Appendix H

Terrestrial Biodiversity Compliance Statement

PB CONSULT
ENVIRONMENTAL MANAGEMENT SERVICES

TERRESTRIAL BIODIVERSITY COMPLIANCE STATEMENT

WITVLEI BOERDERY TRUST, KAKAMAS

THE PROPOSED DEVELOPMENT OF AN AGGREGATE QUARRY (<5HA) ON PLOT 2372, KAKAMAS SOUTH SETTLEMENT NEAR ALHEIT, KAKAMAS, KHAI !GARIB LOCAL MUNICIPALITY, NORTHERN CAPE PROVINCE.

PREPARED FOR:
ENVIROAFRICA CC

PREPARED BY:
PJJ BOTES (PRI. SCI. NAT.)

1 SEPTEMBER 2022

22 Buitekant Street
Bredasdorp
7280

Cell: 082 921 5949
Fax: 086 611 0726
Email: peet@pbconsult.co.za

EXECUTIVE SUMMARY

VEGETATION TYPE

Bushmanland Arid Grassland

Bushmanland Arid Grassland is not considered a threatened vegetation type, with more than 99% remaining. However only 4% is formally conserved (Augrabies Falls National Park). Further conservation options must thus be investigated. The most significant aspect of this vegetation is the presence of several NFA protected tree species and several NCNCA protected plant species in or near to the proposed footprints. However, none of the NFA protected tree species needs to be impacted.

LAND-USE

Land use is focused on natural cattle grazing with intensive agriculture a secondary land-use. The possible impact on socio-economic activities is likely to be positive, as the activity is likely to result in more job opportunities.

VEGETATION ENCOUNTERED

The vegetation encountered at the proposed quarry site can be described as a low grassy shrubland dominated by white grasses (after the recent rains), with a sparse overstory of smaller woody trees and larger shrubs, located on gently east-sloping plains. Denser and higher growing vegetation are found along the ephemeral drainage lines and watercourses and a small rocky outcrop was located just north of the proposed site (but outside of the proposed footprint). The more pronounce the water courses are the and deeper the sand, the more established the riparian zone became (and larger indigenous trees become more frequent) (Refer to Heading 4 & 4.2).

The first section of the proposed road, from the quarry to the existing gate (and on to the larger ephemeral watercourse) is very similar to that encountered on the quarry site (minus the rocky outcrops) (Photo 6). However, it does seem as if the soils are getting progressively deeper towards the easts. Near and just north of the existing gate two mature *Vachellia erioloba* trees (Photo 7) were observed (Refer to waypoints 022 V. erio & 023 V. erio, in Table 2). Both trees are adjacent but away from the proposed road and there is no need for them to be disturbed (they must be protected).

CONSERVATION PRIORITY AREAS

The Northern Cape CBA Map (2016) identifies biodiversity priority areas, called Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs), which, together with protected areas, are important for the persistence of a viable representative sample of all ecosystem types and species as well as the long-term ecological functioning of the landscape (Holness & Oosthuysen, 2016). According to the Northern Cape Critical Biodiversity Areas (2016), the proposed footprint falls within a CBA (critical biodiversity area), but there are no alternative sites on this farm that will not impact on the same CBA.

The proposed footprint will not impact on any recognised centre of endemism.

CONNECTIVITY

The proposed development is unlikely to have a significant impact on connectivity, because of its small scale. The proposed site is also located relatively near to the centre of activity on the farm. Large areas of natural veld will remain around the proposed site and in the larger scheme of things the additional impact on connectivity will not be significant and connectivity will remain good.

PROTECTED PLANT SPECIES

The proposed development will not impact on any red-listed species, but several NFA and NCNCA protected plant species were observed, most notably several *Vachellia erioloba* and two *Boscia albitrunca* trees. However, none of these NFA protected trees falls directly within the footprint and all of them will be easy to avoid (Refer to the recommendations in Table 4). But 6 plant species protected in terms of the NCNCA was observed and is likely to be impacted (including one *Boscia foetida* shrub/small tree). None of these plants are vulnerable or protected and most of them are still well represented in the surrounding veld (Refer Table 5).

ANIMAL SPECIES THEME SENSITIVITY

According to the **NEMA EIA Sensitivity** scan for the site generated on 10/06/2022 by Mr. Bernard de Witt the Animal Species Theme Sensitivity is **high sensitive** because of the potential presence of two bird species that might be impacted. They are:

Aves – *Polemaetus bellicosus* (Martial Eagle): With regards to this project the sensitivity rating should be **low sensitive** (Refer to Table 6 for more detail);

Aves – *Neotis ludwigii* (Ludwig's Bustard): With regards to the is project the sensitivity rating should be **low sensitive**.

WATER COURSES AND WETLANDS

Please note that a separate freshwater report (Watsan Africa, 2022) was commissioned for this development. As a result, this report did not address potential impacts on watercourses or wetlands, but only focus on the vegetation within the riparian zone.

TERRESTRIAL BIODIVERSITY THEME SENSITIVITY

According to the **NEMA EIA Sensitivity** scan for the site generated on 10/06/2022 by Mr. Bernard de Witt the Terrestrial Biodiversity Theme Sensitivity is **very high sensitive** because of it being located within a CBA 2 and within a FEPA Subcatchment. The CBA is discussed under Heading 4.4 and the freshwater ecosystem priority areas within the freshwater report (Watsan, 2022). The overall impact on terrestrial biodiversity is discussed under Heading 5 & 7.

Because of the small scale of the development, the impact on the CBA, Connectivity, Protected Plant species and Vegetation associated with the ephemeral drainage lines and water courses will be relatively insignificant and very localised. As a result, the overall impact on **Terrestrial Biodiversity Sensitivity should be Low sensitive** (Refer to Table 9).

MAIN CONCLUSION

The proposed development will result in the semi-permanent transformation of less than 6ha. According to the impact assessment given in Table 9, the proposed development is unlikely to result in any significant impact and with good environmental control, the development is likely to result in a Low impact on the environment.

With the correct mitigation it is considered highly unlikely that the proposed development will contributed significantly to any of the following:

- Significant loss of vegetation type and associated habitat.
- Loss of ecological processes (e.g. migration patterns, pollinators, river function etc.) due to construction and operational activities.
- Loss of local biodiversity and threatened plant species.
- Loss of ecosystem connectivity.

WITH THE AVAILABLE INFORMATION IT IS RECOMMENDED THAT PROJECT BE APPROVED SINCE IT IS UNLIKELY TO RESULT IN A SIGNIFICANT TERRESTRIAL BIODIVERSITY IMPACT.

NO-GO OPTION

The development is likely to result in potential significant beneficial socio-economic gain, while the no-go option will not contribute significantly to national or provincial conservation targets.

DETAILS OF THE AUTHOR

This is a specialist report compiled by Peet Botes from PB Consult.

COMPANY NAME: PB Consult Sole Proprietor
PHYSICAL ADDRESS: 22 Buitekant Street, Bredasdorp, 7280
CELL PHONE: +27 (82) 921 5949
EMAIL: peet@pbconsult.co.za
FAX: 086 – 611 0726

INDEPENDENCE & CONDITIONS

PB Consult is an independent entity with no interest in the activity other than fair remuneration for services rendered. Remunerations for services are not linked to approval by decision making authorities and the company have no interest in secondary or downstream development because of the authorization of this project. There are no circumstances that compromise the objectivity of this report. The findings, results, observations and recommendations given in this report are based on the author's best scientific and professional knowledge and available information. The author reserves the right to modify aspects of this report, including the recommendations if new information become available which may have a significant impact on the findings of this report.

RELEVANT QUALIFICATIONS & EXPERIENCE OF THE AUTHOR

Mr. Peet Botes holds a BSc. (Hons.) degree in Plant Ecology from the University of Stellenbosch (Nature Conservation III & IV as extra subjects). Since qualifying with his degree, he had worked for more than 20 years in the environmental management field, first at the Overberg Test Range (a Division of Denel) managing the environmental department of OTR and being responsible for developing and implementing an ISO14001 environmental management system, ensuring environmental compliance, performing environmental risk assessments with regards to missile tests and planning the management of the 26 000 ha of natural veld, working closely with CapeNature (De Hoop Nature Reserve).

In 2005 he joined Enviroscientific, an independent environmental consultancy specializing in wastewater management, botanical and biodiversity assessments, developing environmental management plans and strategies, environmental control work as well as doing environmental compliance audits and was also responsible for helping develop the biodiversity part of the Farming for the Future audit system implemented by Woolworths. During his time with Enviroscientific he performed more than 400 biodiversity en environmental legal compliance audits.

During 2010 he joined EnviroAfrica in order to move back to the biodiversity aspects of environmental management. Experience with EnviroAfrica includes NEMA EIA applications, environmental management plans for various industries, environmental compliance audits, environmental control work as well as more than 70 biodiversity & botanical specialist studies.

Towards the end of 2017, Mr Botes started his own small environmental consulting business focusing on biodiversity & botanical assessments, biodiversity management plans and environmental compliance audits.

Mr. Botes is a registered Professional Botanical, Environmental and Ecological Scientists at SACNASP (South African Council for Natural Scientific Professions) as required in terms of Section 18(1)(a) of the Natural Scientific Professions Act, 2003, since 2005.

DECLARATION OF INDEPENDENCE

THE INDEPENDENT PERSON WHO COMPILED A SPECIALIST REPORT OR UNDERTOOK A SPECIALIST PROCESS

I Petrus, Jacobus, Johannes Botes, as the appointed independent specialist hereby declare that I:

- act/ed as the independent specialist in this application;
- regard the information contained in this report as it relates to my specialist input/study to be true and correct, and
- do not have and will not have any financial interest in the undertaking of the activity, other than remuneration for work performed in terms of the NEMA, the Environmental Impact Assessment Regulations, 2014, as amended, and any specific environmental management Act;
- have and will not have no vested interest in the proposed activity proceeding;
- have disclosed, to the applicant, EAP and competent authority, any material information that have 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 NEMA, the Environmental Impact Assessment Regulations, 2014 and any specific environmental management Act;
- am fully aware of and meet the responsibilities in terms of NEMA, the Environmental Impact Assessment Regulations, 2014 (specifically in terms of regulation 13 of GN No. R. 326) and any specific environmental management Act, and that failure to comply with these requirements may constitute and result in disqualification;
- have ensured that information containing all relevant facts in respect of the specialist input/study was distributed or made available to interested and affected parties and the public and that participation by interested and affected parties was facilitated in such a manner that all interested and affected parties were provided with a reasonable opportunity to participate and to provide comments on the specialist input/study;
- have ensured that the comments of all interested and affected parties on the specialist input/study were considered, recorded and submitted to the competent authority in respect of the application;
- have ensured that the names of all interested and affected parties that participated in terms of the specialist input/study were recorded in the register of interested and affected parties who participated in the public participation process;
- have provided the competent authority with access to all information at my disposal regarding the application, whether such information is favourable to the applicant or not; and
- am aware that a false declaration is an offence in terms of regulation 13 of GN No. R. 326.

