floral Species of Conservation Concern (which includes all Red Data flora species) that could potentially occur within the study area.

A snapshot investigation of an area presents limitations in terms of locating and identifying Red Data floral species. Therefore, particular emphasis is placed on the identification of habitats deemed suitable for the potential presence of Red Data species by associating available habitat to known habitat types of Red Data floral species. The verification of the presence or absence of these species from the study area is not perceived as part of this investigation as a result of project limitations.

5.6 Faunal Sensitivity

Determining the full faunal component of a study area during a short time scale of a few field trips can be highly limiting. Therefore, the different habitats within the study area and nearby surrounding areas were scrutinised for attributes that are deemed to be suitable for high diversity of fauna, as well as for Red Data species. Special consideration was given to habitats of pristine condition and high sensitivity.

Areas of faunal sensitivity were calculated by considering the following parameters:

- Habitat status – the status or ecological condition of the habitat. A high level of habitat degradation will often reduce the likelihood of the presence of Red Data species.
- Habitat linkage – Movement between areas used for breeding and feeding purposes forms an essential part of ecological existence of many species. The connectivity of the study area to surrounding habitats and adequacy of these linkages are evaluated for the ecological functioning of Red Data species within the study area
- Potential presence of Red Data species – Areas that exhibit habitat characteristics suitable for the potential presence of Red Data species are considered sensitive.

The same Index Values, Sensitivity Values and Categories used for the floral sensitivity ratings are used for the faunal sensitivity ratings. The same Go, No-Go criteria and ratings used for the flora component are also used for the faunal component.

5.7 Faunal Assessment – Species of Conservation Concern

Literature was reviewed and relevant experts contacted to determine which faunal species of conservation concern (which include all Red Data species) are present, or likely to be present, in the study area.

A snapshot investigation of an area presents limitations in terms of locating and identifying Red Data fauna species. Particular emphasis was therefore placed on the identification of habitat deemed suitable for the potential presence of Red Data fauna species by associating available habitat to known habitat types of Red Data species. The verification of the presence or absence of these species from the study area is not perceived as part of this investigation as a result of project limitations.

5.8 Biodiversity Impact Assessment

The impact assessment takes into account the nature, scale and duration of the effects on the natural environment and whether such effects are positive (beneficial) or negative (detrimental).

A rating/point system is applied to the potential impact on the affected environment and includes an objective evaluation of the mitigation of the impact. In assessing the significance of each issue the following criteria are used and points awarded as shown:

- Extent: National - 4; Regional – 3; Local – 2; Site – 1.
- Duration: Permanent – 4; Long term – 3; Medium term – 2; Short term – 1.
- Intensity: Very high – 4; High – 3; Moderate – 2; Low – 1.
- Probability of Occurrence: Definite – 4; Highly probable – 3; Possible – 2; Impossible – 1.

5.9 Criteria for the classification of an impact

Nature

A brief description of the environmental aspect being impacted upon by a particular action or activity is presented.

Extent (Scale)

Considering the area over which the impact will be expressed. Typically, the severity and significance of an impact have different scales and as such bracketing ranges are often required. This is often useful during the detailed assessment phase of a project in terms of further defining the determined significance or intensity of an impact.

- Site: Within the construction site
- Local: Within a radius of 2 km of the construction site
- Regional: Provincial (and parts of neighbouring provinces)
- National: The whole of South Africa

Duration

Indicates what the lifetime of the impact will be.

- Short-term: The impact will either disappear with mitigation or will be mitigated through natural process in a span shorter than the construction phase.
- Medium-term: The impact will last for the period of the construction phase, where after it will be entirely negated.
- Long-term: The impact will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter.
- Permanent: The only class of impact, which will be non-transitory. Mitigation either by man or natural process will not occur in such a way or in such a time span that the impact can be considered transient.

Intensity

Describes whether an impact is destructive or benign.

- Low: Impact affects the environment in such a way that natural, cultural and social functions and processes are not affected.
- Medium: Effected environment is altered, but natural, cultural and social functions and processes continue albeit in a modified way.

- High: Natural, cultural and social functions and processes are altered to extent that they temporarily cease.
- Very high: Natural, cultural and social functions and processes are altered to extent that they permanently cease.

Probability

Probability is the description of the likelihood of an impact actually occurring.

- Improbable: Likelihood of the impact materialising is very low.
- Possible: The impact may occur.
- Highly probable: Most likely that the impact will occur.
- Definite: Impact will certainly occur.

Significance

Significance is determined through a synthesis of impact characteristics. It is an indication of the importance of the impact in terms of both the physical extent and the time scale and therefore indicates the level of mitigation required. The total number of points scored for each impact indicates the level of significance of the impact.

Using the scoring from the previous section, the significance of impacts is rated as follows:

- Low impact: 4-7 points. No permanent impact of significance. Mitigating measures are feasible and are readily instituted as part of a standing design, construction or operating procedure.
- Medium impact: 8-10 points. Mitigation is possible with additional design and construction inputs.
- High impact: 11-13 points. The design of the site may be affected. Mitigation and possible remediation are needed during the construction and/or operational phases. The effects of the impact may affect the broader environment.
- Very high impact: 14-16 points. The design of the site may be affected. Intensive remediation as needed during construction and/or operational phases. Any activity, which results in a “very high impact”, is likely to be a fatal flaw.

Status

Status gives an indication of the perceived effect of the impact on the area.

- Positive (+): Beneficial impact.
- Negative (-): Harmful or adverse impact.
- Neutral Impact (0): Neither beneficial nor adverse.

It is important to note that the status of an impact is assigned based on the *status quo.* That is, should the project not proceed. Therefore not all negative impacts are equally significant. The suitability and feasibility of all proposed mitigation measures will be included in the assessment of significant impacts. This will be achieved through the comparison of the significance of the impact before and after the proposed mitigation measure is implemented.

6 RECEIVING ENVIRONMENT

6.1 Study Site Location

The study site is an area of less than 5ha located on the Farm Ek Kraal in the Karoo Hoogland Local Municipality, Namakwa District of the Northern Cape Province. The study area is situated 40km north of Matjiesfontein and 1,5km west of the R354 in the Roggeveld region of the Karoo Hoogland Local Municipality of the Namakwa District Municipality of the Northern Cape Province (Figure 1).

6.2 GPS Coordinates of the Main Landmarks

The GPS coordinates of the main landmarks within the project area are as follows:

- Corner GPS points of study area (See Figure 3):
  - F1: 32°52'50.02"S; 20°32'25.27"E.
  - F2: 32°52'50.79"S; 20°32'30.42"E.
  - F3: 32°52'45.33"S; 20°32'31.57"E.
  - F4: 32°52'46.09"S; 20°32'37.26"E.
  - F5: 32°52'53.71"S; 20°32'35.66"E.
  - F6: 32°52'52.08"S; 20°32'24.84"E.
- Matjiesfontein: 33°13'50.51"S; 20°34'57.55"E.
- 1:50 000 map grid references: 3220DC (3220DC11).

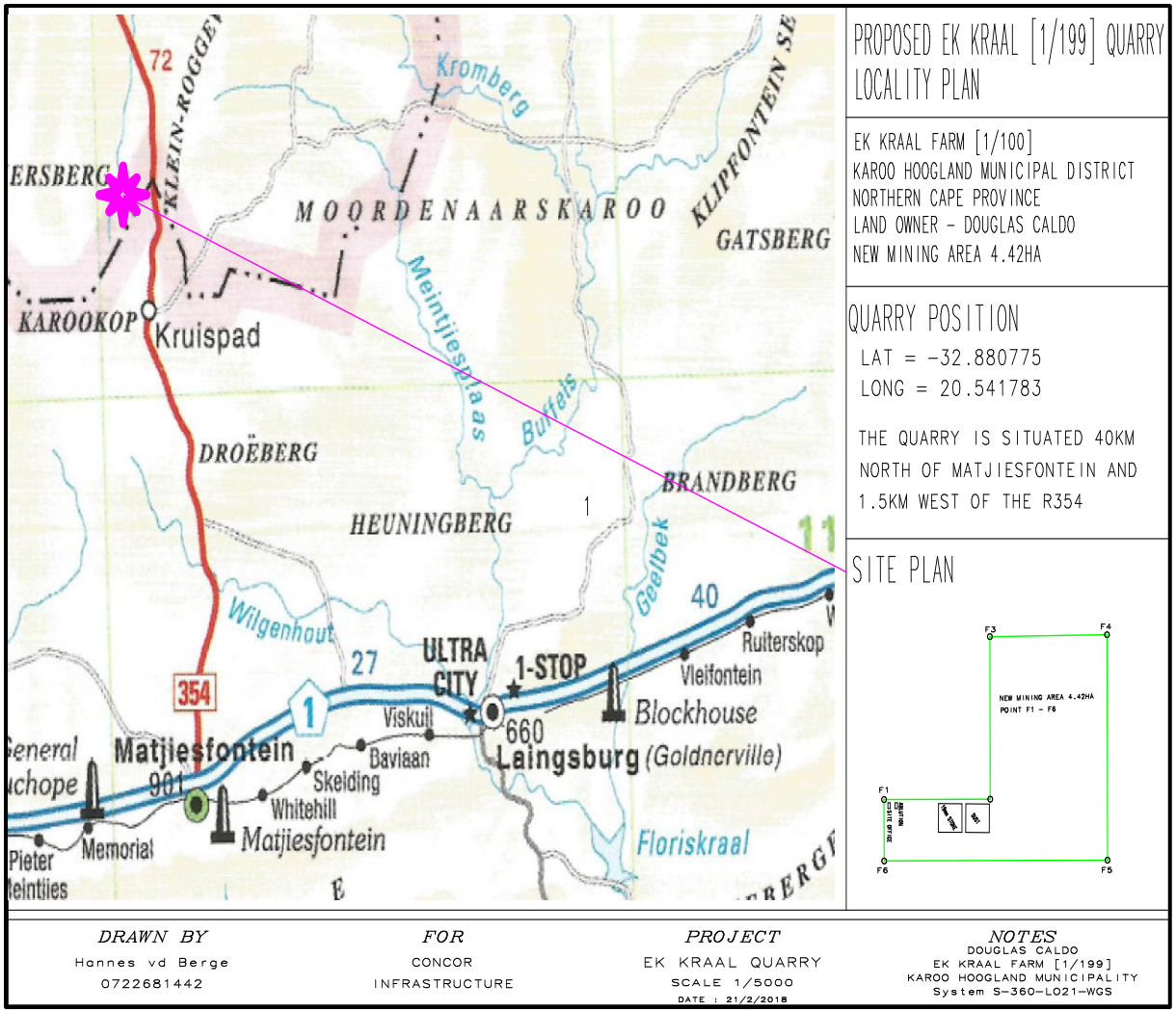

Figure 1: Site location

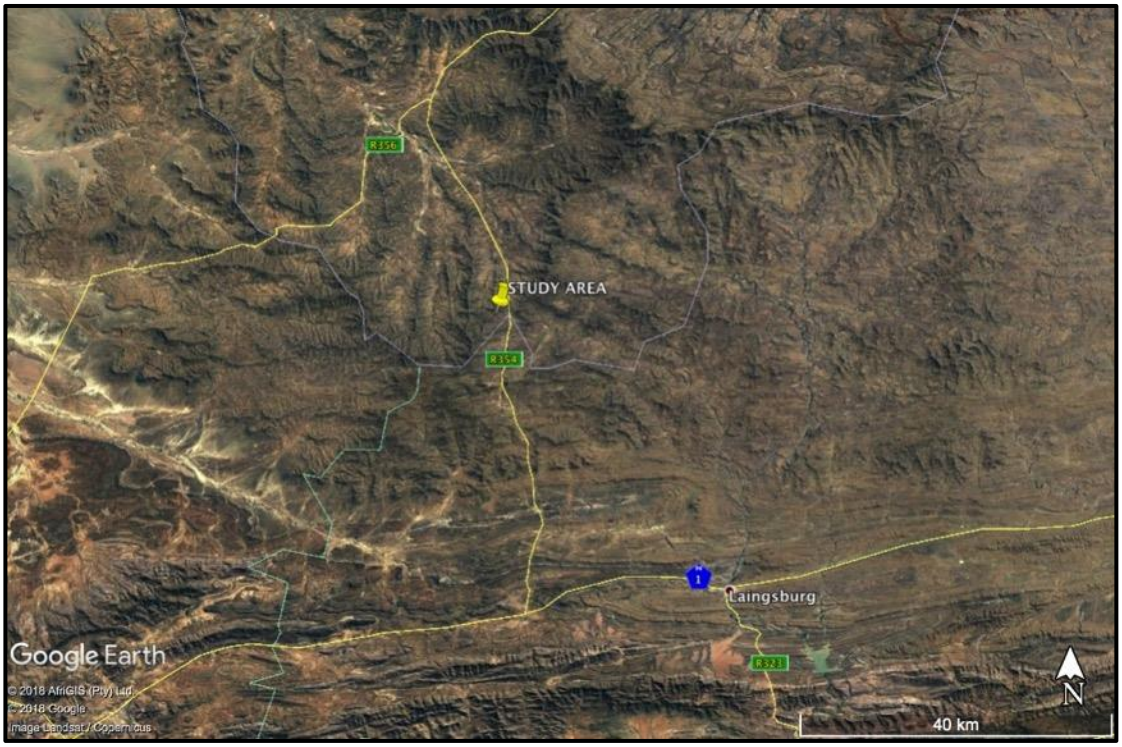

Figure 2: Site location (Google Earth)

Figure 3: Close up of study area

6.3 Topography

The topography of the region is highlands with slopes and broad ridges of low mountains and escarpments, with occasional valleys and ravines. The landscape is dominated by tall to very short reronsterbos shrubland and large suites of dominantly non-succulent Karoo shrubs. The study site is situated on top of a plateau with an average height above sea level of 1 181m, with an approximate maximum and minimum of 1 185m and 1 175m asl, respectively. The general downward slope of the study area is from northwest to southeast.