Note: The terms of reference must be attached.

Signature of the specialist:

PB Consult (Sole Proprietor)

Name of company:

27 June 2019

Date:

COMPLIANCE WITH APPENDIX 6 OF GN. 982 (4 DECEMBER 2014)

Specialist reports

1. A specialist report prepared in terms of these regulations must contain -	
a) Details of –	**Refer to:**
(i) The specialist who prepared the report; and	Refer to Page iii, iv & Appendix 1
(ii) The expertise of the specialist to compile a specialist report including a curriculum vitae;	Refer to Appendix 1
b) A declaration that the specialist is independent in a form as may be specified by the competent authority;	Refer to Page iv
c) An indication of the scope of, and the purpose for which the report was prepared;	Refer to Heading 1.2
d) The duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment;	Refer to Heading 3
e) A description of the methodology adopted in preparing the report or carrying out the specialist process inclusive of equipment and modeling used;	Refer to Heading 3
f) Details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructures, inclusive of a site plan identifying site alternative;	Refer to Headings 7
g) An identification of any areas to be avoided, including buffers;	Refer to Heading 7, Figure 10
h) A map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	Refer to Heading 7, Figure 10
i) A description of any assumptions made and any uncertainties or gaps of knowledge;	Refer to Heading 3.1
j) A description of the findings and potential implications of such findings on the impact of the proposed activity, [including identified alternatives on the environment] or activities;	Refer to Heading 4, 5 & 7, Figure 10
k) Any mitigation measures for inclusion in the EMPr;	Heading 8.1
l) Any conditions for inclusion in the environmental authorization;	None
m) Any monitoring requirements for inclusion in the EMPr or environmental authorization;	Refer to Heading 8.1
n) A reasoned opinion -	
(i) [as to] whether the proposed activity, activities or portions thereof should be authorized;	Refer to the "*Executive Summary*" (Page i & ii)
(iA) regarding the acceptability of the proposed activity or activities; and	
(ii) if the opinion is that the proposed activity, activities or portions thereof should be authorized, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable the closure plan;	Refer to the "*Executive Summary*" (Page i & ii)
o) A description of any consultation process that was undertaken during the course of preparing the specialist report;	N/a
p) A summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	N/a
q) Any information requested by the competent authority.	N/a
2. Where a government notice gazetted by the Minister provides for any protocol or minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply.	

CONTENTS

LIST OF TABLES:

LIST OF FIGURES

LIST OF PHOTOS

ABBREVIATIONS

BAR	Basic Assessment Report
CBA	Critical biodiversity area (in terms of the 2017 City of Cape Town Biodiversity Network)
DENC	Department of Environment and Nature Conservation
EA	Environmental Authorization (Record of Decision)
EAP	Environmental assessment practitioner
ECO	Environmental Control Officer
EIA	Environmental impact assessment
EMP	Environmental Management Plan or Program
EMS	Environmental management system
EN	Endangered
ESA	Ecological support area (in terms of the 2017 City of Cape Town Biodiversity Network)
LT	Least Threatened
NEMA	National Environmental Management Act, 1998 (Act no. 107 of 1998)
VU	Vulnerable

1. INTRODUCTION

Kakamas is a small town founded in 1898 and located in the Kai !Garib Municipality of the Northern Cape province of South Africa, on the banks of the Orange River. The economy of this area is based on farming and to a lesser degree mining. Thanks to irrigation from the Orange River farmers from the Kakamas area have become prime exporters of table grapes peaches, dried fruit, raisins, oranges and dates, while mining contributes 23.4% to the Northern Cape economy and makes up nearly 7% of SA's total mining value (https://en.wikipedia.org/wiki/Kakamas).

Farm 2372, Kakamas South belongs to Witvlei Farming Trust, and is located near Alheit, approximately 8 km west of Kakamas along the N14 (Kakamas South Settlement). The owner is an established local entrepreneur and farmer who is also involved in the local and regional construction and building industry, especially as the provider of sand and mixed aggregate. The proposed project involves the establishment of a new rock/aggregate quarry on Farm 2372, Kakamas south. The quarry will be less than 5ha and will include the development of portions of a new access road (to make it accessible for larger construction vehicles).

The proposed development will trigger listed activities under the National Environmental Management Act, (Act 107 of 1998) (NEMA) and the EIA regulations (as amended). EnviroAfrica was appointed as the Environmental Assessment Practitioners (EAP) to facilitate the NEMA EIA application. The proposed development is located in an area still supporting natural vegetation and PB Consult was appointed to conduct a terrestrial biodiversity assessment of the proposed footprint area and its immediate surroundings.

Only one vegetation type is expected, namely Bushmanland Arid Grassland (considered "Least Threatened" in terms of the National list of ecosystems that are threatened and in need of protection). As with almost all areas in the Northern Cape the development will impact on small ephemeral drainage lines. These drainage lines are often associated with slightly larger shrubs and small trees that are only found in the vicinity of these water courses.

1.1. LEGISLATION GOVERNING THIS REPORT

This is a 'specialist report', compiled in terms of:

- The National Environmental Management Act, Act. 107 of 1998 (NEMA);
- Appendix 6 of the Environmental Impact Assessment Regulations, 2014 (as amended);
- The "Procedures for the Assessment and Minimum Criteria for Reporting on identified Environmental Themes" in terms of Sections 24(5)(a) and (h) and 44 of the NEMA (Government Notice No. 320 of 20 March 2020).
- The National Environmental Management: Biodiversity Act, Act 10 of 2004, which allows for the conservation of endangered ecosystems and restriction of activities according to the status of the ecosystem;
- The National Forest Act, Act 84 of 1998, which provide a list of protected trees species in SA;
- The Northern Cape Nature Conservation Act, Act 9 of 2009, which provide extensive lists of protected fauna & flora species in the Northern Cape.

1.2. TERMS OF REFERENCE

The terms of reference for this appointment were to:

- Evaluate the proposed site(s) to determine whether any significant botanical or other terrestrial biodiversity features will be impacted as a result of the proposed development.
- Determine and record the position of any plant species of special significance (e.g. protected tree species, or rare or endangered plant species) that should be avoided or that may require "search & rescue" intervention.
- Locate and record sensitive areas from a terrestrial biodiversity perspective within the proposed development footprint that may be interpreted as obstacles to the proposed development.
- Make recommendations on impact minimization should it be required
- Consider short- to long-term implications of impacts on biodiversity and highlight irreversible impacts or irreplaceable loss of species.

2. STUDY AREA

2.1. LOCATION & LAYOUT

The town of Kakamas is located on the banks of the Orange River and along the N14, about 80 km west of Upington within the Kai !Garib Local Municipality (ZF Mgcawu District Municipality) of the Northern Cape Province (Figure 1).

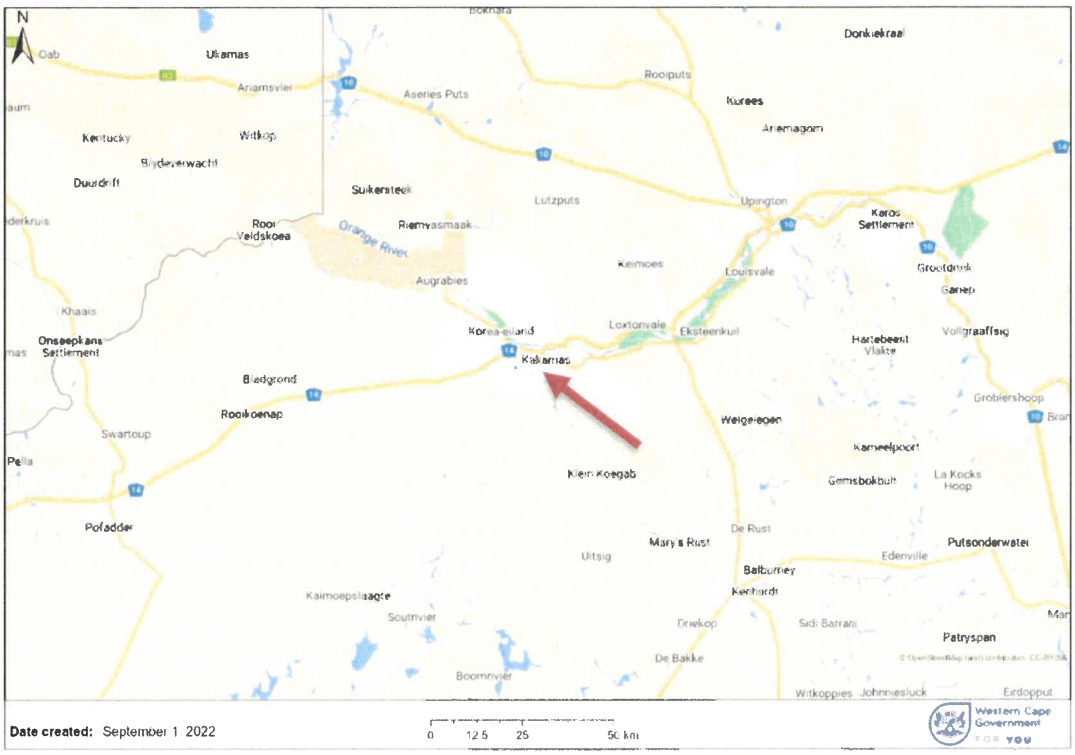

Figure 1: A map showing the location of the town of Kakamas in the Northern Cape Province

Figure 2 gives shows the location of the proposed rock quarry on Farm 2372, Kakamas South, about

6km south of the Alheit Settlement.

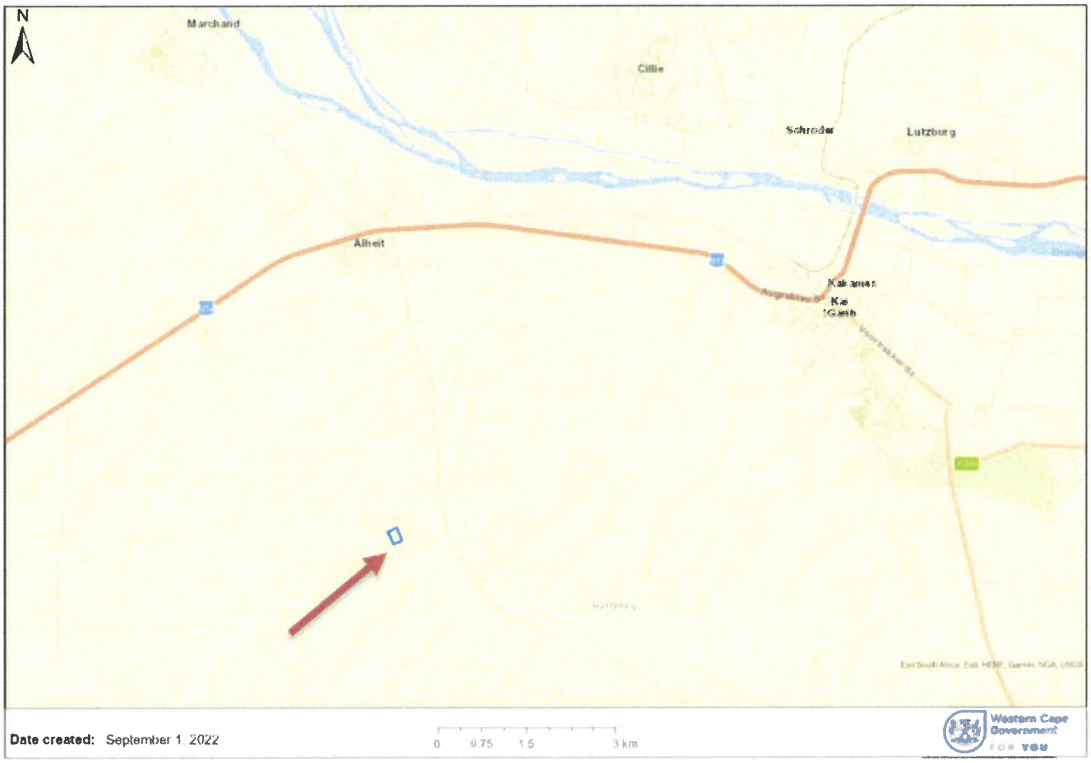

Figure 2: The location of the proposed quarry (Blue) in relation to Alheit & Kakamas

Figure 3: A Google image showing the location of the proposed quarry (Blue) and the surrounding land-use(s)

2.2. ACTIVITY DESCRIPTION

The landowner would like to establish a new rock/aggregate quarry on his farm to supply himself and local contractors of the area. The rock quarry will be fitted with a crusher and mechanical screen. Access to the site is presently gained, using existing small twee spoor tracs and other existing roads on the property. To allow direct access (the shortest route in and out) sections of the old roads will have to be upgraded and sections of new road is proposed to allow access to heavy machinery and suitable roads for larger trucks.

Figure 4: The proposed location of the quarry (red) and the proposed access road (yellow)

2.3. CLIMATE

The site falls within the Nama Karoo, which is an arid biome (areas with a rainfall of less than 400 mm/year are regarded as arid). Kakamas normally receives about 134 mm of rain per year, with rainfall largely in late summer/early autumn (major peak) and very variable from year to year. It receives the lowest rainfall (3 mm) in June and the highest (27 mm) in March (Refer to Table 1).

Table 1: Average rainfall and temperatures at Kakamas (https://en.climate-data.org/location/911655/)

	January	February	March	April	May	June	July	August	September	October	November	December
Avg Temperature (°C)	27.3	26.4	24.4	21.1	16	13.1	12.2	14.5	17.3	20.9	23.5	26.3
Min Temperature (°C)	18.9	18.3	16.7	12.8	7.8	4.6	3.7	5.4	8.1	11.6	14.3	17.2
Max Temperature (°C)	35.7	34.5	32.2	29.5	24.3	21.7	20.8	23.6	26.5	30.3	32.8	35.4
Avg Temperature (°F)	81.1	79.5	75.9	70.0	60.8	55.6	54.0	58.1	63.1	69.6	74.3	79.3
Min Temperature (°F)	66.0	64.9	62.1	55.0	46.0	40.3	38.7	41.7	46.6	52.9	57.7	63.0
Max Temperature (°F)	96.3	94.1	90.0	85.1	75.7	71.1	69.4	74.5	79.7	86.5	91.0	95.7
Precipitation / Rainfall (mm)	17	21	27	17	9	3	4	3	3	7	13	10

The climate of Nama-Karoo is essentially continental and is little affected by the ameliorating influences of the oceans. Rainfall is unreliable and droughts are unpredictable and sometimes prolonged (Mucina *et. al.,* 2006). The monthly distribution of average daily maximum temperatures shows that the average midday temperatures for Kakamas range from 20°C in July to 35°C in January. The region is the coldest during July with temperatures as low as 3.7°C on average during the night (www.saexplorer.co.za). Table 1 gives a summary of temperatures and rainfall recorded at Kakamas (https://en.climate-data.org/location/911655/).

2.4. GEOLOGY AND SOILS

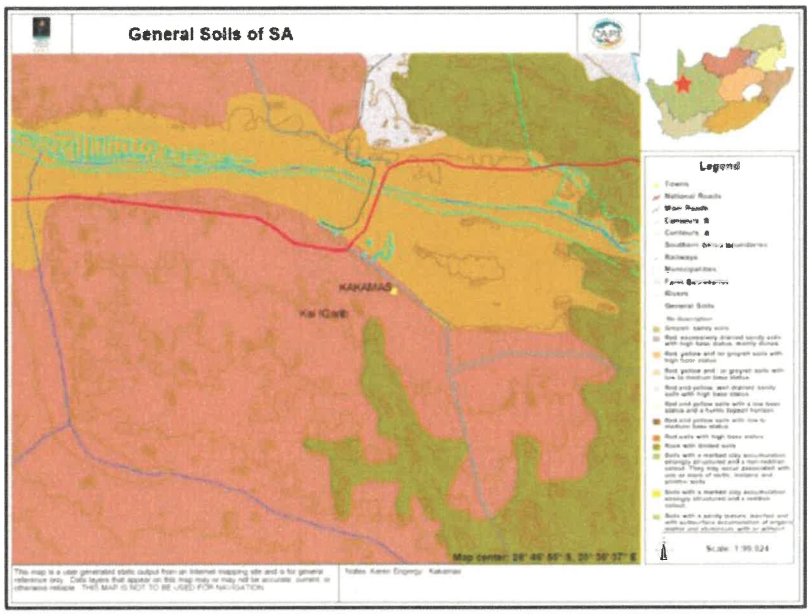

Figure 5: National soils map of the area, including the proposed quarry site

According to Mucina & Rutherford (2006), the geology is dominated by mudstones and shales of the Ecca Group (Prince Albert and Volksrust Formations) and Dwyka tillites, both of the early Karoo age. About 20% of rock outcrops are formed by Jurassic intrusive dolerite sheets and dykes.

The soils (Refer to Figure 5) are described as soils with minimal development, usually shallow on hard or weathering rock, Glenrosa and Mispah forms, with lime generally present in the entire landscape (Fc land type) and, to a lesser extent, red-yellow apedal, freely drained soils with a high base status and usually <15% clay (Ah and Ai land types) are also found. The salt content in these soils is very high. Lime is generally present in part or most of the landscape.

The site is characterized by outcroppings of granite sheets undergoing exfoliation (external delamination of layers or systematic weathering) surrounded by relative shallow red-yellow, freely drained apedal soils. The rocky outcrops are almost devoid of any vegetation, but the surrounding soils support several plant species typical to Bushmanland Arid Grassland.

2.5. TOPOGRAPHY

The proposed footprint is located in a landscape with a slight slope towards the east, or towards the Hartbees River, which is located about 1km east of the quarry. In general aspect is not expected to have any significant influence on the vegetation. The main environmental feature that influences vegetation are geographical features such as water courses and rocky outcrops. As is typical of this part of the Northern Cape, small ephemeral drainage lines are present in the vicinity of the proposed

quarry and some of these drainage lines will be impacted. In terms of vegetation, the drainage lines in the vicinity of the quarry are not significant (located in shallow soils). However, to the east the proposed new road will have to cross a larger ephemeral water course with deeper soils. Several larger indigenous trees were identified next to this water course. These trees are considered significant features of the landscape, utilised by many bird and animal species.

3. APPROACH & METHODOLOGY

The first step of the study was to conduct a desktop study of the proposed footprint and its immediate surroundings. Spatial information from online databases such as SANBI BGIS and Google Earth were used to evaluate the site in terms of vegetation, critical biodiversity areas and other potential significant features that might be encountered (e.g., variations in soil type, rocky outcrops etc.) and obvious differences in landscape or vegetation densities, which might indicate differences in plant community or species composition. This information is used to prepare a study area map, which is used as a reference during the physical site visit.