6.4 Climate

The study area is situated 40km north of Matjiesfontein and has a similar climate. Matjiesfontein is within the low rainfall region of South Africa and only receives on average about 98mm of rain per year. The area is within a winter rainfall region and therefore has a Mediterranean type climate. The area receives the lowest rainfall (1mm) in January and the highest rainfall (17mm) in June (www.saexplorer.co.za). The region of the study area is arid to semi-arid. The region is the coldest during July, at an average night temperature of 1,9^0 C. During the summer months the average midday temperatures range from 14,8^0 C to 28,4^0 C. The study area is situated within the Cold Interior Climatic Zone of South Africa (Figure 5).

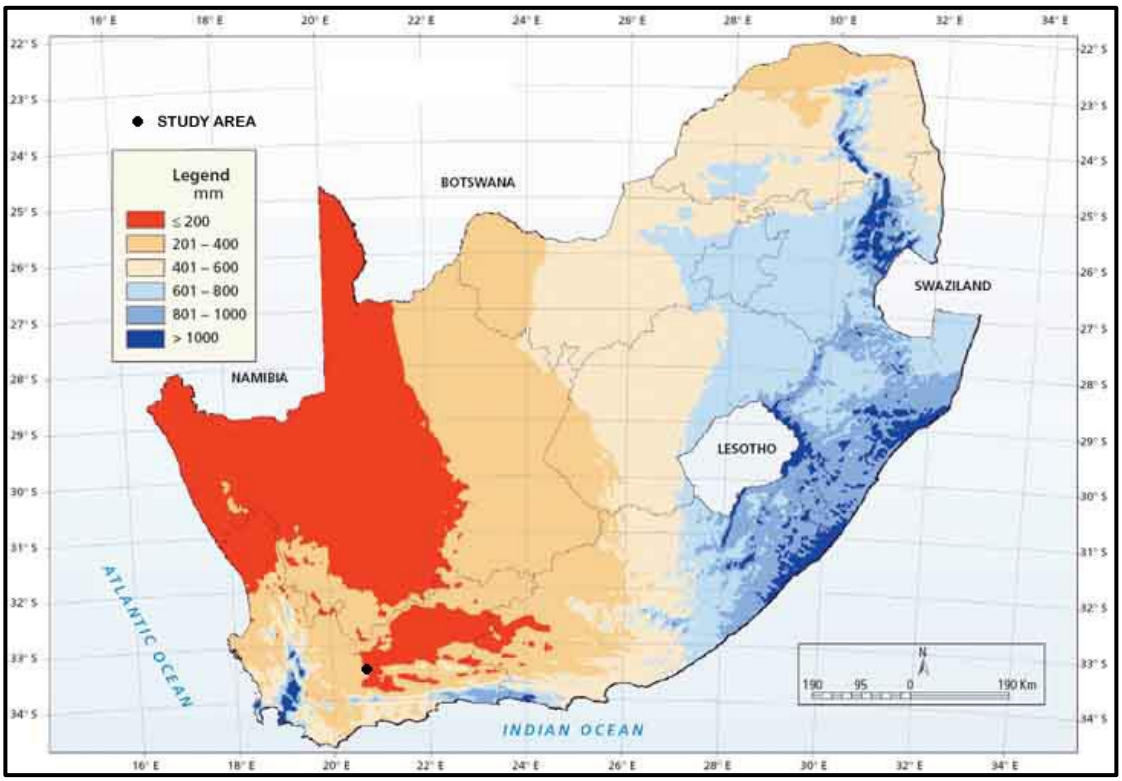

Figure 4: Rainfall averages for South Africa

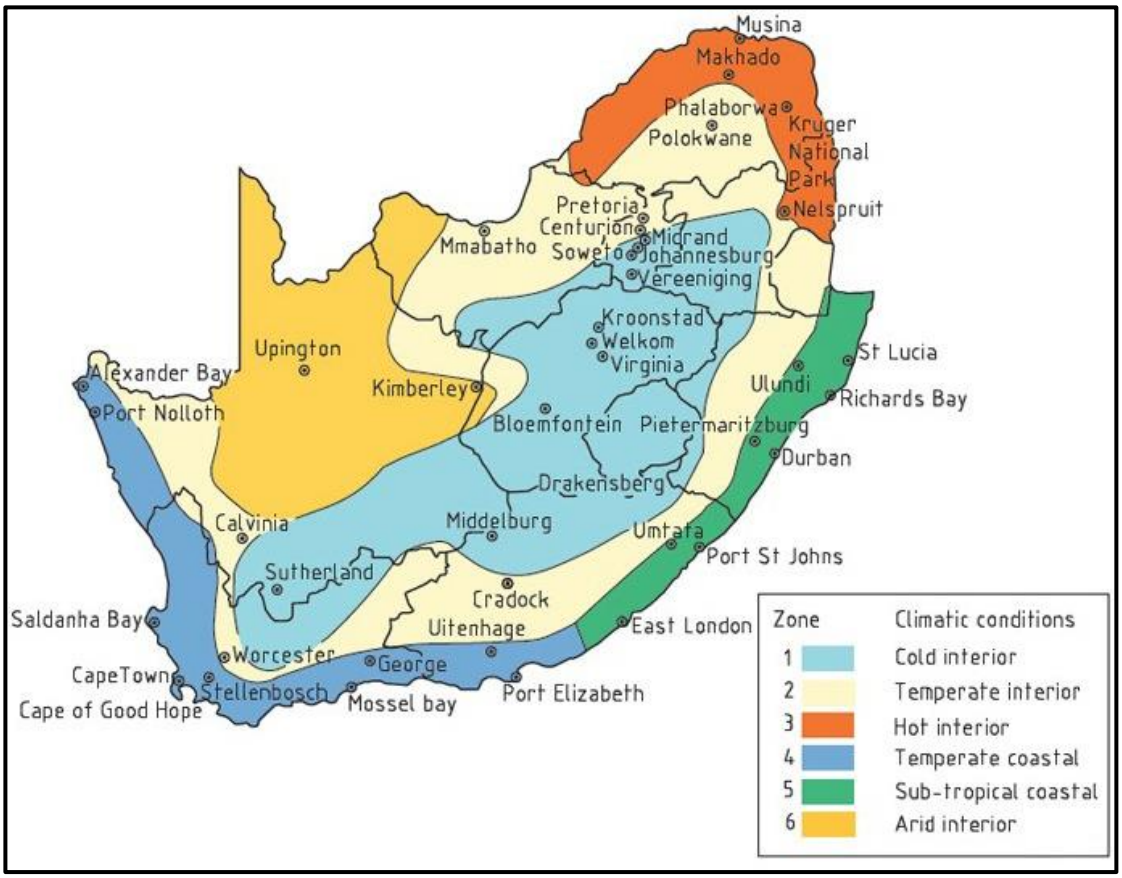

Figure 5: Broad climatic zones of South Africa

7 TERRESTRIAL ECOLOGY

7.1 Vegetation

South Africa is divided up into nine major Biomes. The study area and the surrounding region fall within the Fynbos Biome (Figure 6). Although well defined geographically, the Fynbos Biome actually comprises of three distinctive, naturally fragmented vegetation types, namely, fynbos, renosterveld and strandveld. The three types occur in winter- and summer-rainfall areas, and are dominated by small- leaved, evergreen shrubs, whose regeneration is intimately related to fire (Mucina & Rutherford, 2006).

Due to the complexity and lack of botanical data, the Fynbos Biome is not divided up into Bioregions in the same way, or sense, as that of Savanna or Grassland Biomes. For simplicity of explanation, the Fynbos Biome currently is divided into three 'Bioregions' of Fynbos, Renosterveld and Strandveld, with numerous sub-vegetation units and veldtypes. The study site is situated within the 'bioregion' of the Renosterveld (Karoo Renosterveld) and the veldtype unit of Central Mountain Shale Renosterveld (Figure 1 & Table 1). The veldtype is a very poorly known renosterveld type despite its interesting biogeographical

borderline position. The veldtype straddles the Fynbos, Succulent Karoo and marginally the Nama- Karoo Biomes. It does not appear to have any endemic species (Mucina & Rutherford, 2006).

Central mountain shale renosterveld is characterised by a mix of open karroid scrubland and renosterveld shrubland. The terrain is typically slopes and broad ridges of low mountains and escarpments, with tall to short shrubland dominated by renosterbos and large suites of mainly non-succulent karoo shrubs and with a rich geophytic flora in the undergrowth or in more open, wetter or rocky habitats (Mucina & Rutherford, 2006).

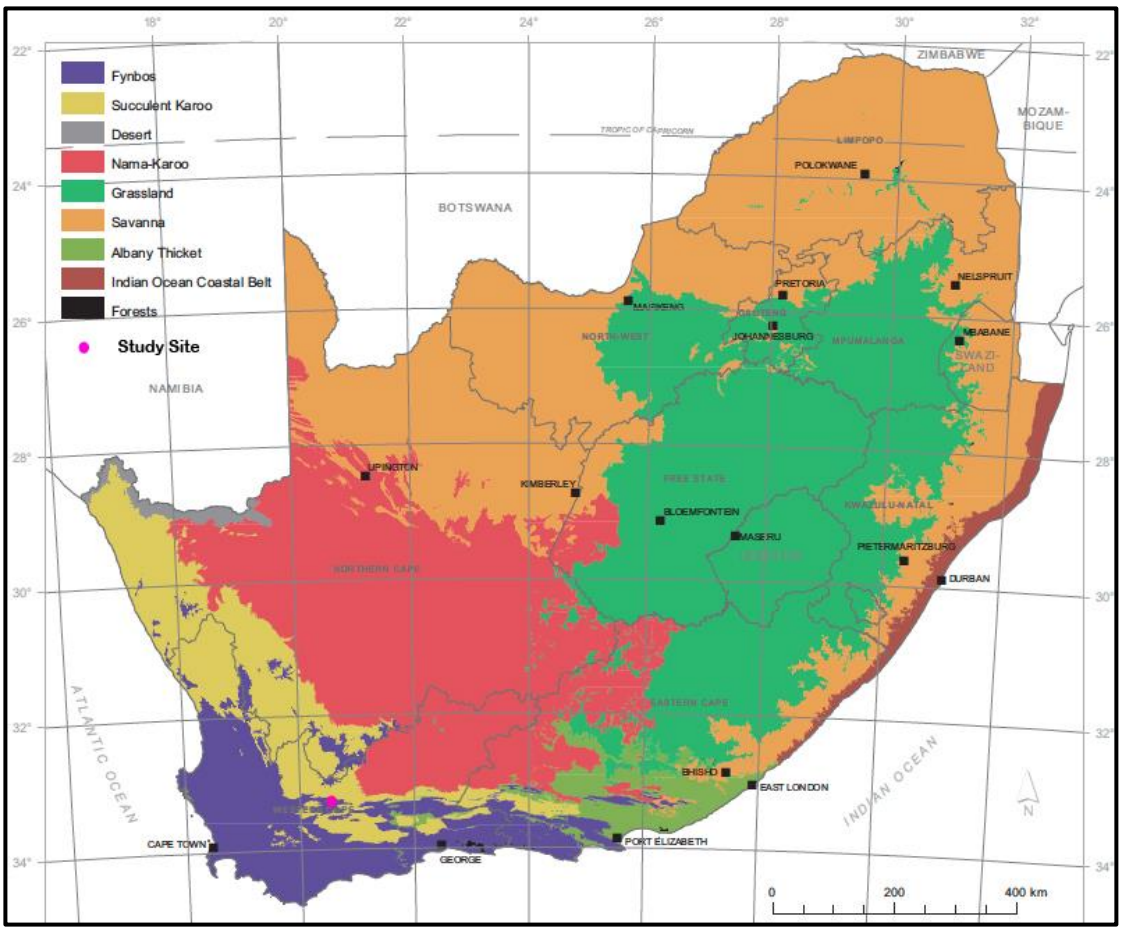

Figure 6: Biomes of South Africa

Table 1: Vegetation hierarchy of the study area

Category Description	Classification
Biome	Fynbos
Bioregion	Renosterveld (Karoo Renosterveld)
Sub-Bioregion	Shale Renosterveld
Vegetation Types	Central Mountain Shale Renosterveld

7.2 Priority Floral Species

No Red Data species (endangered, threatened or vulnerable) were observed during field investigations. According to the SANBI database (www.posa.sanbi.org) two threatened (Vulnerable) Red Data species has been recorded in QDS. The summaries of priority floral species per grid reference are tabled below (Table 2).

Table 2: Priority Floral Species per 1:50 000 Grid Reference

Grid reference & Priority Category	No. of species	Name of species
3220DC		
Critically endangered (CR)	0	-
Endangered (EN)	0	-
Vulnerable (VU)	2	*Lotononis venosa* *Romulea eburnea*

Lotononis vernosa is found in the Klein Roggeveld Mountains. Wheat cultivation and grazing are potential threats to the species. The species prefers karroid scrub on sandy clay alluvium soils.

Romulea eburnea is a rare, localised endemic to the Roggeveld Escarpment, where it is only known from two locations and potentially threatened by habitat degradation due to overgrazing (Red List of South African Plants. www.redlist.sanbi.og).

7.3 Conservation status

The conservation status of Central Mountain Shale Renosterveld is Least Threatened, according to Mucina & Rutherford (2006, 2010) (Table 3 & Figure 8). According the latest threatened veldtypes datasets of

Table 3: Veldtype status

Veldtype	Status	Info
Central Mountain Shale Renosterveld	Least Threatened (LT)	None of the veldtype is conserved in statutory or private conservation areas. However, only about 1% trans- formed. Erosion moderate.

Table 4 below gives a basic description of each of the status categories, while Figure 7 shows the categories in a hierarchical format (IUCN Redlist, 2010).

The Biodiversity Act (Act 10 of 2004) provides for listing of threatened or protected ecosystems, in one of four categories: Critically Endangered (CR), Endangered (EN), Vulnerable (VU) or protected. The main purpose for the listing of threatened ecosystems is an attempt to reduce the rate of ecosystem and species destruction and habitat loss, leading to extinction. This includes preventing further degradation and loss of structure, function and composition of threatened ecosystems (SANBI).

Table 4: Ecosystem Status: Simplified explanation of categories used

STATUS	% Transformed	Effect on Ecosystem
Least Threatened (LT)	0-20% (<20% loss)	No significant disruption of ecosystem functions
Vulnerable (VU)	20-40% (>20% loss)	Can result in some ecosystem functions being altered
Endangered (EN)	40-60% (>40% loss)	Partial loss of ecosystem functions
Critically Endangered (CR)	>60% or BT Index for that specific veldtype	Species loss. Remaining habitat is less than is required to represent 75% of species diversity

Source: South African National Spatial Biodiversity Assessment Technical Report. Volume 1: Terrestrial Component. 2004. SANBI. Mucina & Rutherford (eds) (2010).

Note: BT stands for the Biodiversity Threshold and is an index value that differs for each veldtype. In other words, because the composition, recovery rate, etc. differs for each veldtype there will be a different threshold (in this case percentage transformed) at which species become extinct and ecosystems breakdown. That is, at which point the veldtype is critically endangered. For the grassland vegetation units discussed the index value (BT) is broadly given as 60% and greater.

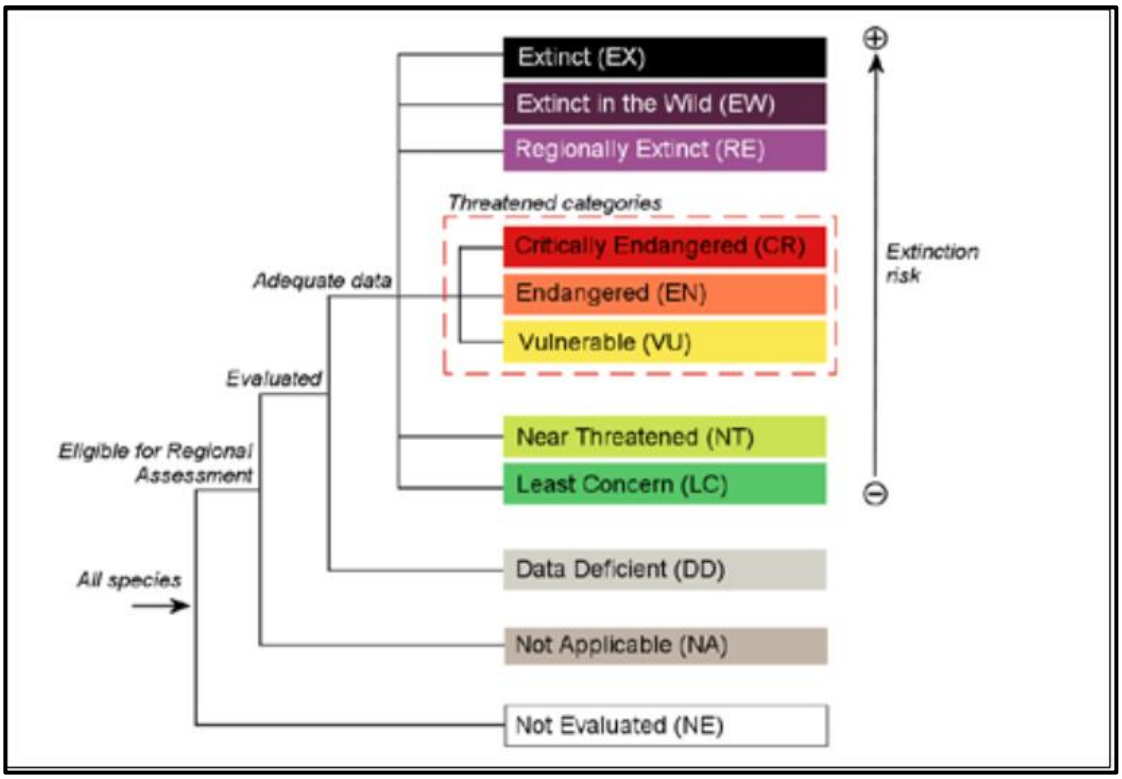

Figure 7: Structure of categories used at the regional level

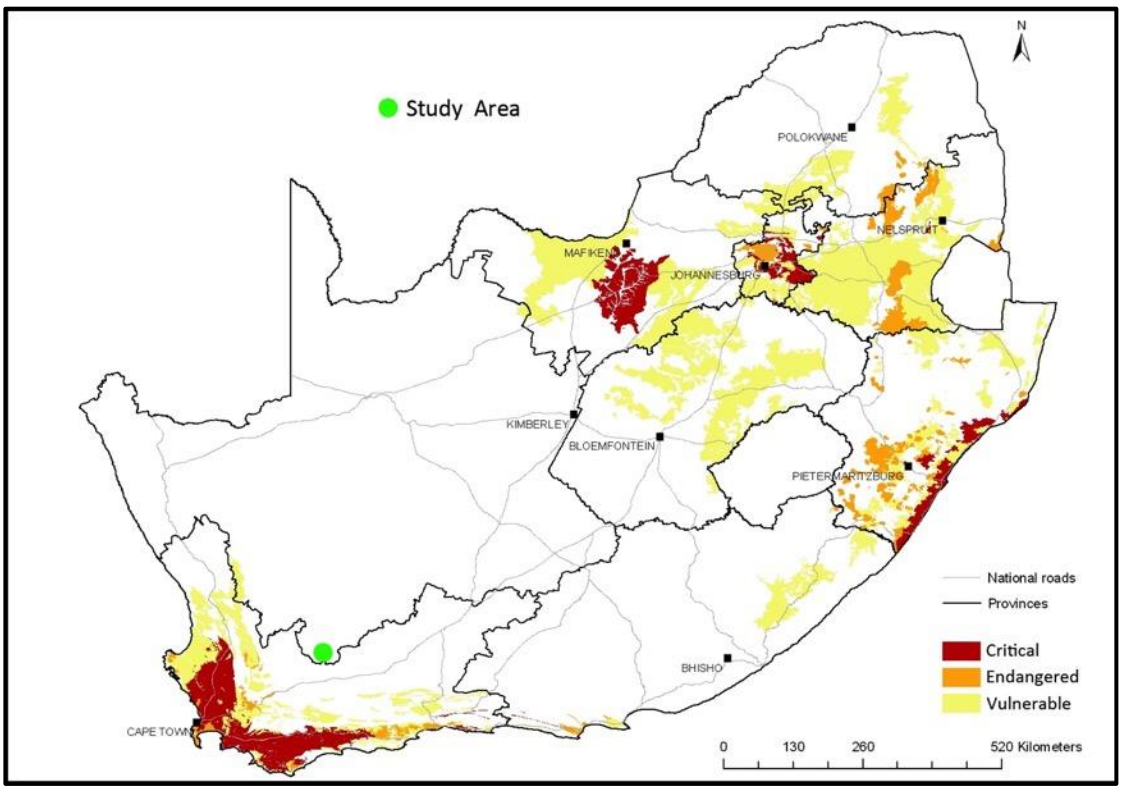

Figure 8: Threatened veldtypes

7.4 Plants identified during field investigations

The dominant plant species found in the area are listed in the appendices.

No Red Data or Orange Data species were observed in the study area during field investigations.

7.5 Protected tree species identified in the study area

There are no protected trees in the study area.

7.6 Fauna

The region of the study area is fairly open with low levels of urbanisation. It is therefore understandable that numerous, albeit limited wild faunal species will be found in the area, especially in the wilder, more rugged hill and mountainous countryside.

7.6.1 Mammals

The general region in which the study area is situated is open Karoo and renosterveld with farming activities such a sheep, grazzing and low urbanisation. Numerous mammal species will therefore naturally occur in the region and occasionally also in the study area. These would in include small game species such as Cape hare (*Lepus capensis*), duiker species (Sub-family: Cephalophinae), shrew species (*Graphiurus* spp.), rats and mice. Larger mammal species that would occur in the region include Cape mountain zebra (*Equus zebra zebra*), caracal (rooikat) (*Caracal caracal*) and leopard (*Panthera pardus*). The area was historically home to mammals such as hartebeest, blesbok (*Damaliscus pygargus phillipsi*) and black wildebeest (*Connochaetes gnou*).

7.6.2 Avifuana

The study area is not situated within or close to an important bird area (IBA). The immediate area is not known as a birding hotspot, but certain priority species such as raptors will visit the area from time to time. Ostriches are also known to occur in the area. However, the nature of the project is such that it will not have a measurable negative impact on avifaunal species. This is also due to the very localised nature of the project.

7.6.3 Reptiles

The maps below show the hotspots for priority snake and lizard species for South Africa (Figure 9 & Figure 10). The study area is not within a snake or lizard hotspot. However,

care should still be taken to avoid interacting with snakes should any be encountered. It is more than likely that there are snakes in the general area.

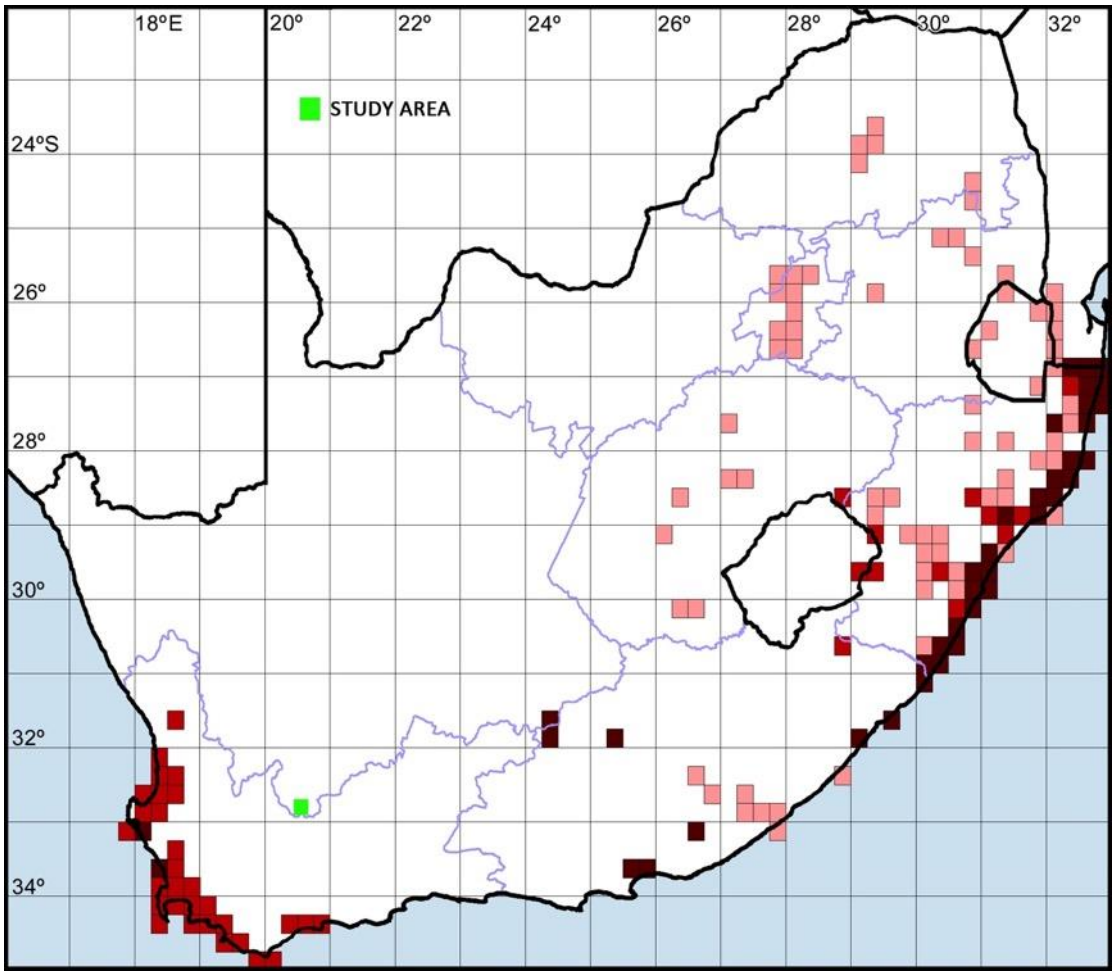

Figure 9: Snake hotspots

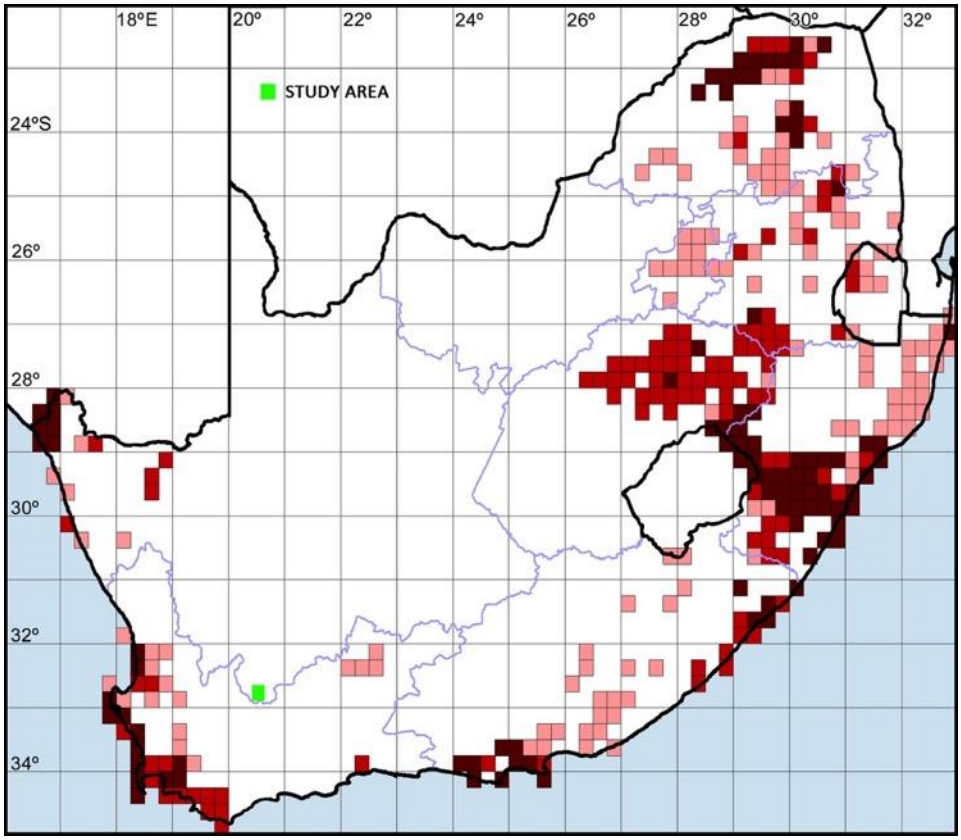

Figure 10: Lizard hotspots

7.6.4 Invertebrates

The map below shows the hotspots for priority butterflies and species-rich areas for South Africa (Figure 11). The study area is not within any of these known hotspots.