Plant species lists (of the expected plant species for this vegetation type) are prepared and species of special significance are flagged (used as reference during the site visit). The desktop study led to the following conclusions:

- It is almost certain that the proposed footprint still supports indigenous vegetation;
- The vegetation type is expected to be Bushmanland Arid Grassland, which is considered "Least Threatened" in terms of the National list of threatened terrestrial ecosystems (2011);
- According to the 2016 Northern Cape Critical Biodiversity Area's map, the footprint falls within a CBA (Refer to Figure 9);

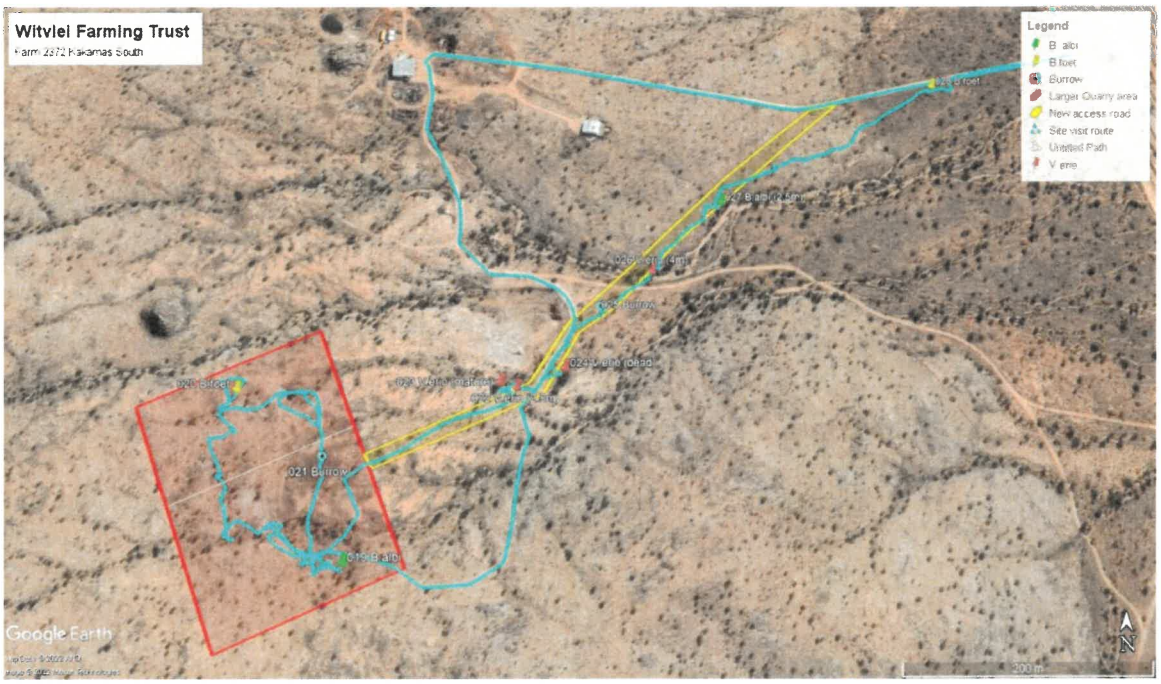

Figure 6: Google overview, showing the larger quarry area (red), the proposed access road (yellow) and the physical routes inspected (blue line) during the site visit.

A one day site visit was performed on the 6th of July 2022. The site assessment survey was conducted by walking the site and examining, marking, and photographing any area of interest (Figure 6). A hand-held Garmin GPSMAP 62s was used to track the sampling route and for recording waypoints of locations of specific importance. During the survey notes, and photographic records were collected. During the site visit the author endeavoured to identify and locate all significant terrestrial biodiversity features, including fauna & avi-fauna, special plant species and or specific soil conditions which might indicate special botanical features (e.g., rocky outcrops or silcrete patches) and watercourses.

3.1. ASSUMPTIONS AND UNCERTAINTIES

The author has now done several botanical assessments in this area (some of them on the same and adjacent properties) and confidence in the findings are high. The timing of the site visit was good, since recent rains had alleviated the effects of the recent 7 year drought period. Many of the plants were in flower and even some annuals were observed. Essentially all perennial plants species were identifiable. Together with the previous studies in the same vegetation type, a good understanding of the status of the vegetation and plant species in the study areas was obtained, although there is always the possibility that a few plant species might have been missed (some of which may only flower for short periods of time or after rains). There are no limiting factors which could significantly alter the outcome of this study (keeping in mind that this assessment is not based on long term repetitive sampling).

4. THE VEGETATION

The Northern Cape contains about 3500 plant species in 135 families and 724 genera, with about 25% of this flora endemic to the region. It is also home to an exceptionally high level of insect and reptile endemism, with new species still being discovered. However, it is important to note that this remarkable diversity is not distributed evenly throughout the region but is concentrated in many local centres of endemism.

The Kakamas area would be classified as a desert region. In accordance with the Vegetation map of South Africa, Lesotho and Swaziland (Mucina & Rutherford, 2006, as updated 2018) only one broad vegetation type is expected in the proposed footprint and its immediate vicinity, namely **Bushmanland Arid Grassland**. More than 99% of this vegetation still remains, but only 4% is formally conserved (Augrabies Falls National Park). According to the National list of ecosystems that are threatened and in need of protection (GN 1002, December 2011), Bushmanland Arid Grassland, remains classified as *Least Threatened*.

According to Mucina and Rutherford (2016), Bushmanland Arid Grassland is found in the Northern Cape Province spanning about one degree of latitude from around Aggeneys in the west to Prieska in the east. The southern border of the unit is formed by edges of the Bushmanland Basin while in the north-west this vegetation unit borders on desert vegetation (north-west of Aggeneys and Pofadder). The northern border (in the vicinity of Upington) and the eastern border (between Upington and Prieska) are formed with often intermingling units of Lower Gariep Broken Veld, Kalahari Karroid Shrubland and Gordonia Duneveld. Most of the western border is formed by the edge of the Namaqualand hills. Altitude varies from 600 – 1 200 m.

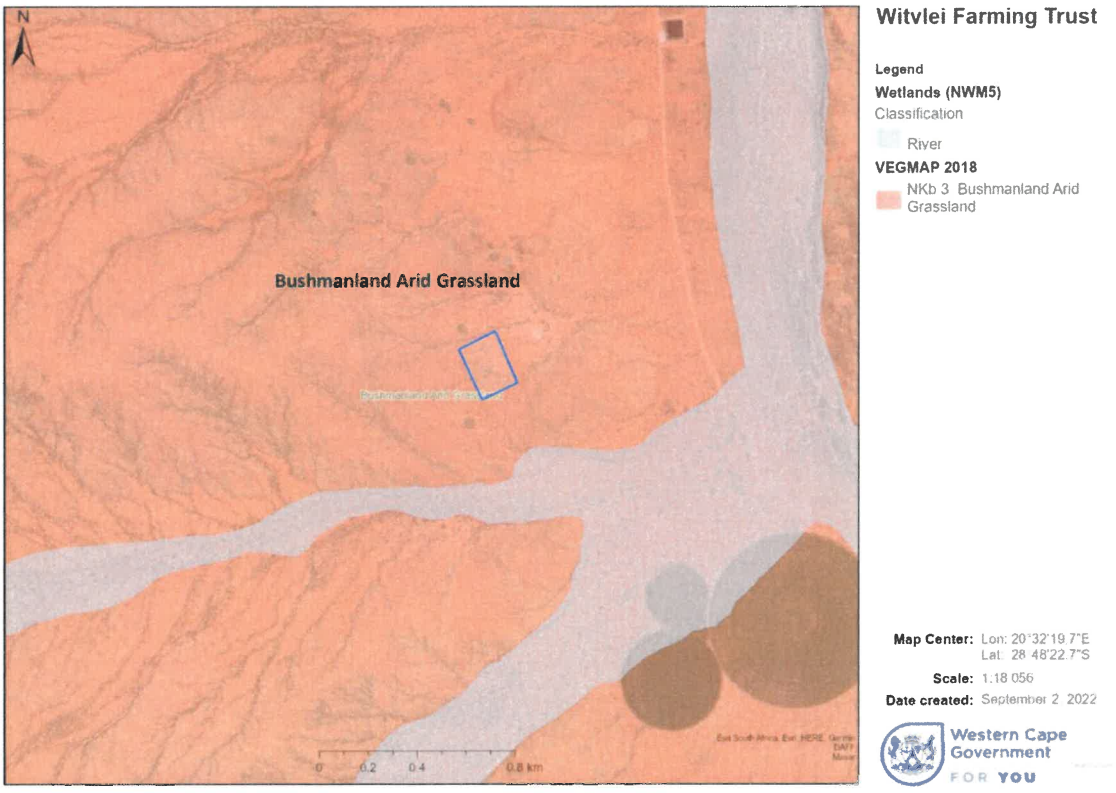

Figure 7: Vegetation map of South Africa (2018), showing the expected vegetation in the vicinity of the footprint

4.1. ECOLOGICAL DRIVERS AND THE VEGETATION IN CONTEXT

Bushmanland Arid Grassland is part of the Nama-Karoo Biome, which is a large arid landlocked region on the central plateau of the western half of South Africa, extending into Namibia. It is flanked by the Succulent Karoo to the west and south, desert to the northwest, arid Kalahari Savanna to the north, Grassland to the northeast, Albany Thicket to the southeast and small parts of Fynbos to the south. In South Africa, only the Desert Biome has a higher variability in annual rainfall and only the Kalahari Savanna greater extremes in temperature. The Nama-Karoo receives most of its rainfall in summer, especially in late summer (Mucina *et. al.*, 2006).

Climate is essentially continental and with almost no effect of the ameliorating influences of the oceans. Rainfall is low and unreliable, peaking in March. Droughts are unpredictable and often prolonged. Summers are hot and winters cold with temperature extremes ranging from -5°C in winter to 43°C in summer. However, rainfall intensity can be high (e.g. episodic thunderstorm and hail storm events). This coupled with the generally low vegetation cover associated with aridity and grazing pressure by domestic stock over the last two centuries, raises the potential for soil erosion. In semi-arid environments such as the Nama-Karoo, nutrients are generally located near the soil surface, making it vulnerable to sheet erosion (Mucina *et. al.*, 2006).

In contrast with the Succulent Karoo, the Nama-Karoo is not particularly rich in plant species and does not contain any centre of endemism. Local endemism is very low, which might indicate a relative youthful biome linked to the remarkable geological and environmental homogeneity of the Nama-Karoo. Rainfall seasonality and frequency are too unpredictable and winter temperatures too low to enable leaf succulent dominance (as in the Succulent Karoo). It is also too dry in summer for dominance by perennial grasses alone and the soils generally to shallow and rainfall too low for dominance by trees. But soil type, soil depth and local differences in moisture availability can cause abrupt changes in vegetation structure and composition (e.g. small drainage lines support more plant species than surrounding plains) (Mucina *et. al.*, 2006).

In terms of status, very little of the Nama-Karoo has been transformed and the dominant land use is farming with small stock, cattle and game. Farms are fenced, but generally large (because of the low carrying capacity). The biggest threat to this vegetation remains domestic livestock grazing pressure. Grazing by livestock particularly during the summer growing season, reduces the perennial grass component, while prolonged droughts kill a high proportion of perennial plants, rapidly changing vegetation composition in favour of short-lived species with soil stored seed banks. Overgrazing after drought periods can delay vegetation recovery, which will worsen the effect of subsequent droughts.

4.2. VEGETATION ENCOUNTERED

The proposed quarry site and the new road sections will be much smaller than the area investigated during this study (the study area being approximately 6ha). The proposed footprint falls within a larger grazing camp, used mainly for cattle grazing on natural veld. Because of the arid nature of the region (and the unpredictability of rainfall) the carrying capacity of the veld is very low and much of the natural veld in this vegetation type has suffered from incorrect grazing or overgrazing practices since the early 19th century (after farms became fenced). However, the present landowner seems to lean towards good grazing practices and has a very high regard for the protection of indigenous

trees.

The vegetation encountered in the larger study area can be described as a low grassy shrubland dominated by white grasses (after the recent rains), with a sparse overstory of smaller woody trees and larger shrubs, located on gently east-sloping plains. Denser and higher growing vegetation are found along the ephemeral drainage lines and watercourses and a small rocky outcrop was located just north of the proposed site (but outside of the proposed footprint). The more pronounce the water courses are the and deeper the sand, the more established the riparian zone became (and larger indigenous trees become more frequent).

4.2.1. VEGETATION: QUARRY SITE

The proposed quarry site itself is characterized by large outcroppings of exfoliating granite sheets (which will be the areas targeted for mining), with relative shallow red-yellow, freely drained apedal soils surrounding these sheets. These rocky outcrops are almost devoid of any vegetation (Photo 1), but the surrounding soils supported vegetation typical as described above (Photo 2).

Photo 1: The outcroppings of granite sheets, which are the focus area of the proposed mining activity.

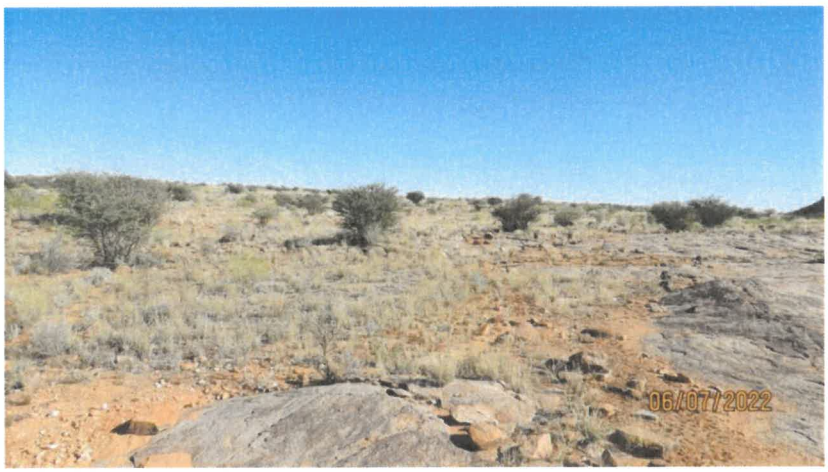

Photo 2: Typical vegetation encountered next to the rocky outcrops within the proposed quarry site. Note the *Senegalia mellifera* (small) trees in the background.

The remaining vegetation surrounding the rocky outcrops normally shows two distinct stratums or vegetation layers.

The sparse top stratum had a vegetation cover of between 5 – 12% and reached a height of between 1 – 1.6m. This layer consisted of scattered individuals of larger shrubs and smaller trees. In the proposed quarry footprint, the top stratum consisted of, or was made up, almost exclusively by *Senegalia mellifera* (swarthaak) individuals, sometimes with *Lycium bosciifolium* (slapkriedoring) growing in its shade. Occasionally other larger shrubs like *Phaeoptilum spinosum* (brosdoring) *Rhigozum trichotomum* (driedoring) and *Lycium cinereum* (kriedoring) were encountered. One *Boscia foetida* (stink-bush) was encountered within the proposed footprint, and one *Boscia albitrunca* (witgat or shepherd's tree) was encountered to the south, outside of the proposed footprint (Photo 3**Photo 4**). The hemiparasite, *Tapinanthus oleifolius* (mistletoe) often grows within the branches of *Senegalia mellifera* (as well as *Parkinsonia africana*).

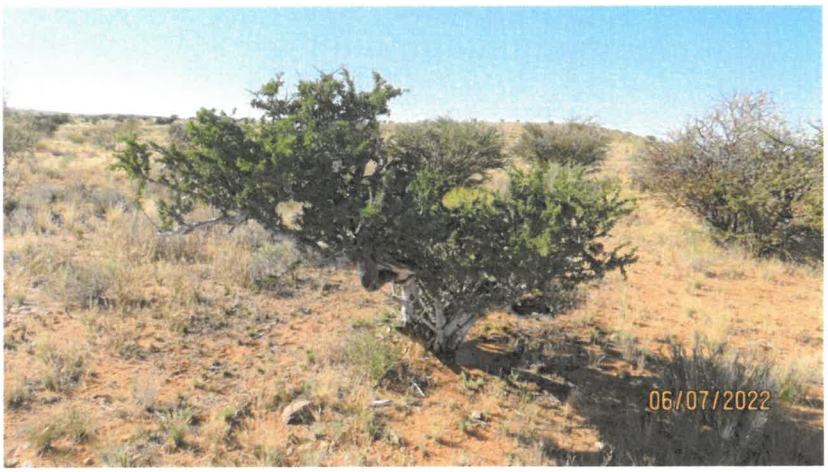

Photo 3: The *Boscia albitrunca* individual encountered just south of the proposed quarry site at waypoint 019 B. albi (refer to Table 2).

The dominant bottom stratum had a vegetation cover of between 40 – 60% (after the recent rains), reaching a height of between 0.5 – 0.6m. After the recent rains, the bottom stratum was still dominated by white grasses (including various *Schmidtia-*, *Stipagrostis-*, *Aristida-* and *Enneapogon* species) with shrubs and herbs making up about 15-20% of the total cover. Within the quarry footprint the shrub layer was usually dominated by a combination of *Justicia spartioides* (maklikbreekbos) and *Aptosimum spinescens* (doringviooltjie) with *Salsola tuberculata* and *Ruschia divaricate* also prominent (but to a lesser degree). In between the grasses and dominant shrubs, the following smaller shrubs and herbs was also occasionally observed namely: the small flat growing *Acanthopsis hoffmannseggiana*, *Aizoon burchellii*, the thorny *Blepharis mitrata*, *Geigeria ornativa* (vermeerbos), *Gorteria warmbadica,* the beautiful *Hermannia spinosa* (steekbossie) as well as the striking *Hermannia stricta* (desert rose), *Indigofera heterotricha* (hairy indigo), *Kewa salsoloides* (haassuring), *Ledebouria undulata* (a geophyte), *Kleinia longiflora* (sambokbos), *Limeum aethiopicum, Mesembryanthemum coriarium, Mesembryanthemum noctiflorum, Ptycholobium biflorum*

Photo 4: The indigenous vegetation encountered to the north of the quarry site. Note the dense grassy layer with the various shrubs in between.

The drainage lines were typically associated with a denser and larger vegetation in its riparian zone (Photo 5). In this case the riparian vegetation was usually a combination of the following plants: *Parkinsonia africana, Senegalia mellifera, Lycium bosciifolium, Phaeoptilum spinosum, Asparagus cooperi* and *Justicia spartioides,* with various smaller shrubs and herbs sometimes in between open patches.

Photo 5: Denser vegetation typically associated with the smaller watercourses and even drainage lines (to the south of the quarry).

4.2.2. VEGETATION: THE PROPOSED ROAD

The applicant also proposes to build a new road from the quarry site in an almost strait line to connect with his existing access road. Twee-spoor tracks will have to be upgraded and a new section of the road will have to be constructed to allow for the shortest route to and from the quarry. The road will also have to be slightly wider to allow access by heavy vehicles. The proposed route will follow a strait line from the quarry to the existing gate, after which it will cross a larger ephemeral watercourse and run along the southern side of a "koppie" to connect with the existing entrance road (Refer to Figure 8).

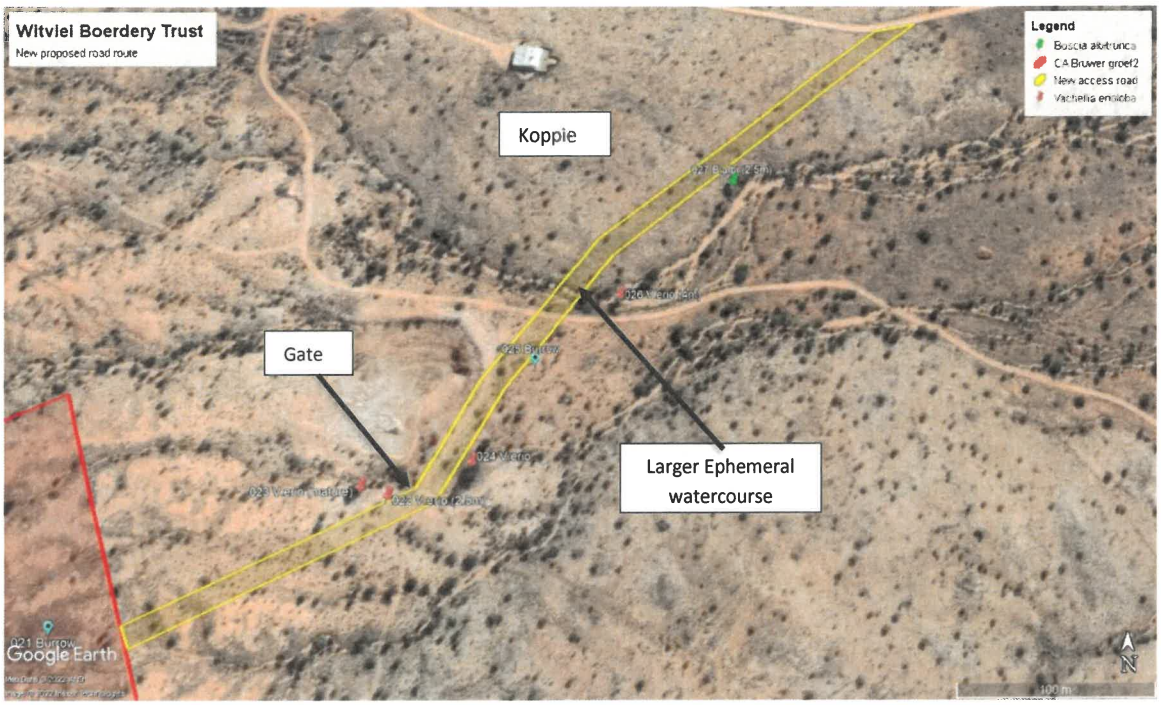

Figure 8: Proposed road location, showing the various sections discussed under this heading

Photo 6: The vegetation south of the quarry to the existing entrance gate. The vegetation remains very similar to that described for the quarry site.