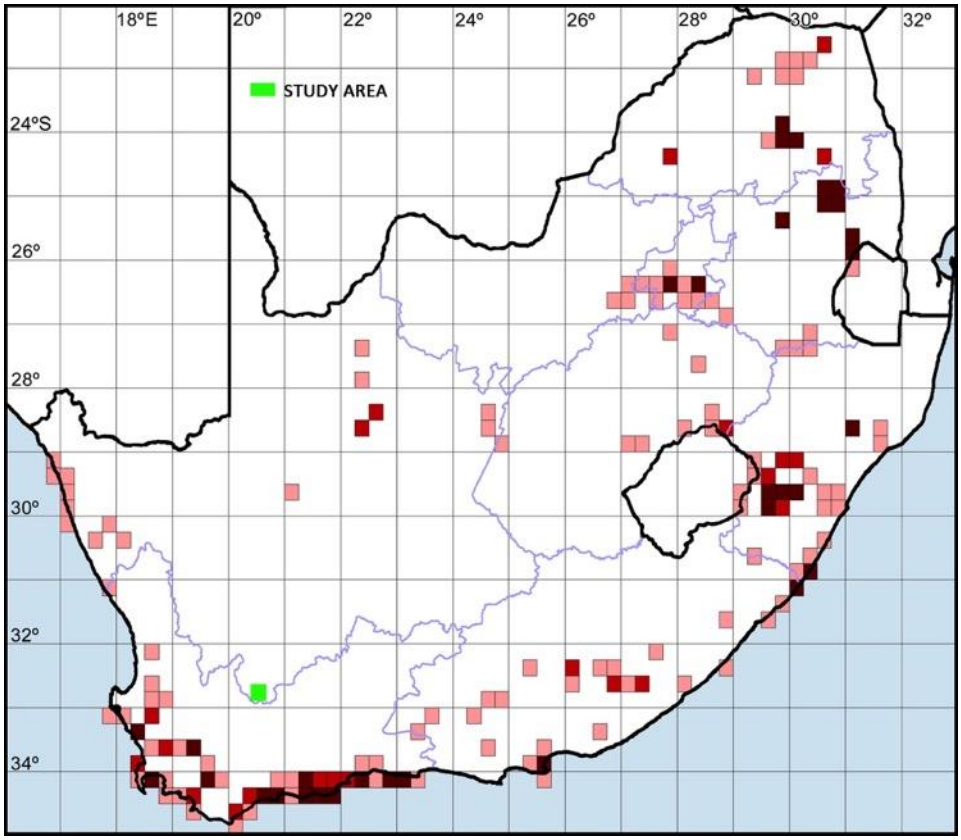

Figure 11: Butterfly hotspots

8 AQUATIC ECOLOGY

The aquatic ecology focuses on the open waterbodies within the study area. These watercourses include wetlands, rivers, streams, pans, lakes and manmade dams. In reality a pan is actually a type of wetland and must be approached as such. The focus is to delineate watercourses and limit any impact the project might have on these watercourses.

8.1 Wetlands

'Wetland' is a broad term and for the purposes of this study it is defined according the parameters as set out by the Department of Water & Sanitation (DWS) in their guideline (A practical field procedure for identification and delineation of wetlands and riparian areas, 2005). The classification of wetlands (which is a type of watercourse) is summarised below (Figure 12).

According to the DWS document and the National Water Act (NWA) a wetland is defined as, "*land which is transitional between terrestrial and aquatic systems where the water table is usually at or near surface, or the land is periodically covered with shallow water, and*

which land in normal circumstances supports or would support vegetation typically adapted to life in saturated soil."

Furthermore, the guidelines stipulate that wetlands must have one or more of the following defining attributes:

- Wetland (hydromorphic) soils that display characteristics resulting from prolonged saturation;
- The presence, at least occasionally, of water loving plants (hydrophytes); and
- A high water table that results in saturation at or near surface, leading to anaerobic conditions developing in the top 50cm of the soil.

During site investigations the following indicators are typically used to determine whether an area needed to be defined as a wetland or not, namely:

- Terrain unit indicator;
- Soil form indicator;
- Soil wetness indicator; and
- Vegetation indicator.

Hydrogeomorphic types		Description	Source of water maintaining the wetland[1]	
			Surface	Sub-surface
Floodplain		Valley bottom areas with a well defined stream channel, gently sloped and characterized by floodplain features such as oxbow depressions and natural levees and the alluvial (by water) transport and deposition of sediment, usually leading to a net accumulation of sediment. Water inputs from main channel (when channel banks overspill) and from adjacent slopes.	***	*
Valley bottom with a channel		Valley bottom areas with a well defined stream channel but lacking characteristic floodplain features. May be gently sloped and characterized by the net accumulation of alluvial deposits or may have steeper slopes and be characterized by the net loss of sediment. Water inputs from main channel (when channel banks overspill) and from adjacent slopes.	***	*/ ***
Valley bottom without a channel		Valley bottom areas with no clearly defined stream channel, usually gently sloped and characterized by alluvial sediment deposition, generally leading to a net accumulation of sediment. Water inputs mainly from channel entering the wetland and also from adjacent slopes.	***	*/ ***
Hillslope seepage linked to a stream channel		Slopes on hillsides, which are characterized by the colluvial (transported by gravity) movement of materials. Water inputs are mainly from sub-surface flow and outflow is usually via a well defined stream channel connecting the area directly to a stream channel.	*	***
Isolated Hillslope seepage		Slopes on hillsides, which are characterized by the colluvial (transported by gravity) movement of materials. Water inputs mainly from sub-surface flow and outflow either very limited or through diffuse sub-surface and/or surface flow but with no direct surface water connection to a stream channel.	*	***
Depression (includes Pans)		A basin shaped area with a closed elevation contour that allows for the accumulation of surface water (i.e. it is inward draining). It may also receive sub-surface water. An outlet is usually absent, and therefore this type is usually isolated from the stream channel network.	*/ ***	*/ ***

[1] Precipitation is an important water source and evapotranspiration an important output in all of the above settings

Water source: * Contribution usually small

*** Contribution usually large

*/ *** Contribution may be small or important depending on the local circumstances

*/ *** Contribution may be small or important depending on the local circumstances.

 Wetland

Figure 12: Classification of wetlands

8.2 Riparian zones

Riparian vegetation is typically zonal vegetation closely associated with the course of a river or stream and found in the alluvial soils of the floodplain. According to the National Water Act (NWA) riparian habitat is defined as including "*The physical structure and associated vegetation of the areas associated with a watercourse which are commonly characterised by alluvial soils, and which are inundated or flooded to an extent and with a frequency*

sufficient to support vegetation of species with a composition and physical structure distinct from those of adjacent land areas."

It is important to note that the NWA states that the riparian zone has a floral composition distinct from those of adjacent areas. The NWA also defines riparian zones as areas that "*commonly reflect the high-energy conditions associated with the water flowing in a water channel, whereas wetlands display more diffuse flow and are lower energy environments*."

8.3 Rivers and streams

A stream or river is a watercourse that is characterised by a very distinct channel. Most, but not all streams and rivers have an associated floodplain and / or riparian zone. Although wetlands and rivers are both watercourses, the legal implications differ in terms of development, buffer zones, etc.

8.4 Watercourses in the study area

There are no watercourses in the study area, including distinctive drainage lines, seasonal streams and wetlands. The study site is not only situated within an arid, Karoo environment, but is on a flat to very flat plateau plain. There are a few highly ephemeral and erratic drainage lines that run down the surrounding slopes (Figure 13).

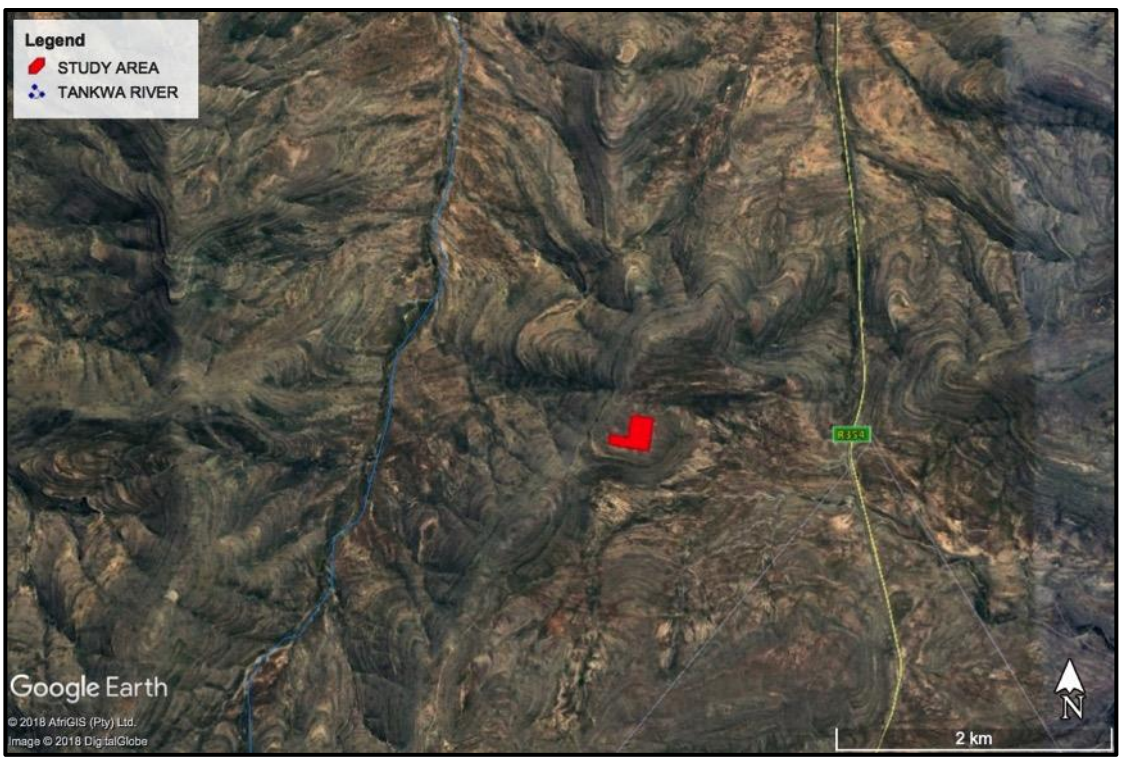

Figure 13: Rivers

8.5 Classification of watercourses in the study area

All watercourses identified in the study area are classified along different hydrogeomorphic (HGM) types or units, up to Level 4, in terms of various levels as refined for South Africa by Kleynhans, *et. al*. (2005) and used in the Classification System for Wetlands user manual – SANBI Series 22 (Ollis *et. al.* 2013). See tables below (Table 5). The classification system shown above in Figure 12 is typically used for wetlands. However, there are no wetlands in the study area. Although there are no watercourses in the study area itself, there are a few small, highly ephemeral drainage lines along the outer slopes of the plateau on which the study area is situated, which were classified as shown below (Table 6).

Table 5: Classification levels 1 - 4

LEVEL 1 System	**LEVEL 2 Regional setting (Ecoregion)**	**LEVEL 3 Landscape Unit**	**LEVEL 4 HGM Unit**	
			HGM Type	Landform
Inland	SA Ecoregions according to DWS and/or NFEPA	• Valley floor • Slope • Plain • Bench	River	• Mountain headwater stream • Mountain stream • Transitional stream • Upper foothill • Lower foothill • Lowland • Rejuvenated foothill • Upland floodplain
			Channeled valley bottom wetland	
			Unchannelled valley bottom wetland	
			Floodplain Wetland	
			Depression	• Exorheic • Endorheic • Dammed

			Seep	• With channel outflow (connected) • Without channel outflow (disconnected)
			Wetland flat	

Table 6: HGM Level 4: Watercourses in the region

Delineated systems	Level 1 System	Level 2 Regional Setting (Ecoregion)	Level 3 Landscape Unit	Level 4 HGM Unit
Drainage lines	Inland	Renosterveld	Bench	River (Mountain headwater stream)

8.6 Delineated Watercourses

There are no watercourses in the study area. The closest significant watercourse is the Tankwa River, which originates in the region and is approximately 1,7km due west of the study site. The study site is situated on top of a plateau with relatively steep edges between 150m to 300m from the outer boundaries. On these edges are a few natural drainage lines that are only active during rain downpours, channeling surface stormwater flow off the plateau. These drainage lines do not have any riparian zones or 100 flood year areas that are broader or larger than the drainage lines themselves. The study area is situated more than 100m from the edge of any watercourse, riparian zone or 100 year floodline (Figure 14).