The first section of the proposed road, from the quarry to the existing gate (and on to the larger ephemeral watercourse) is very similar to that encountered on the quarry site (minus the rocky outcrops) (Photo 6). However, it does seem as if the soils are getting progressively deeper towards the easts. Near and just north of the existing gate two mature *Vachellia erioloba* trees (Photo 7) were observed (Refer to waypoints 022 V. erio & 023 V. erio, in Table 2). Both trees are adjacent but away from the proposed road and there is no need for them to be disturbed (they must be protected).

Photo 7: A photo of the Vachellia erioloba encountered at waypoint 023 V. erio. An old mature tree that has fallen over and are regrowing from the fallen stem.

Between the gate and the larger ephemeral stream another *Vachellia erioloba* tree was observed (waypoint 024 V. erio). Again, this tree was located to the south of the proposed road and there is no reason why it should be impacted by the proposed road. Similarly, a *Vachellia erioloba* and a *Boscia albitrunca* was observe (within the riparian zone of the larger ephemeral watercourse) along the remainder of the proposed new road section (refer to waypoint 026 V. erio and 027 B. albi, in Table 2) (Photo 8). Both these trees are associated with the riparian vegetation along the larger ephemeral watercourse. Again, there is no reason why they should be impacted by the proposed development if the road remains more than 10m away from the ephemeral watercourse.

Photo 8: A photo of the Vachellia erioloba encountered at waypoint 024 V. erio. Again, it was an old tree fallen over and regrowing from its stem.

Photo 9: The vegetation encountered to the south of the larger "koppie" along the proposed new road.

To the south of the "koppie" the vegetation changes slightly into a more dryer version of karroid veld. *Justicia spartioides* is replaced by *Justicia australis* (perdebos) and *Mesembryanthemum tetragonum, Microloma incanum* (in the shade of larger trees) and *Tetraena decumbens* was observed for the first time.

4.2.3. PROTECTED TREES ENCOUNTERED

Several *Vachellia erioloba* as well as two *Boscia foetida* trees were encountered near to the proposed footprint (Refer to Figure 9). Fortunately, none of these trees will or should be impacted by the proposed development (refer to Table 2).

Table 2: List and location of protected tree species encountered near the proposed site 1 location

No.	Species name	Coordinates	Comments	Recommendations
019 B. albi	*Boscia albitrunca*	S28° 48' 21.1" E20° 32' 30.8" (Photo 3)	Medium (1.5m) but mature tree	**Protect**: Avoid coming nearer than 1 m of the canopy (or drip line) this tree.
022 A erio	*Vachellia erioloba*	S28° 48' 16.2" E20° 32' 35.8"	Mature (>3.5 m) tree	**Protect**: Avoid coming nearer than 1 m of the canopy (or drip line) of any tree.
023 A erio	*Vachellia erioloba*	S28° 48' 16.0" E20° 32' 35.3" (Photo 7)	An old tree, fallen over and regrowing from its stem	**Protect**: Avoid coming nearer than 1 m of the canopy (or drip line) of any tree.
024 A erio	*Vachellia erioloba*	S28° 47' 36.3" E20° 31' 45.4"	An old tree fallen over and regrowing from its stem.	**Protect**: Avoid coming nearer than 1 m of the canopy (or drip line) of any tree.
026 A erio	*Vachellia erioloba*	S28° 48' 12.4" E20° 32' 40.3"	Mature (>4m in height) within the riparian zone	**Protect**: Avoid coming nearer than 1 m of the canopy (or drip line) of any tree.
027 B albi	*Boscia albitrunca*	S28° 48' 10.0" E20° 32' 42.8"	Mature (2.5m) tree in good condition	**Protect**: Avoid coming nearer than 1 m of the canopy (or drip line) of any tree.

4.3. FLORA ENCOUNTERED

Table 3 gives a list of the plant species encountered during this study. The timing of the site visit was good (after recent rains), and a lot of annual species were in flower or growing. Because of the one day site visit it is still likely that species (especially annuals and geophytes) might have been missed, but the author is confident that a good understanding of the vegetation was achieved and confidence in the findings is high. Species diversity was relatively low (as to be expected in this veld type). Thirty seven (37) plant species were identified (including one alien invasive species). No red-listed plant was observed, but two species protected in terms of the NFA, and six (6) species protected in terms of the NCNCA was observed.

Table 3: List of species encountered within or near the proposed footprint

NO.	SPECIES NAME	FAMILY	STATUS	LOCATION
1.	*Acanthopsis hoffmannseggiana*	ACANTHACEAE	LC	Small plant relatively common.
2.	*Aizoon burchellii*	AIZOACEAE	NE; SA Endemic Protected in terms of schedule	Dwarf shrub, occasionally observed.

NO.	SPECIES NAME	FAMILY	STATUS	LOCATION
			2 of the NCNCA	
3.	*Aptosimum spinescens*	SCROPHULARIACEAE	LC	Spiny looking dwarf shrub.
4.	*Aristida congesta*	POACEAE	LC	Small grass
5.	*Asparagus cooperi*	ASPARAGACEAE	LC	Wiry shrub/climber near watercourses.
6.	*Blepharis mitrata*	ACANTHACEAE	LC	Small thorny shrub, quite common.
7.	*Boscia albitrunca*	BRASSICACEAE (CAPPARACEAE)	LC, but NFA protected and all *Boscia* species protected in terms of Schedule 2 of NCNCA	Only two individuals observed in the vicinity of the footprint. Both can be protected.
8.	*Boscia foetida*	BRASSICACEAE (CAPPARACEAE)	LC All *Boscia* species protected in terms of Schedule 2 of NCNCA	One individual within the quarry footprint will most likely be impacted.
9.	*Enneapogon scaber*	POACEAE	LC	Small short perennial grass.
10.	*Geigeria ornativa*	ASTERACEAE	LC	Half woody perennial dwarf shrub, occasionally seen.
11.	*Gorteria warmbadica*	ASTERACEAE	LC	Small herb.
12.	*Hermannia spinosa*	MALVACEAE	LC	A rounded dwarf woody shrub, with spine like flower stalks.
13.	*Hermannia stricta*	MALVACEAE	LC	A slender hairless dwarf shrub with striking pink flowers.
14.	*Indigofera heterotricha*	FABACEAE	LC	A medium large shrub growing in the shade of larger shrubs.
15.	*Justicia australis (=Monechma genistifolium)*	ACANTHACEAE	LC	Common in dryer karroid veld to the east.
16.	*Justicia spartioides (=Monechma spartioides)*	ACANTHACEAE	LC	Dominant shrub (0.9 – 1m in height)
17.	*Kewa salsoloides (=Hypertelis salsoloides)*	MOLLUGINACEAE	LC	A dwarf shrub with succulent leaves., occasionally seen.
18.	*Kleinia longiflora*	ASTERACEAE	LC	A medium large hairless, many stemmed, stem succulent.
19.	*Ledebouria undulata*	HYACINTHACEAE	LC	Only the leaves of one plant observed.
20.	*Limeum aethiopicum*	LIMEACEAE	LC	A small prostrate herb, occasionally seen.
21.	*Lycium bosciifolium*	SOLANACEAE	LC	Occasionally encountered in the shade of larger trees
22.	*Lycium cinereum*	SOLANACEAE	LC	A large spiny shrub, occasionally observed.
23.	*Mesembryanthemum coriarium (=Psilocaulon)*	AIZOACEAE	LC Protected in terms of schedule 2 of the NCNCA	A strangely succulent occasionally observed.
24.	*Mesembryanthemum noctiflorum (=Aridaria)*	AIZOACEAE	Protected in terms of schedule 2 of the NCNCA	A large succulent shrub occasionally observed.
25.	*Mesembryanthemum tetragonum (=Prenia)*	AIZOACEAE	Protected in terms of schedule 2 of the NCNCA	A succulent observed in the dryer karroid veld to the east
26.	*Microloma incanum*	APOCYNACEAE	LC	A climbing shrub, occasionally observed in shady spots.
27.	*Parkinsonia africana*	FABACEAE	LC	Almost exclusively associated with water courses.
28.	*Phaeoptilum spinosum*	NYCTAGINACEAE	LC	Scattered throughout, relatively common.
29.	*Prosopis* species	FABACEAE	**Alien invasive plant species**	Occasionally observed.
30.	*Ptycholobium biflorum*	FABACEAE	LC	Small shrub, occasionally observed.

NO.	SPECIES NAME	FAMILY	STATUS	LOCATION
31.	*Rhigozum trichotomum*	BIGNONIACEAE	LC	Large shrub, relatively common.
32.	*Salsola tuberculata*	AMARANTHACEAE	LC	Dwarf shrub, relatively common.
33.	*Senegalia mellifera (=Acacia)*	FABACEAE	LC	Dominant Small tree
34.	*Stipagrostis uniplumis*	POACEAE	LC	Medium sized grass.
35.	*Tapinanthus oleifolius*	LORANTHACEAE	LC	
36.	*Tetraena decumbens (=Zygophyllum)*	ZYGOPHYLLACEAE	LC	Relatively common plant to the east of the quarry site.
37.	*Vachellia erioloba (=Acacia)*	FABACEAE	LC NFA protected species	Occasionally found near the road footprint. **Non need to be impacted.**

4.4. CRITICAL BIODIVERSITY AREAS MAPS

The Northern Cape CBA Map (2016) identifies biodiversity priority areas, called Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs), which, together with protected areas, are important for the persistence of a viable representative sample of all ecosystem types and species as well as the long-term ecological functioning of the landscape as a whole (Holness & Oosthuysen, 2016). The 2016 Northern Cape Critical Biodiversity Area (CBA) Map updates, revises and replaces all older systematic biodiversity plans and associated products for the province (including the Namakwa District Biodiversity Sector Plan, 2008). Priorities from existing plans such as the Namakwa District Biodiversity Plan, the Succulent Karoo Ecosystem Plan, National Estuary Priorities, and the National Freshwater Ecosystem Priority Areas were incorporated. Targets for terrestrial ecosystems were based on established national targets, while targets used for other features were aligned with those used in other provincial planning processes.

Critical biodiversity areas (CBA's) are terrestrial and aquatic features in the landscape that are critical for retaining biodiversity and supporting continued ecosystem functioning and services (SANBI 2007). The primary purpose of CBA's is to inform land-use planning in order to promote sustainable development and protection of important natural habitat and landscapes. CBA's can also be used to inform protected area expansion and development plans.