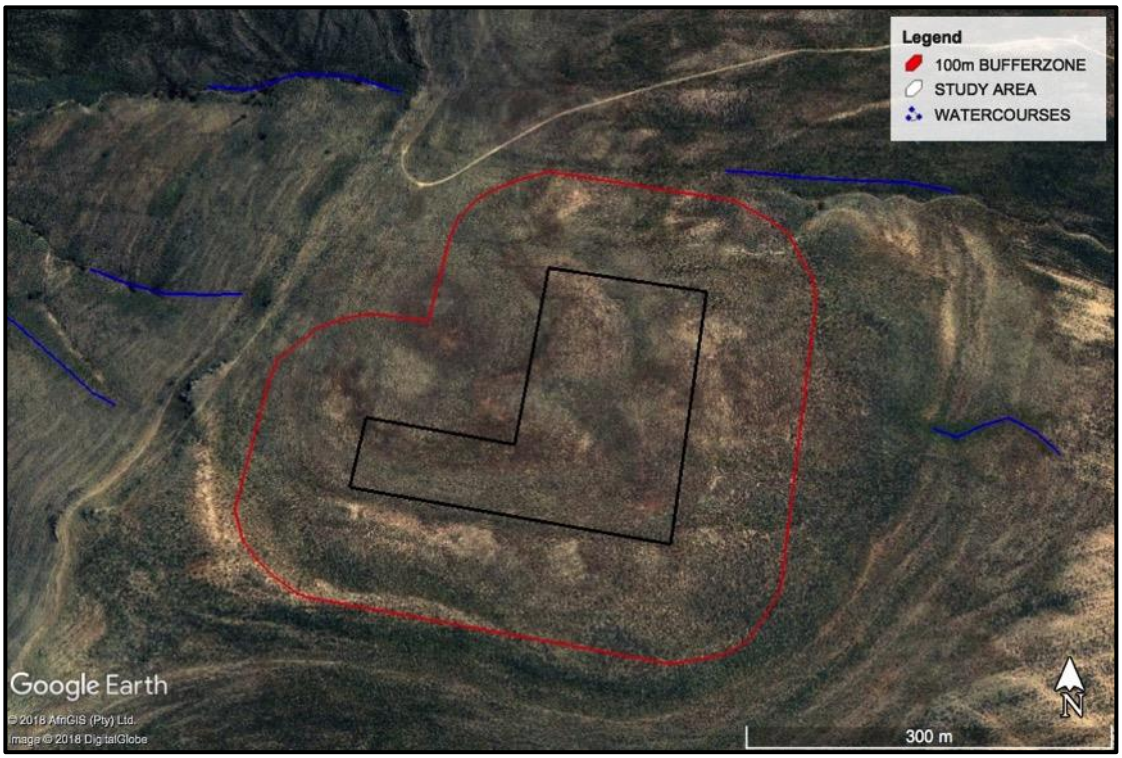

Figure 14: Delineated watercourses & 100m Bufferzone

8.7 Drainage areas

South Africa can naturally be divided up into a number of geographically occurring Primary Drainage Areas (PDAs) (Figure 15). The PDAs can be further divided into a number of Quaternary Drainage Areas (QDAs). The different areas are demarcated into Water Management Areas (WMAs) and Catchment Management Agencies (CMAs). Until recently, there were 19 WMAs and 9 CMAs. Figure 16 shows the extent of the old (or previous) Water Management Areas (WMAs). As of September 2016, the WMAs were revised and there are now officially only 9 WMAs, which correspond directly in demarcation and area to the 9 CMAs (Figure 17) (Government Gazette, 16 September 2016. No.1056, pg.169-172).

The study area is situated within the Primary Drainage Area (PDA) of J and in the Quaternary Drainage Area (QDA) of J11D (Figure 18). The study area is within the new Breede-Gouritz Water Management Area (WMA 8) and under the jurisdiction of the new Breede-Gouritz Catchment Management Agency (CMA 8) (Figure 17). A summary of the catchment and management areas is shown in Table 7, below.

Table 7: Summary of Catchment Areas

Level	Category
Primary Drainage Area (PDA)	J

Quaternary Drainage Area (QDA)	J11D
Water Management Area (WMA) – Previous / Old	Gouritz
Water Management Area (WMA) – New (as of Sept. 2016)	Breede-Gouritz
Sub-Water Management Area	Groot
Catchment Management Agency (CMA)	Breede-Gouritz

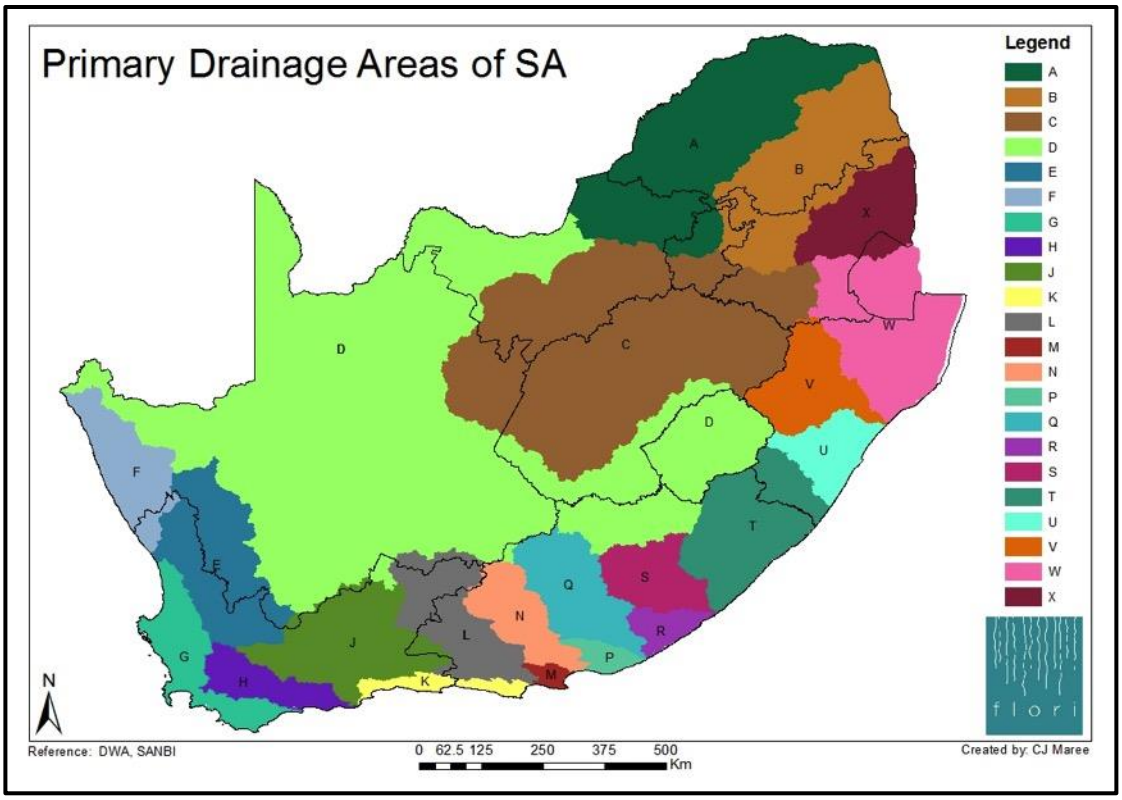

Figure 15: Primary drainage areas of South Africa

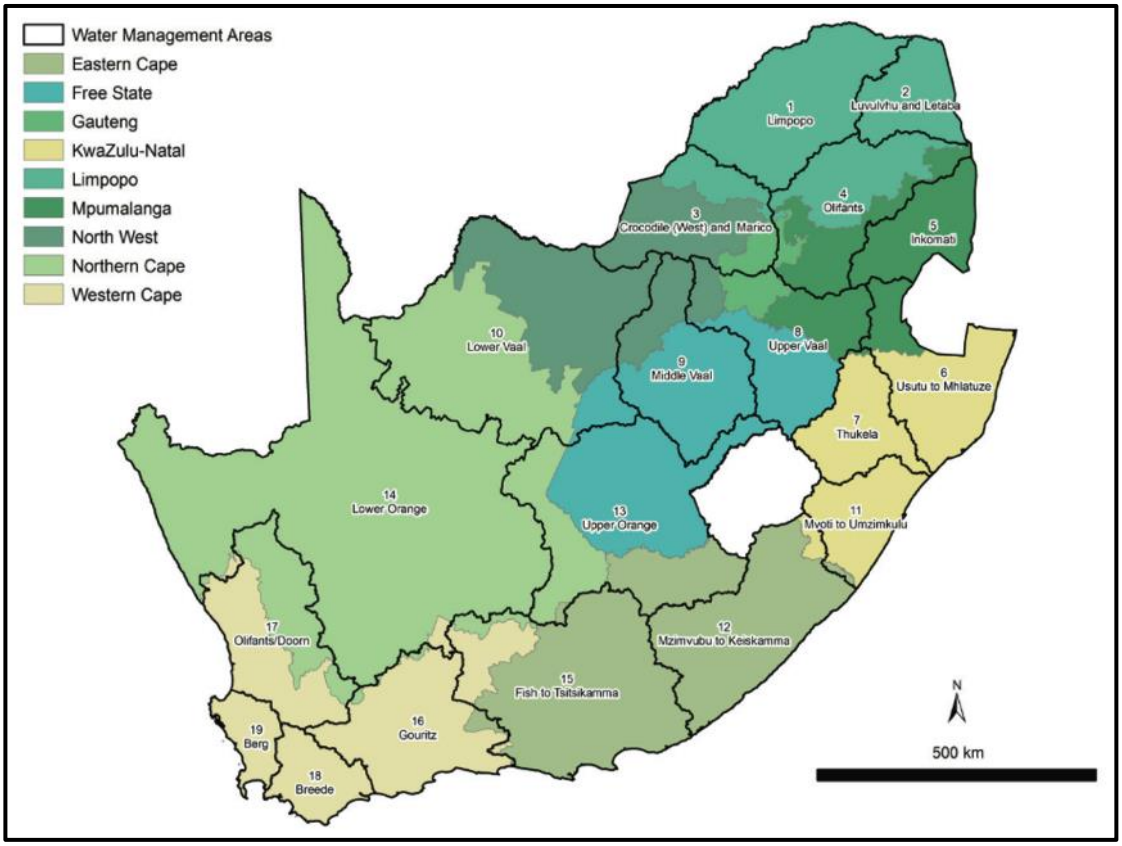

Figure 16: Previous Water Management Areas (WMAs) of South Africa

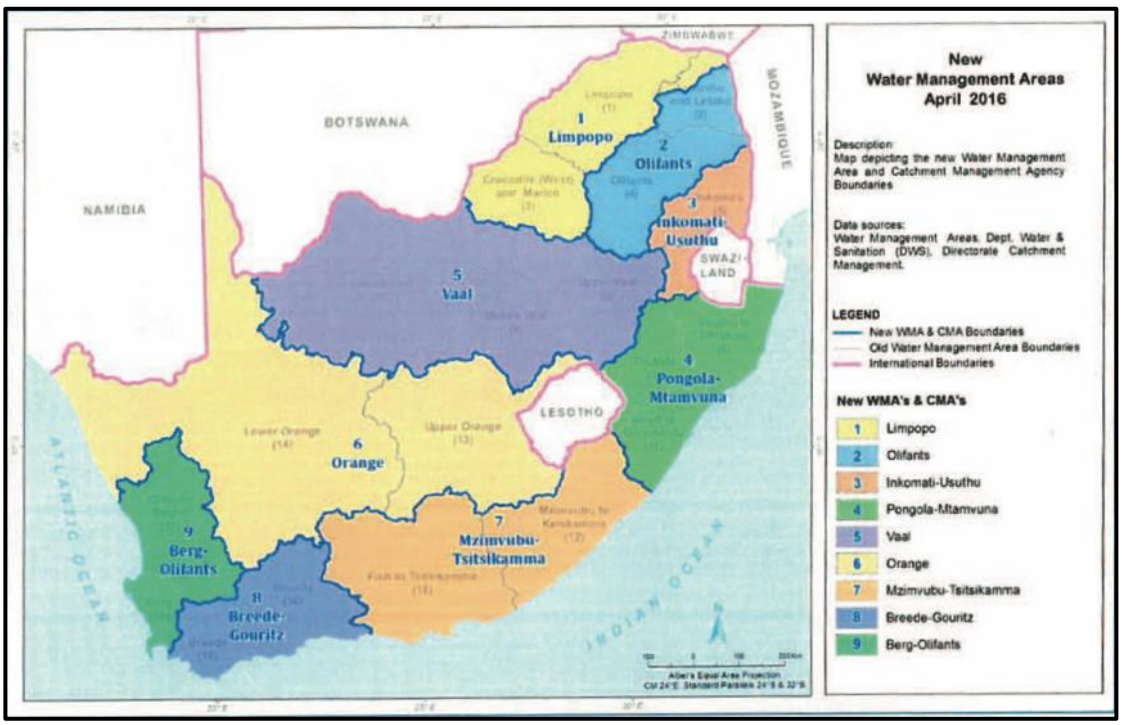

Figure 17: New WMAs and CMAs of South Africa

Figure 18: Quaternary Drainage Areas (QDAs)

8.8 Methodology: Present Ecological State

The Present Ecological State (PES) is the current (present) ecological condition (state) in which the watercourse is found, prior to any further developments or impacts from the proposed project. The PES ratings of watercourses found in the study area are just as important to determine, as are the potential impacts of the proposed development. The PES of a watercourse is assessed relative to the deviation from the Reference State (also known as the Reference Condition).

The reference state is the original, natural or pre-impacted condition of the system. The reference state is not a static condition, but refers to the natural dynamics (range and rates of change or flux) prior to development. The PES Method (DWA, 2005) was used to establish the present state (integrity) of the unnamed drainage line in the study area. The methodology is based on the modified Habitat Integrity approach of Kleynhans (1996, 1999).

Table 8 shows the criteria used for assessing the habitat integrity (PES) of wetlands and other watercourses, along with Table 9 describing the allocation of scores to the various attributes. These criteria were selected based on the assumption that anthropogenic

modification of the criteria and attributes listed under each selected criterion can generally be regarded as the primary causes of the ecological integrity of a wetland.

Table 8: Habitat assessment criteria

Rating Criteria	Relevance
Hydrology	
Flow modification	Consequence of abstraction, regulation by impoundments or increased runoff from human settlements or agricultural lands. Changes in flow regime (timing, duration, frequency), volumes, and velocity, which affect inundation of wetland habitats resulting in floristic changes or incorrect cues to biota. Abstraction of groundwater flows to the wetland.
Permanent inundation	Consequence of impoundment resulting in destruction of natural wetland habitat and cues for wetland biota.
Water quality	
Water Quality Modification	From point or diffuse sources. Measured directly by laboratory analysis or assessed indirectly from upstream agricultural activities, human settlements and industrial activities. Aggravated by volumetric decrease in flow delivered to the wetland.
Sediment Load Modification	Consequence of reduction due to entrapment by impoundments or increase due to land use practices such as overgrazing. Cause of unnatural rates of erosion, accretion or infilling of wetlands and change in habitats.
Geomorphology & Hydraulics	
Canalisation	Results in desiccation or changes to inundation patterns of wetland and thus changes in habitats. River diversions or drainage.
Topographic Alteration	Consequence of infilling, ploughing, dykes, trampling, bridges, roads, railway lines and other substrate disruptive activities, which reduce or changes wetland habitat directly in inundation patterns.
Biota	
Terrestrial Encroachment	Consequence of desiccation of wetland and encroachment of terrestrial plant species due to changes in hydrology or geomorphology. Change from wetland to terrestrial habitat and loss of wetland functions.

Indigenous Vegetation Removal	Direct destruction of habitat through farming activities, grazing or firewood collection affecting wildlife habitat and flow attenuation functions, organic matter inputs and increases potential for erosion.
Invasive Plant Encroachment	Affects habitat characteristics through changes in community structure and water quality changes (oxygen reduction and shading).
Alien Fauna	Presence of alien fauna affecting faunal community structure.
Over utilisation of Biota	Overgrazing, over fishing, over harvesting of plant material, etc.

Table 9: Scoring guidelines for habitat assessment

Scoring guidelines per criteria	
Natural / unmodified	5
Mostly natural	4
Moderately modified	3
Largely modified	2
Seriously modified	1
Critically modified (totally transformed)	0

Table 10 provides guidelines for the determination of the Present Ecological Status Category (PESC), based on the mean score determined for the assessments. This approach is based on the assumption that extensive degradation of any of the wetland attributes may determine the PESC (DWA, 2005).

Table 10: Wetland integrity categories

Category	Mean Score	Description
A	>4	Unmodified, natural condition.
B	>3 to 4	Largely natural with few modifications, but with some loss of natural habitats.
C	>2,5 to 3	Moderately modified, but with some loss of natural habitats.
D	2 to 2,5	Largely modified. A large loss of natural habitats and basic ecosystem functions has occurred.
E	>0	Seriously modified. The losses of natural habitats and basic ecosystem functions are extensive.
F	0	Critically modified. Modifications have reached a critical level and the system has been modified completely with an almost complete loss of natural habitat.

The integrity of watercourses with a category rating of F,E & D were deemed to be Low. Category rating of C was deemed to be Medium, while Category ratings of B & A were deemed to be High.

8.9 PES of watercourses in the study area

There are no watercourses in the study area. Therefore no PES assessments are necessary or could be done. From a strategic, desktop view, the PES of the small drainage lines in the region of the study area are in the range of a Category B (Largely Natural) watercourses.

8.10 Methodology: Ecological Importance and Sensitivity

The ecological importance and sensitivity (EIS) looks at the importance of the wetland, watercourse or water ecosystem in terms of biodiversity and maintenance. The determination is not just based on the identified watercourse in isolation, but also its' importance in terms of supplying and maintaining services to the larger catchment and water systems up and downstream.

The ecological sensitivity (ES) part of the EIS looks at how sensitive the system is to changes in services and environmental conditions. The Recommended Environmental Management Class (REMC) is the recommended state to which the watercourse should be returned to or maintained at. The EIS categories and descriptions are outlined in the table below (Table 11).

A high REMC relates to ensuring a high degree of sustainability and a low risk of ecosystem failure occurring. A low REMC would ensure marginal sustainability, but with a higher risk of ecosystem failure. The REMC is based on the results obtained from assessing the ecosystem or watercourse in terms of EIS, PES and function. The ideal would be that with realistic recommendations and mitigating actions, to return the system to a certain level of functionality and original state.

Table 11: EIS Categories and Descriptions

EIS Categories	Median Range	Category
Wetlands that are considered ecologically important and sensitive on a **national or international** level. The biodiversity of these wetlands is usually very sensitive to flow & habitat modifications. They play a major role in moderating the quantity and quality of water of major rivers.	Very high 3 - 4	A
Wetlands that are considered to be ecologically important and sensitive. The biodiversity of these wetlands may be sensitive to flow and habitat modifications. They play a role in moderating the quantity and quality of water of major rivers.	High 2 - 3	B
Wetland that are considered to be ecologically important and sensitive on a **provincial or local** scale. The biodiversity of these wetlands is not usually sensitive to flow and habitat modifications. They play a small role in moderating the quantity and quality of water of major rivers.	Moderate 1 - 2	C
Wetlands that are not ecologically important and sensitive on any scale. The biodiversity of these wetlands is ubiquitous and not sensitive to flow and habitat modifications. They play an insignificant role in moderating the quantity and quality of water of major rivers.	Low 0 - 1	D

8.11 EIS of watercourses in the study area

There are no watercourses in the study area. From a strategic, desktop view, the EIS of the small drainage lines in the area of the study site are in the range of Category C (Moderate) watercourses. The main determinate is that the region is arid and therefore even the importance of small, ephemeral drainage lines are elevated.

9 SENSITIVITY ASSESSMENT

The sensitivity assessment identifies those areas and habitats within the study site that have a high conservation value and that may be sensitive to disturbance. All watercourses, including seasonal streams and drainage lines are, by default, viewed as sensitive, even if they are badly degraded. Areas or habitats have a higher conservation value (or sensitivity) based on their threatened ecosystem status, ideal habitat for priority species (including Red Data species), species-richness, distinctive habitats, etc.

The natural environment within the study site consists of existing quarry and open renosterveld. The other habitat present nearby is the small stream (watercourse). The floral and faunal sensitivity analyses are shown in the tables below (Table 12 & Table 13).

9.1 Floristic Sensitivity Analysis

Table 12: Floristic sensitivity analysis

Criteria	Distinctive habitats in the study area	
	Renosterveld	Drainage Lines
Red Data Species	4	4
Habitat Sensitivity	4	5
Floristic Status	5	5
Floristic Diversity	5	6
Ecological Fragmentation	5	6
Sensitivity Index	46%	52%
Sensitivity Level	Medium	Medium
Development Go Ahead	Go-But	Go-But

9.2 Faunal Sensitivity Analysis

Table 13: Faunal sensitivity analysis

Criteria	Distinctive habitats in the study area	
	Renosterveld	Watercourse
Red Data Species	5	5
Habitat Sensitivity	5	7
Faunal Status	5	7
Faunal Diversity	5	6
Ecological Fragmentation	5	6
Sensitivity Index	50%	62%
Sensitivity Level	Medium	Medium/High
Development Go Ahead	Go-But	Go-But

9.3 Ecological Sensitivity Analysis

The ecological sensitivity of the study area is determined by combining the sensitivity analyses of both the floral and faunal components. The highest calculated sensitivity unit of the two categories is taken to represent the sensitivity of that ecological unit, whether it is floristic or faunal in nature (Table 14).

Table 14: Ecological sensitivity analysis

Ecological community	Floristic sensitivity	Faunal sensitivity	Ecological sensitivity	Development Go-ahead
Renosterveld	Medium	Medium	Medium	Go-But

Watercourse	Medium	Medium/High	Medium/High	Go-But

According to the analyses there are no high sensitivity areas or habitats. However, regardless of the rating watercourses are by default viewed as sensitive. However, the study area is not within 100m of any watercourses and no activities will take place within these small drainage lines anyway. The drainage lines will not be negatively impacted by the project or related activities.

9.4 Priority areas

The study area is situated within the general NPAES focus area of the Western Karoo only, and not within any other priority areas. Priority areas include formal and informal protected areas (nature reserves); important bird areas (IBAs); RAMSAR sites; National fresh water ecosystem priority areas (NFEPA) and National protected areas expansion strategy (NPAES) areas.

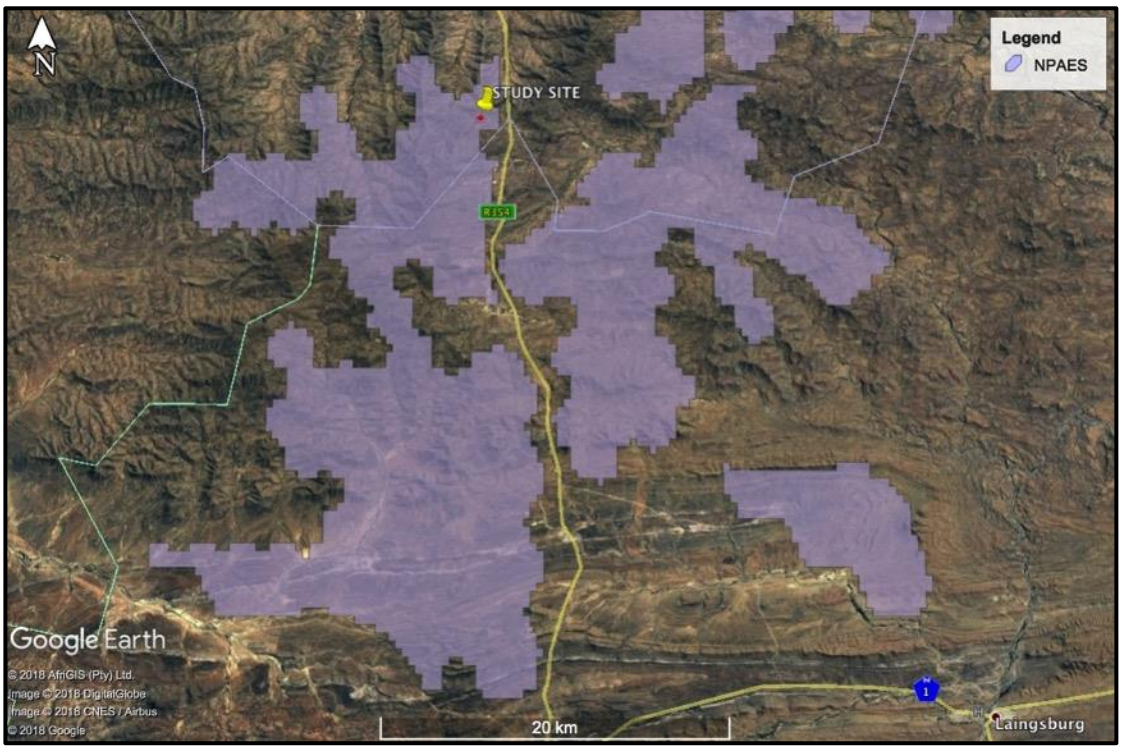

Figure 19: Western Karoo NPAES focus area

9.5 Northern Cape Critical Biodiversity Areas (2016)

According to the Northern Cape Critical Biodiversity Areas (2016) (NCCBA, 2016) and the Namakwa District Biodiversity Sector Plan (2008) (NDBSP), the study area is not situated within any critical biodiversity areas (CBAs) or within any ecological support areas (ESAs) (Figure 20).

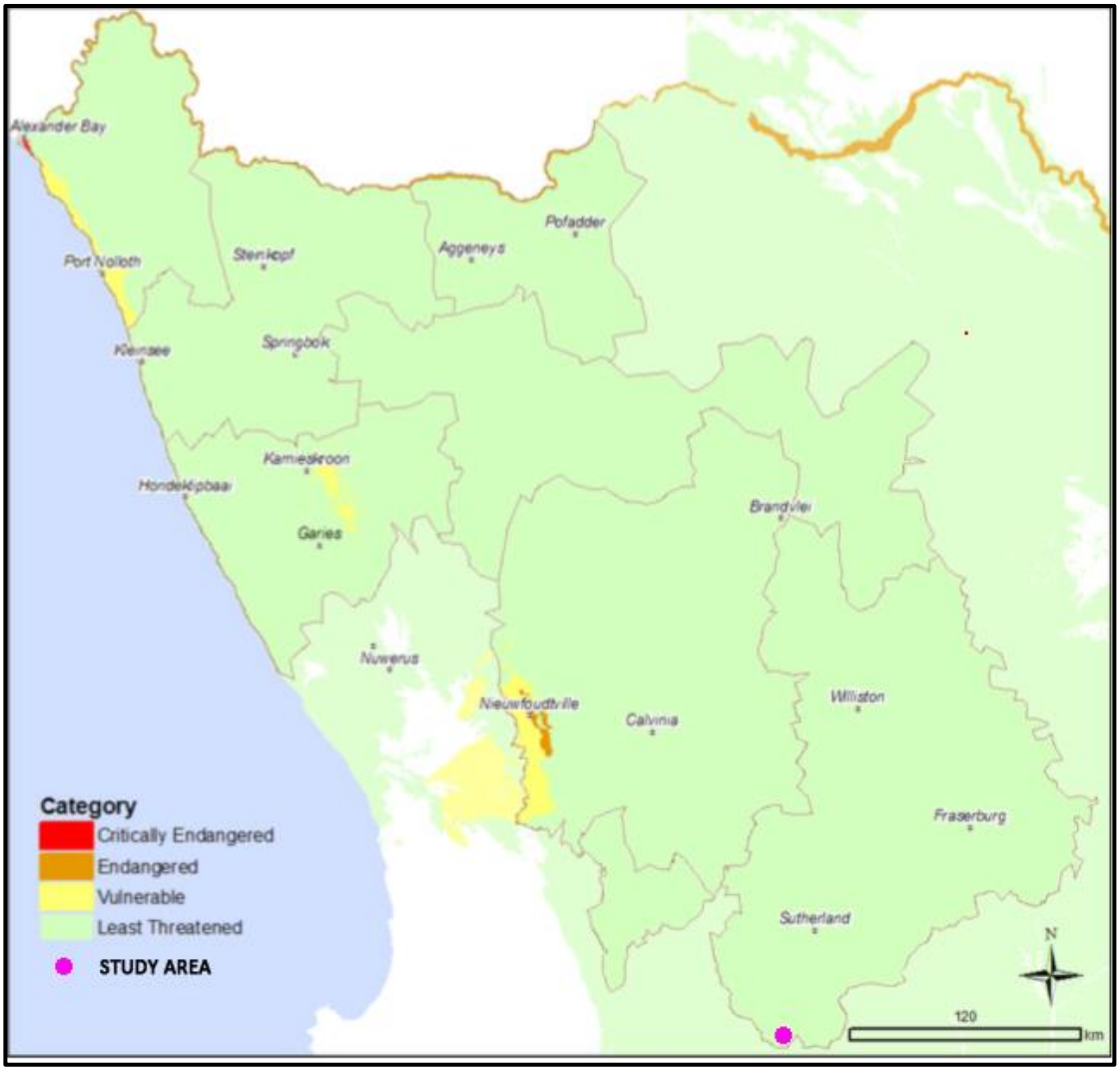

Figure 20: CBAs and ESAs (NDBSP)

9.6 Sensitive areas identified during field investigations

The study area consists primarily of open renosterbosveld and karoo shrubland that is moderately impacted on by farming activities such as grazing for sheep. There are no high sensitive areas or habitats within the study area. Below is a sensitivity map of the study area (Figure 21).