- **Critical biodiversity areas (CBA's)** are areas of the landscape that need to be maintained in a natural or near-natural state in order to ensure the continued existence and functioning of species and ecosystems and the delivery of ecosystem services. In other words, if these areas are not maintained in a natural or near-natural state then biodiversity conservation targets cannot be met. Maintaining an area in a natural state can include a variety of biodiversity-compatible land uses and resource uses.
- **Ecological support areas (ESA's)** are areas that are not essential for meeting biodiversity representation targets/thresholds but which nevertheless play an important role in supporting the ecological functioning of critical biodiversity areas and/or in delivering ecosystem services that support socio-economic development, such as water provision, flood mitigation or carbon sequestration. The degree of restriction on land use and resource use in these areas may be lower than that recommended for critical biodiversity areas.

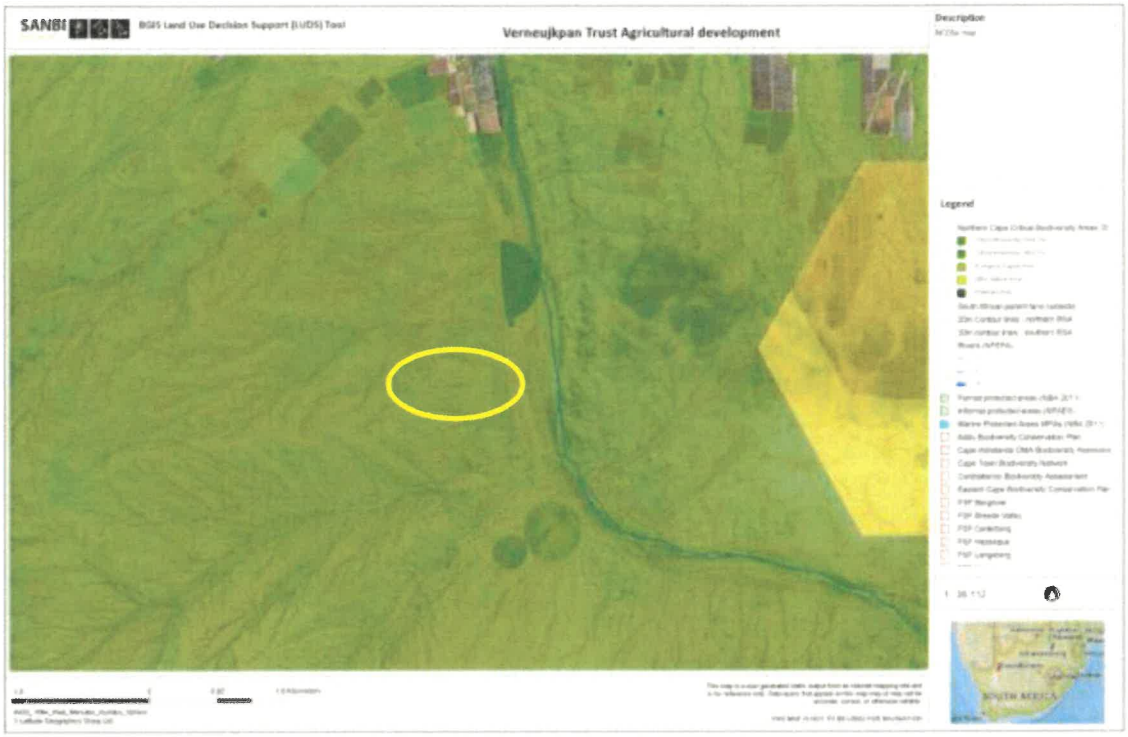

Figure 9: The Northern Cape Critical Biodiversity Areas (2016) showing the approximately location of the proposed development footprint

From a land-use planning perspective it is useful to think of the difference between CBA's and ESA's in terms of where in the landscape the biodiversity impact of any land-use activity action is most significant:

- For CBA's the impact on biodiversity of a change in land-use that results in a change from the desired ecological state is most significant locally at the point of impact through the direct loss of a biodiversity feature (e.g., loss of a populations or habitat).
- For ESA's a change from the desired ecological state is most significant elsewhere in the landscape through the indirect loss of biodiversity due to a breakdown, interruption, or loss of an ecological process pathway (e.g., removing a corridor results in a population going extinct elsewhere or a new plantation locally results in a reduction in stream flow at the exit to the catchment which affects downstream biodiversity).

The 2016 Northern Cape Critical Biodiversity Areas (NCCBA) gives both aquatic and terrestrial Critical Biodiversity Areas (CBAs) and ecological support areas for the Northern Cape.

According to the NCCBA (Refer to Figure 6) the proposed sites will fall within a terrestrial critical biodiversity area. Unfortunately, there are no alternative areas on this property that will not impact on the CBA. However, the impact will be local and on a relatively small scale.

4.5. POTENTIAL IMPACT ON CENTRES OF ENDEMISM

The proposed development does not impact on any recognised centre of endemism. The Gariep Centre is located to the north (quite a distance away), associated with Augrabies, Pella and Onseepkans along the border of South Africa and Namibia, while the Griqualand West Centre of Endemism starts to the east of Upington Northern Cape Province (Van Wyk & Smith, 2001).

4.6. THREATENED AND PROTECTED PLANT SPECIES

South Africa has become the first country to fully assess the status of its entire flora. Major threats to the South African flora are identified in terms of the number of plant taxa Red-Listed as threatened with extinction as a result of threats like, habitat loss (e.g. infrastructure development, urban expansion, crop cultivation and mines), invasive alien plant infestation (e.g. outcompeting indigenous plant species), habitat degradation (e.g. overgrazing, inappropriate fire management etc.), unsustainable harvesting, demographic factors, pollution, loss of pollinators or dispersers, climate change and natural disasters (e.g. such as droughts and floods). South Africa uses the internationally endorsed IUCN Red List Categories and Criteria in the Red List of South African plants. However, due to its strong focus on determining risk of extinction, the IUCN system does not highlight species that are at low risk of extinction, but may nonetheless be of high conservation importance. As a result a SANBI uses an amended system of categories in order to highlight species that may be of low risk of extinction but are still of conservation concern (SANBI, 2015).

In the Northern Cape, species of conservation concern are also protected in terms of national and provincial legislation, namely:

- The National Environmental Management: Biodiversity Act, Act 10 of 2004, provides for the protection of species through the "*Lists of critically endangered, endangered, vulnerable and protected species*" (GN. R. 152 of 23 February 2007).
- National Forest Act, Act 84 of 1998, provides for the protection of forests as well as specific tree species through the "*List of protected tree species*" (GN 908 of 21 November 2014).
- Northern Cape Nature Conservation Act, Act of 2009, provides for the protection of "*specially protected species*" (Schedule 1), "*protected species*" (Schedule 2) and "*common indigenous species*" (Schedule 3).

4.6.1. RED LIST OF SOUTH AFRICAN PLANT SPECIES

The Red List of South African Plants online provides up to date information on the national conservation status of South Africa's indigenous plants (SANBI, 2015).

- No red-listed species was observed during the study (Refer to Table 3).

4.6.2. NEM:BA PROTECTED PLANT SPECIES

The National Environmental Management: Biodiversity Act, Act 10 of 2004, provides for the protection of species through the "Lists of critically endangered, endangered, vulnerable and

protected species" (GN. R. 152 of 23 February 2007).

- No species protected in terms of NEM: BA was observed.

4.6.3. NFA PROTECTED PLANT SPECIES

The National Forests Act (NFA) of 1998 (Act 84 of 1998) provides for the protection of forests as well as specific tree species (as updated).

- **Two (2) species protected in terms of the NFA** was observed (Refer to Table 2 - 4).

Table 4: Plant species protected in terms of the NFA encountered within the study area

NO.	SPECIES NAME	COMMENTS	I
1.	*Boscia albitrunca* **Sheppard's tree**	Two plants observed in the proximity of the footprint (Refer to Table 2), but there is no reason why either should be impacted by the proposed development.	All mature individuals must be marked and protected. The road and quarry site should stay at least 1m away from the drip line of the canopy of each tree
2.	*Vachellia erioloba* **Camel Thorn**	Four individuals observed, near the proposed road, but again there is no reason why any of them should be impacted by the proposed development (Refer to Table 2 for their locations).	All mature individuals must be identified and protected during the construction of the road. The road should stay at least 1m (preferably further) away from the drip line of the canopy of each tree. All efforts should be made to minimise the impact on these trees, no matter size or general condition.

4.6.4. NCNCA PROTECTED PLANT SPECIES

The Northern Cape Nature Conservation Act 9 of 2009 (NCNCA) came into effect on the 12th of December 2011, and also provides for the sustainable utilization of wild animals, aquatic biota and plants. Schedule 1 and 2 of the act give extensive lists of specially protected and protected fauna and flora species in accordance with this act. NB. Please note that all indigenous plant species are protected in terms of Schedule 3 of this act (e.g. any work within a road reserve).

- **The following species protected in terms of the NCNCA were encountered** (Refer to Table 3 & Table 5). Recommendations on impact minimisation also included.

Table 5: Plant species protected in terms of the NCNCA encountered within the study area

NO.	SPECIES NAME	COMMENTS	I
1.	*Aizoon burchellii* **Schedule 2 protected**	Only a few individuals were observed (within the quarry footprint), but it is likely that more of these plants may be impacted.	This plant is not vulnerable or endangered and is unlikely to transplant successfully (because of their woody rootstock). Protection through topsoil removal and management.
2.	*Boscia albitrunca* **Schedule 2 protected**	Refer to Table 4, above	
3.	*Boscia foetida* **Schedule 2 protected**	Only two plants observed, of which one falls within the quarry footprint and will be impacted.	Mature individuals do not transplant successfully. One plant will be lost. A flora permit must be submitted in terms of the NCNCA for the removal of this individual.
4.	*Mesembryanthemum coriarium* **Schedule 2 protected**	Occasionally observed to the east of the quarry site.	No special measures needed; this is a weedy pioneer species.
5.	*Mesembryanthemum noctiflorum* **Schedule 2 protected**	Several plants were observed in and around the proposed quarry site.	This plant is not vulnerable or endangered. Protection through topsoil removal and management.
6.	*Mesembryanthemum tetragonum* **Schedule 2 protected**	A few plants were observed near the larger ephemeral stream to the east of the quarry.	This plant is not vulnerable or endangered. Protection through topsoil removal and management.