There are no high sensitive areas in the study site. The few small ephemeral drainage lines in the area are, by default, viewed as sensitive, but will not be impacted in any way by the project and related activities. The 100m bufferzone area is also shown around the study area.

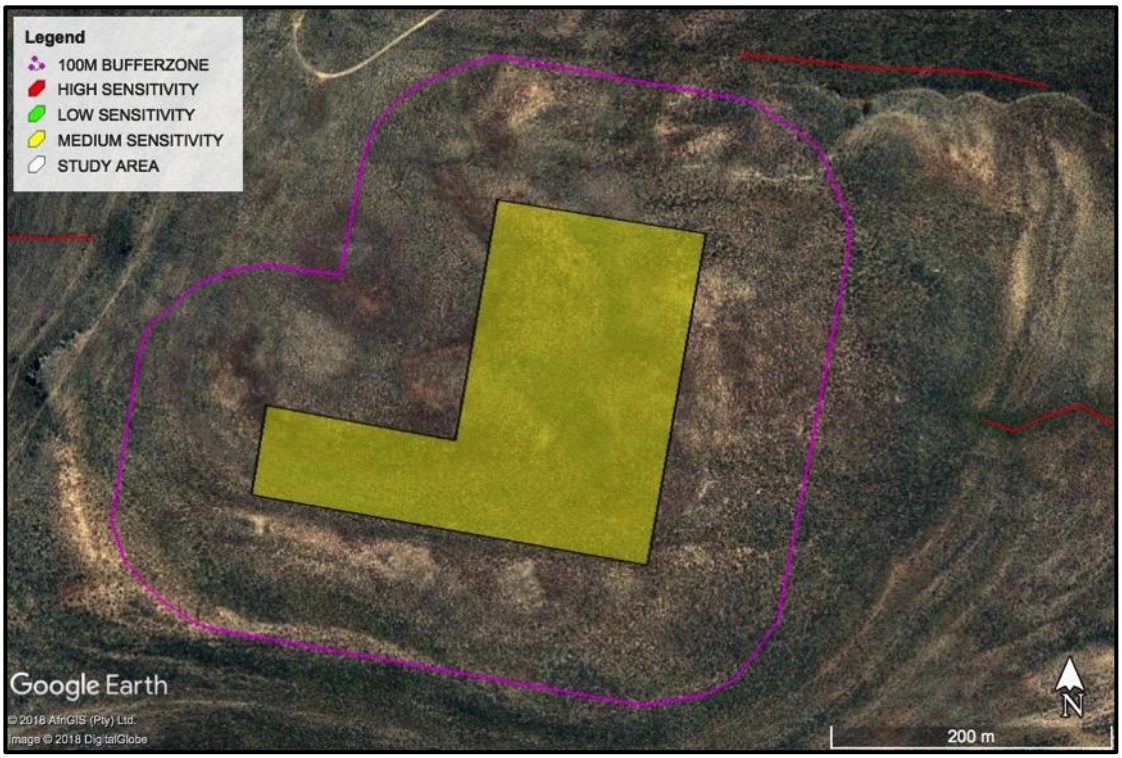

Figure 21: Sensitivity map

10 THE GO, NO-GO OPTION

10.1 Classification criteria

The term ‘fatal flaw’ is used in the pre-application planning and screening phases of a project to evaluate whether or not an impact would have a ‘no-go’ implication for the project. In the scoping and impact assessment stages, this term is not used. Rather impacts are described in terms of their potential significance.

A potential fatal flaw (or flaws) from a biodiversity perspective is seen as an impact that could have a "no-go" implication for the project. A ‘no-go’ situation could arise if residual negative impacts (i.e. those impacts that still remain after implementation of all practical mitigatory procedures/actions) associated with the proposed project were to:

a) Conflict with international conventions, treaties or protocols (e.g. irreversible impact on a World Heritage Site or Ramsar Site);

b) Conflict with relevant laws (e.g. clearly inconsistent with NEMA principles, or regulations in terms of the Biodiversity Act, etc.);

c) Make it impossible to meet national or regional biodiversity conservation objectives or targets in terms of the National Biodiversity Strategy and Action Plan (BSAP) or other relevant plans and strategies (e.g. transformation of a ‘critically endangered’ ecosystem);

d) Lead to loss of areas protected for biodiversity conservation;

e) Lead to the loss of fixed, or the sole option for flexible, national or regional corridors for persistence of ecological or evolutionary processes;
f) Result in loss of ecosystem services that would have a significant negative effect on lives (e.g. loss of a wetland on which local communities rely for water);
g) Exceed legislated standards (e.g. water quality), resulting in the necessary licences/approvals not being issued by the authorities (eg. WULA);
h) Be considered by the majority of key stakeholders to be unacceptable in terms of biodiversity value or cultural ecosystem services.

10.2 Potential Fatal Flaws for the Project

Taking all aspects into consideration, as well as mitigating measures and existing procedures for quarries, there are no fatal flaws and the project may go ahead.

11 IMPACT ASSESSMENT

11.1 Existing Impacts

Existing negative impacts on the study area and surrounding natural environments are low and include farmlands in the form of grazing lands and gravel roads.

11.2 Potential Impacts

The project and related activities do have high potential negative impacts on the natural environment due to the nature of the project. The impacts will however, be at a very localised level (site). With the implementation of mitigating measures and general standards and procedures, the potential impacts can be reduced and contained to the specific quarry site. The impacts will be medium-term to long-term and rehabilitation of the site is required.

11.3 Assessment of potential impacts

The calculated potential impacts on the natural environment are summarised in the table below (Table 15).

Table 15: Assessment of impacts

CONSTRUCTION PHASE		
Impact Rating	**Mitigating Measures**	**Sensitivity**
Before Mitigation: Low Extent: Site: 1 Duration: Medium-term: 2 Intensity: High: 3 Probability: Highly probable: 3 Total: 9 **After Mitigation: Low** Extent: Site: 1 Duration: Short-term: 1 Intensity: Moderate: 2 Probability: Possible: 2 Total: 6	Any temporary storage, lay-down areas or accommodation facilities to be setup in existing disturbed areas only. No temporary facilities or portable toilets to be setup within 100m of the nearby stream / drainage line (north of the study site). No excess excavated soils may be stockpiled within 50m of the edge of any watercourses, as siltation of the watercourses may occur during heavy rain downpours (al be they rare). No excess excavated soils or over burden dumps may be situated within 100m of the edge of the plateau. Ensure as small a footprint as possible during the construction phase. All hazardous materials *inter alia* paints, turpentine and thinners must be stored appropriately to prevent these contaminants from entering the natural environment and especially the water environment; Spill-sorb or similar type product must be used to absorb hydrocarbon spills in the event that such spills should occur; All excess materials brought onto site for construction to be removed after construction / set up phase. Rehabilitation plan for disturbed temporary set up areas to be compiled and implemented as part of the construction / set up phase. Special attention must be given to the rehabilitation of temporary construction and set up areas. Re-seeding of bare areas with local indigenous grasses to be part of the rehabilitation plan. No exotic species to be used for rehabilitation.	**LOW** **(After mitigation)**
OPERATION PHASE		
Impact Rating	**Mitigating Measures**	**Sensitivity**

Before Mitigation: Medium Extent: Local: 2 Duration: Medium-term: 2 Intensity: High: 3 Probability: Highly probable: 3 Total: 10 **After Mitigation: Low** Extent: Site: 1 Duration: Medium-term: 2 Intensity: Moderate: 2 Probability: Possible: 2 Total: 7	Any offices, lay-down areas etc. to be setup in existing disturbed areas (as far a possible) and only within the demarcated study site area. Access roads to be continually maintained, especially in terms of storm water run off and damage due to heavy vehicles. Access to the quarry site should not be from the northern side (which is close to the small stream / drainage line). Preferably access to the quarry and new expansion area should be on the southern side. No excess excavated soils or tailings or over burden may be stockpiled within 100m of the edge of any watercourses. No xcess soils, tailings or over burden may be dumped within 100m of the plateau edge. All hazardous materials *inter alia* paints, turpentine and thinners must be stored appropriately to prevent these contaminants from entering the natural environment and especially the water environment; Special attention must be given to the rehabilitation upon closure of the quarry pit (including tailing dumps). Re-seeding of bare areas with local indigenous grasses to be part of the rehabilitation plan. No exotic species to be used for rehabilitation.	**LOW** **(After mitigation)**

11.4 Cumulative Impacts

Cumulative impacts can be defined as impacts or effects on the environment which are caused by the combined effects of past, current and future activities. Cumulative impacts are the sum of the overall impacts arising from the project (under the control of the developer), other activities (that may be under the control of others, including other developers, local communities, government and landowners) and other background pressures and trends which may be unregulated.

The cumulative impacts on the study site are:
Loss of grazing land for the medium- to long-term.
Loss of natural vegetation for the medium- to long-term.

Very low levels of loss of habitat and ecosystem functions in the area.

11.5 Levels of acceptable change

The cumulative negative impacts will increase in the localised area of the study area, with little to no measurable increase in negative impacts outside of the study area. The levels of change (increase in negative cumulative impacts) due to the activities of the proposed project are at acceptably low levels for the area and for the project to proceed and not create any related 'fatal flaws'.

12 MITIGATION OF IMPACTS

The following mitigating measures are recommended to help reduce the potential negative impacts of the project on the natural environment. The implementation of recommended mitigating measures are necessary if the conclusions and assessments of the report are to remain pertinent. The mitigation measures below are to be considered

12.1 Construction & Operation Phase

- No temporary accommodation or temporary storage facilities may be setup within 100m of the any watercourse, including drainage lines and farm dams.
- No temporary facilities (including portable toilets) to be positioned within a 100m of the edge of any watercourses.
- Only existing roads to be used by vehicles during construction / set up phase as far as possible.
- Access roads to be maintained at all times.
- All construction material, equipment and any foreign objects brought into the area by contractors to be removed immediately after completion of the construction / set up phase.
- Proper rubbish/waste bins to be provided. These to be emptied weekly and the waste to be removed to an official waste disposal site.
- During the operation phase the gravel access roads need to be continually maintained. Storm water run off and erosion of gravel access roads are important considerations, including damaged caused by heavy vehicles.
- A site-specific rehabilitation plan for the closure of the quarry has to be compiled and implemented.

13 CONCLUSIONS

The following are conclusions of the study:

- There are no fatal flaws.
- The study area is not within any threatened veld type of ecosystem.
- The study area is not within any critical biodiversity area (CBA) or ecological support area (ESA).
- There are no watercourses present in the study area, including wetlands.
- No red data listed (RDL) fauna or flora species were observed to be present and / or breeding with the study area boundaries.
- Recommended mitigating measures should be implemented if the findings of this report are to remain pertinent.
- The sum of the existing and potential impacts, with the implementation of mitigating measures is assessed to be low.
- Site investigations were conducted during the summer months but the findings and availability of field data is sufficient to reached acceptable findings and outcomes from the assessment.
- Taking all findings and recommendations into account it is the reasonable opinion of the author / specialist that the activity may be authorised. The project and related activities may proceed, but the mitigation measures should be strictly adhered to.

14 APPENDICES

14.1 List of floral species

The following is a list of dominant and common taxa found within Central Mountain Shale Renosterveld (Muciina & Rutherford, 2006).

Low Shrubs

Elytropappus rhinocerotis (d), *Amphiglossa tomentosa*, *Asparagus capensis* var. *capensis*, *Chrysocoma ciliata*, *Chrysocoma oblongifolia*, *Diospyros austro-africana*, *Eriocephalus africanus* var. *africanus*, *Eriocephalus ericoides, Eriocephalus eximius, Eriocephalus grandiflorus, Eriocephalus microphyllus var. pubescens, Eriocephalus pauperrimus, Eriocephalus purpureus, Euryops imbricatus, Exomis microphylla, Felicia filifolia subsp. filifolia, F. muricata subsp. muricata, Felicia ovata, Galenia africana, Helichrysum dregeanum, Helichrysum lucilioides, Hermannia multiflora, Lessertia fruticosa, Lycium cinereum, Nenax microphylla, Pelargonium abrotanifolium, Pentzia incana, Pteronia ambrariifolia, Pteronia glauca, Pteronia glomerata, Pteronia incana, Pteronia sordida, Rosenia glandulosa, Rosenia humilis, Rosenia oppositifolia, Selago albida, Tripteris sinuata, Zygophyllum spinosum. Succulent Shrubs: Delosperma subincanum, Drosanthemum lique, Euphorbia stolonifera, Trichodiadema barbatum, Tylecodon reticulatus subsp. reticulatus, Tylecodon wallichii subsp. wallichii.*

Woody Climber

Asparagus aethiopicus.

Herbs

Dianthus caespitosus subsp. caespitosus, Heliophila pendula, Lepidium desertorum, Osteospermum acanthospermum, Senecio hastatus.

Geophytic Herbs

Bulbine asphodeloides, Drimia intricata, Othonna auriculifolia, Oxalis obtusa. **Succulent Herbs**

Crassula deceptor, Crassula muscosa, Crassula tomentosa var. glabrifolia, Senecio radicans.

Graminoids

Ehrharta calycina, Karroochloa purpurea, Merxmuellera stricta.

Aquatic plants

None

14.2 National Protected Trees

Below is the national list of protected trees of South Africa (Table 16). Each province also has trees that are protected within that province, but not necessary in other provinces. Provincially protected trees need to be treated in the same way as nationally protected trees. There are no protected trees in the study area.

Table 16: National protected trees of South Africa

BOTANICAL NAME	COMMON NAME	Likely to occur in the region	Found in the study area
Acacia erioloba	Camel thorn	No	No
Acacia haematoxylon	Grey camel thorn	No	No
Adansonia digitata	Baobab	No	No
Afzelia quanzensis	Pod mahogany	No	No
Balanites maughamii	Torchwood / Greenthorn	No	No
Barringtonia racemosa	Powder-puff tree	No	No
Boscia albitrunca	Shepherd's tree	No	No
Brachystegia spiciformis	Msasa	No	No
Breonadia salicina (=*B. microcephala*)	Matumi / Transvaal teak	No	No
Brugeiera gymnorrhiza	Black mangrove	No	No
Cassipourea swaziensis	Swazi onionwood	No	No
Catha edulis	Bushman's tea	No	No
Ceriops tagal	Indian mangrove	No	No
Cleistanthus schlechteri var. *schlechteri*	False tamboti	No	No
Colubrina nicholosonii	Pondo weeping thorn	No	No
Combretum imberbe	Leadwood	No	No
Curtisia dentata	Assegai tree	No	No
Elaeodendron transvaalense	Bushveld saffron	No	No
Erythrophysa transvaalensis	Bushveld red balloon	No	No
Euclea pseudebenus	Ebony guarri	No	No
Ficus trichopoda	Swamp fig	No	No
Leucadendron argenteum	Silver tree	No	No
Lumnitzera racemosa var.	Spring-tide mangrove	No	No

racemosa			
Lydenburgia abottii	Pondo bushman's tea	No	No
Lydenburgia cassinoides	Sekhukhuni bushman's tea	No	No
Mimusops caffra	Coast red milkwood	No	No
Newtonia hildebrandtii var. *hildebrandtii*	Lebombo wattle	No	No
Ocotea bullata	Stinkwood	No	No
Ozoroa namaquensis	Gariep resin tree	No	No
Philenoptera violacea	Apple-leaf	No	No
Pittosporum viridiflorum	Cheesewood	No	No
Podocarpus elongatus	Breede River yellowwood	No	No
Podocarpus falcatus	Outeniqua yellowwood	No	No
Podocarpus henkelii	Henkel's yellowwood	No	No
Podocarpus latifolius	Real yellowwood	No	No
Protea comptonii	Saddleback sugarbush, Barberton mountain protea	No	No
Protea curvata	Barberton Lowveld sugarbush	No	No
Prunus africana	Red stinkwood	No	No
Pterocarpus angolensis	Kiaat, Wild teak	No	No
Rhizophora mucronata	Red mangrove	No	No
Sclerocarya birrea subsp. *caffra*	Marula	No	No
Securidaca longipedunculata	Violet tree	No	No
Sideroxylon inerme subsp. *inerme*	White Milkwood	No	No
Tephrosia pondoensis	Pondo fish-poison pea	No	No
Warburgia salutaris	Pepper-bark tree	No	No
Widdringtonia cedarbergensis	Clanwilliam cedar	No	No
Widdringtonia schwarzii	Willowmore cedar	No	No

14.3 Photographs

Photo 1: Study site

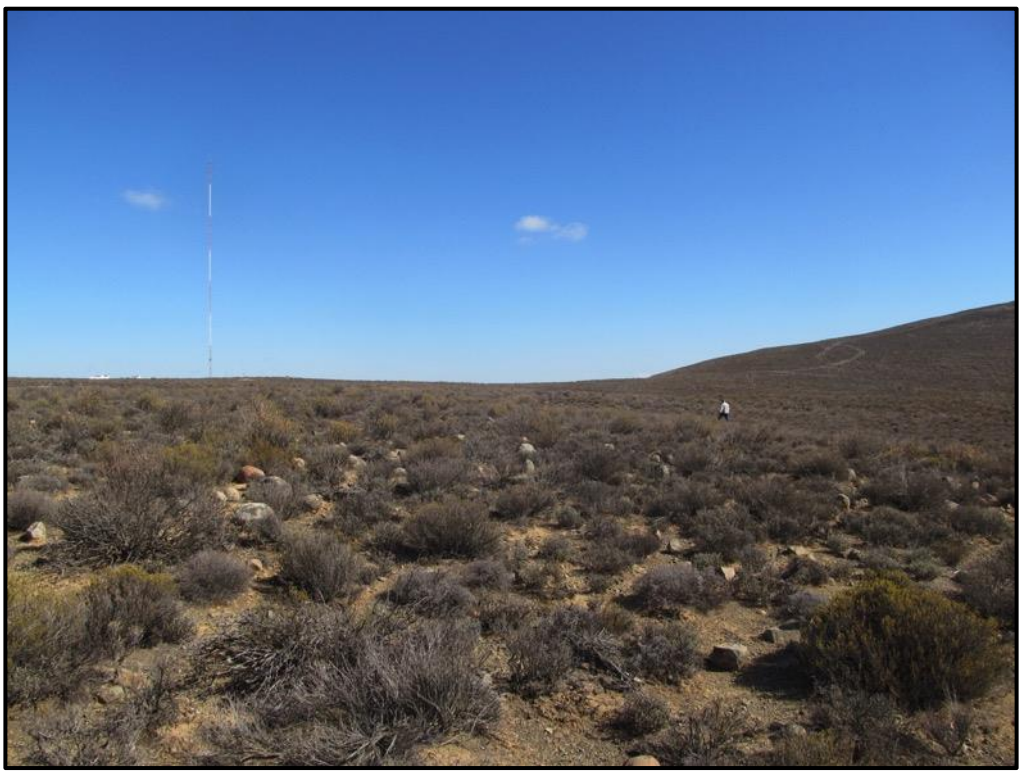

Photo 2: Study site from a different direction

Photo 3: Study site showing the arid area with very low renosterbos and karoo shrub

Photo 4: Arid conditions of study site

14.4 Conditions for inclusion in the Environmental Authorisation (EA)

The mitigation measures in the report are included in the EMPr for the project that will be approved together with the BAR.

The EMPr for the project must therefore be strictly implemented by the applicant.
There are no additional or special conditions required.

14.5 Monitoring requirements

Environmental monitoring by an ECO, as required by law, industry standards, etc. should still take place. Part of the monitoring must include the mitigating measures as per this report as well as the conditions of the EMPr. No special or specific monitoring requirements are required or recommended.

14.6 Reasoned opinion as to whether the activity should be authorised

Taking all findings and recommendations into account it is the reasoned opinion of the author / specialist that the activity may be authorised. The project and related activities may proceed, but the mitigation measures should be strictly adhered to.

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16 SHORT CV OF SPECIALIST

CURRICULUM VITAE

Johannes O. Maree

1. **Education:**

Institution (Date from – Date to)	Degree(s) or Diploma(s) obtained
Rand Afrikaans University (1984-1986)	B.Sc
Rand Afrikaans University (1987)	B.Sc (Hons.)
Rand Afrikaans University (1988)	M.Sc
Damelin College (1998)	Dip. Small Business Management
Oxford Brookes University (England) (1998-2000)	MBA

2. **Membership of Professional Bodies:**

Registered with the SA Council of Natural Scientific Professions (SACNASP)
Registration no. 400077/91.

3. **Other Skills:**

- Dip. Public Speaking & Communications – Ambassador College (USA)
- SAQA accreditation and qualifications in training, assessing & service provision (AgriSeta)
- Co-Authored a book: Cut Flowers of the World. 2010. Briza, Pretoria.

4. **Present Position:**

Director / Member – Flori Scientific Services cc

6. **Experience:**

- Twenty five (25) years experience in botanical and ecological fields, including horticulture, floriculture and environmental
- Twelve (12) years experience in project management and consultancy
- Experience in environmental impact assessments for both linear developments and nodal developments
- Experience in Wetland identification, delineation and assessment.
- Extensive experience in biodiversity assessments in terms of fauna and flora
- Involved in numerous bird-monitoring programmes for projects related to mining, wind farms (wind turbine energy) and Eskom power lines
- Experience in field investigations and report writing

7. **Professional Career:**

Date	Since 2000 to present
Organisation	Flori Scientific Services
Location	Modimolle (Nylstroom), Limpopo Province. Pretoria, Gauteng.
Position	Member / Director
Description of duties	Conduct specialist studies related to EIA projects. Specialist studies and consultancy includes ecological studies; wetland assessments; avifaunal impact assessments; Water Use Licence and other water related studies. Specialist environmental consultant, Environmental Control Officer (ECO). Specialist work involving field investigations and report writing.

Date	1997 - 2000
Organisation	Sunbird Flowers (Pty) Ltd
Location	Tarlton, Gauteng
Position	Technical Manager
Description of duties	Consulted on and managed projects in the agricultural & floricultural industries, with specific emphasis on high-yield agriculture. Managed existing and new projects. Involved in all aspects of project management from managing, planning; costing; marketing; budgeting, technical and training. Assisted emerging rural farmers in most aspects of agriculture (ie. Cut flower and vegetable production) including setting up of business plans, marketing, training and costings. Did “turn-key” projects in most agriculture related fields. This included – Tunnel and greenhouse production; Hydroponics; vegetables, cut flowers; field crops.

Date	1993 - 1997
Organisation	Flori Horticultural Services
Location	Johannesburg, Gauteng
Position	Member / Owner
Description of duties	Duties were the exact same as when worked for Sunbird Flowers fulltime from 1997 – 2000. That is, Consulted on and managed projects in the agricultural & floricultural industries, with specific emphasis on high-yield agriculture. Managed existing and new projects. Involved in all aspects of project management from

	managing, planning; costing; marketing; budgeting, technical and training. Assisted emerging rural farmers in most aspects of agriculture (ie. Cut flower and vegetable production) including setting up of business plans, marketing, training and costings. Did "turn-key" projects in most agriculture related fields. This included – Tunnel and greenhouse production; Hydroponics; vegetables, cut flowers; field crops.

Date	1989 - 1997
Organisation	Department of Environmental Affairs and Tourism
Location	National Department, Pretoria
Position	Environmental & Conservation Officer
Description of duties	Involved in environmental policies related to Nature Reserves in SA and conservation in general. Involved in auditing of nature reserves in SA. Involved in various environmental sensitive projects at the time. Eg. Richard's Bay Minerals (RBM) wanting to mine sand dunes along north coast of KZN (near St.Lucia). Involved in the very early stages of setting up of Vredefort Dome World Heritage Site. Main lead in Heritage Programme, which aimed to encourage farmers to preserve areas or features of natural significance on their farms.

8**. Other relevant information:**

- A list of some Specialist Studies completed (not exhaustive).

Project Title	Study conducted	Date of study	Client
Feasibility Master Plan for Ekurhuleni Metro Municipality waterbodies	Biodiversity, Strategic planning	March 2015 – March 2016	Ekurhuleni Metro Municipality
Platinum Zone Strategic Environmental Assessment North West Province	Biodiversity, Strategic assessment, Planning	Feb 2014 – November 2014	Eskom & Motla Consulting Engineers
Construction of an 88KV powerline from the Middleburg-Uitkyk 88kV powerline to the Aerorand Substation	Wetland Assessment	March 2014	ESKOM
Upgrade of an existing 88kV powerline to	Wetland,	March 2014	Wandima

a 132kV powerline between Marathon, Paardekop and Kiepersol Substations.	Ecological and Avifauna Impact Assessments		Environmental Consultants
Construction of an 132kV underground cable between Delmas DS and Delmas SAR Substations	Wetland Assessment	February 2014	ESKOM
Construction of a 132kV powerline between Vesel and Mokalaka Substations	Wetland, Ecological and Avifauna Impact Assessments	February 2014	Wandima Environmental Consultants
The proposed development of the Musina Ring Road N1-29	Wetland Assessment	December 2013	Chameleon Environmental Consultants
The partial reconstruction of national route R71 Section 1 from Km 34 to Km 39 between Polokwane and Tzaneen at Moria	Wetland & Ecological Assessments	November 2013	Chameleon Environmental Consultants
Township Development: Delineation of wetlands and other watercourses found on The Remainder and Portion 1 of Holding 41, Barbeque Downs and Agricultural Holdings	Wetland Assessments	November 2013	Rob Fowler & Associates
Township Development: Delineation of wetlands and other watercourses found on the premises of President Park Extension 42	Wetland Assessments	November 2013	Rob Fowler & Associates
Development of a sand-washing facility on Eenzaamheid Farm, near Witbank.	Wetland & Biodiversity Assessments	November 2013	Kego Mining (Pty) Ltd
Township Development: Lilyfield Phase 2. Delineation fo watercourses on the premises of Noordwyk Ext. 85	Wetland Assessment	September 2013	George Chantler & Associates
Rerouting of the Twin Rivers, Mogase and Vaalkop T-off sections of powerlines. Construction of a switching station. Dismantling of old existing powerline sections	Wetland Assessment	August 2013	Shumani Environmental Consultants
Construction of a Chickadee 132kV Loop-Out powerline from the Pelly-Warmbad Backbone to the Rust de Winter Substation	Ecological Assessment	July 2013	ESKOM

17 DECLARATION OF INDEPENDENCE

DECLARATION OF INDEPENDENCE

I, **Johannes Oren Maree** , do hereby declare that I :

- Act as an independent ecologist, wetland specialist and environmental specialist in compiling this report
- Do not have any financial interests, or stand to gain in any way whatsoever in the undertaking of this activity, other than remuneration for work performed in terms of the Environmental Impact Assessment Regulations, 2005
- Do not have, nor will have, any vested interest in the proposed activity proceeding
- Have no, neither will engage in, conflicting interests in the undertaking of this activity
- Undertake to disclose, to the competent authority, any material information that has, or may have, the potential to influence the decision of the competent authority or the objectivity of any report, plan or document required in terms of the Environmental Impact Assessment Regulations, 2005
- Will provide the competent authority with access to all information at my disposal regarding the investigations, studies and application, whether such information is favourable to the applicant or not

The South African Council for Natural Scientific Profession (SACNASP) certifies that in terms of Section 20(3)(a) of the Natural Scientific Professions Act, 2003 (Act 27 of 2003), that Mr. J.O. Maree is registered as a Professional Natural Scientist.
Reg. No: 400077/91

Private Bag X5401; Silverton; Pretoria; 0127
Tel: (012) 841 - 1057

SIGNATURE: _____

NAME OF COMPANY: **Flori Scientific Services cc**

DATE: __29 March 2018 ____