5. FAUNA AND AVI-FAUNA

Because of its aridity and unpredictable rainfall patterns, the Nama-Karoo region (in which this site falls) favours free moving herbivores such as ostrich and springbok, nomadic birds and invertebrates with variable dormancy cued by rain. Plant defence against herbivores and seed adaption for dispersal by mammals are relatively uncommon, except along rivers and seasonal pans, suggesting the transient nature of herbivores, except near water where they would have lingered longer. However, since the 19th century the vast herds of migratory ungulates indigenous to this biome have been almost completely replaced by domestic stock. Once farmers started fencing their properties into camps (following the Fencing Act of 1912), stock numbers were dramatically increased with dire consequences to plant diversity. Grazing during and immediately after droughts periods is regarded as a major cause of detrimental change in vegetation composition and were ultimately responsible for the decline of large numbers of palatable plants (Mucina *et. al.*, 2006).

No fauna or avi-fauna screening was done as part of this study, but observations were made during the site visit. The location of the study area, relatively near to areas of intensive agriculture, the current land-use (livestock grazing), and the adjacent farming practices would all have contributed to a disturbance factor. It is considered highly unlikely that a true reflection of potential game species can still be encountered on the property. This in turn would have affected the food chain and ultimately the density of tertiary predators, particularly mammals and larger birds of prey, while smaller predators and scavengers such as jackal and caracal would have been eradicated by farmers in fear of their livestock. Because of the long-term impact of human settlement on the larger areas a comprehensive faunal or avi-fauna survey is not deemed necessary.

However, according to the **NEMA EIA Sensitivity** scan for the site generated on 10/06/2022 by Mr. Bernard de Witt the:

- Animal Species Theme Sensitivity is high sensitive because of the potential presence of two bird species discussed in **Error! Reference source not found.**;
- Aquatic Biodiversity Theme Sensitivity is very high sensitive because of the freshwater ecosystem priority areas (refer to the freshwater report, Watsan, 2022); and
- Terrestrial Biodiversity Theme Sensitivity is very high sensitive because of it being located within a CBA 2 and within a FEPA Subcatchment. The CBA is discussed under Heading 4.4 and the freshwater ecosystem priority areas within the freshwater report (Watsan, 2022).

5.1. MAMMALS

The nearby Augrabies Falls National Park still supports an impressive diversity of larger antelope and other mammal species. However, it is highly unlikely that any of this larger game will still frequent or even visit the proposed footprint or its immediate surroundings (because of its location). Smaller game and other mammal species that may potentially still be found in this area can include the following (deducted from the list of species in the Augrabies Falls National Park: *Orycteropus afer* (Aardvark), *Pedetes capensis* (Springhare), *Phacochoerus africanus* (Common warthog), *Raphicerus campestris* (Steenbok), *Sylvicapra grimmia* (Common duiker) *Suricata suricatta* (Suricate), *Xerus inauris* (Southern African ground squirrel) and *Canis mesomelas* (Black-backed jackal).

Two Aardvark burrows and several smaller tunnels (used by mice) were observed. Only the one Aardvark burrow was still in use. The burrow near the quarry site showed no recent activity. Steenbok, ground squirrel and other smaller game is likely to be present in the area, but apart from a temporary impact on several mice burrows (which will have to move), the impact on other game should be relatively low to insignificant (in this larger landscape). Keep in mind that this is a relatively small operation within a very large grazing camp (almost all of which remains relatively natural.

5.2. AVI-FAUNA

This area can potentially attract a great number of bird species like Cape Buntings Cape Wagtail, Cape Southern Masked Weaver, Cinnamon-Breasted Buntings Common Waxbill, Karoo Robin-Chats, Pale Winged Starlings, Pied Wagtail, Red Eyed Bulbuls, Rock Hyraxes, Swallow-Tailed Bee Eaters and White Throated Canaries. Near permanent rivers Alpine Swifts, Bradfield's Swifts, Brown-Throated Martins, Cape Robin-Chats, Common Moorhen Orange-River White-eyes, Rock Martins, Red-Eyed Bulbuls, White-Backed Mousebirds, and Lesser Swamp-Warblers may be observed.

No large indigenous trees will be removed, and the proposed footprint is small. As a result, the impact is unlikely to be significant.

Table 6: Animal species theme according to the NEMA EIA Sensitivity Scan results

SENSITIVITY	FEATURES	MOTIVATION
High	Aves – *Polemaetus bellicosus*	The Martial Eagle is southern Africa's largest eagle and is considered endangered, because of deliberate or accidental poisoning, habitat loss, and loss of available pray, collisions with power lines etc. The remaining population is believed to be 800 pairs in South Africa (Taylor, 2015). The Martial Eagle has an extensive range across much of sub-Saharan Africa but is generally scarce to uncommon or rare. It inhabits open woodland, wooded savanna, bushy grassland, thornbush and, in southern Africa, more open country and even subdesert, from sea level to 3,000 m but mainly below 1,500 m (Ferguson-Lees and Christie 2001). Evidence suggests that breeding pairs select strongly against human-disturbed habitats. They need large trees for nests and prefer protected areas as breeding spots. The Martial Eagle might hunt in the vicinity of the farm, but it is unlikely that it will breed on the farm. It is highly unlikely that the establishment of this relatively small-scale quarry and road will have any significant impact on the breading or feeding patters of these birds. With regards to this project the sensitivity rating should be **low sensitive**.
Medium	Aves – *Neotis ludwigii*	Ludwig's Bustard is a near endemic and classified as endangered as a result of a projected rapid population decline. It has a large range centred on the dry biomes of the Karoo and Namib in southern Africa, being found in the extreme south-west of **Angola**, western **Namibia** and in much of **South Africa** (del Hoyo *et al.* 1996, Anderson 2000). Today if occurs predominantly in the dry Karoo region of South Africa (Herold, 1988), but historically id is believed that its distribution extended to the eastern and north-eastern portions of the Grassland Biome (Brooke,

SENSITIVITY	FEATURES	MOTIVATION
		1984). This species inhabits open lowland and upland plains with grass and light thornbush, sandy open shrub veld and semi-desert in the arid and semi-arid Namib and Karoo biomes. The breeding season spans from August-December, with the species nesting on bare ground with a clutch of 2-3 eggs (del Hoyo *et al.* 1996, Jenkins and Smallie 2009) Although not observed, the bird may potentially feed and nest on the farm, but it is highly unlikely that the relatively small quarry and short additional road will have any impact on breading or feeding potential for this bird. With regards to the is project the sensitivity rating should be **low sensitive**.

5.3. REPTILE & AMPHIBIANS

No reptile or amphibian species were observed during the site survey. The project footprint may provide habitat for a number of reptile species, but they would most likely be terrestrial species adapted to grassland and preying on avifauna and small mammal species. No amphibian species are likely to occur due to a lack of aquatic and wetland habitat in the proposed footprint.

6. IMPACT ASSESSMENT METHOD

The objective of this study was to evaluate the botanical diversity of the property area in order to identify significant environmental features which might have been impacted as a result of the development. The Ecosystem Guidelines for Environmental Assessment (De Villiers *et. al.*, 2005), were used to evaluate the botanical significance of the property with emphasis on:

- Significant ecosystems
  - Threatened or protected ecosystems
  - Special habitats
  - Corridors and or conservancy networks
- Significant species
  - Threatened or endangered species
  - Protected species

6.1. DETERMINING SIGNIFICANCE

Determining impact significance from predictions of the nature of the impact has been a source of debate and will remain a source of debate. The author used a combination of scaling and weighting methods to determine significance based on a simple formula. The formula used is based on the method proposed by Edwards (2011). However, the criteria used were adjusted to suite its use for botanical assessment. In this document significance rating was evaluated using the following criteria (Refer to

Table 7**Error! Reference source not found.**).

Significance = Conservation Value x (Likelihood + Duration + Extent + Severity) (Edwards 2011)

Table 7: Categories and criteria used for the evaluation of the significance of a potential impact

ASPECT / CRITERIA	LOW (1)	MEDIUM/LOW (2)	MEDIUM (3)	MEDIUM/HIGH (4)	HIGH (5)
CONSERVATION VALUE Refers to the intrinsic value of an attribute or its relative importance towards the conservation of an ecosystem or species or even natural aesthetics. Conservation status is based on habitat function, its vulnerability to loss and fragmentation or its value in terms of the protection of habitat or species	The attribute is transformed, degraded not sensitive (e.g. Least threatened), with unlikely possibility of species loss.	The attribute is in good condition but not sensitive (e.g. Least threatened), with unlikely possibility of species loss.	The attribute is in good condition, considered vulnerable (threatened), or falls within an ecological support area or a critical biodiversity area, but with unlikely possibility of species loss.	The attribute is considered endangered or, falls within an ecological support area or a critical biodiversity area, or provides core habitat for endemic or rare & endangered species.	The attribute is considered critically endangered or is part of a proclaimed provincial or national protected area.
LIKELIHOOD Refers to the probability of the specific impact occurring as a result of the proposed activity	Under normal circumstances it is almost certain that the impact will not occur.	The possibility of the impact occurring is very low, but there is a small likelihood under normal circumstances.	The likelihood of the impact occurring, under normal circumstances is 50/50, it may or it may not occur.	It is very likely that the impact will occur under normal circumstances.	The proposed activity is of such a nature that it is certain that the impact will occur under normal circumstances.
DURATION Refers to the length in time during which the activity is expected to impact on the environment.	Impact is temporary and easily reversible through natural process or with mitigation. Rehabilitation time is expected to be short (1-2 years).	Impact is temporary and reversible through natural process or with mitigation. Rehabilitation time is expected to be relative short (2-5 years).	Impact is medium-term and reversible with mitigation, but will last for some time after construction and may require on-going mitigation. Rehabilitation time is expected to be longer (5-15 years).	Impact is long-term and reversible but only with long term mitigation. It will last for a long time after construction and is likely to require on-going mitigation. Rehabilitation time is expected to be longer (15-50 years).	The impact is expected to be permanent.
EXTENT Refers to the spatial area that is likely to be impacted or over which the impact will have influence, should it occur.	Under normal circumstances the impact will be contained within the construction footprint.	Under normal circumstances the impact might extent outside of the construction site (e.g. within a 2 km radius), but will not affect surrounding properties.	Under normal circumstances the impact might extent outside of the property boundaries and will affect surrounding land owners or –users, but still within the local area (e.g. within a 50 km radius).	Under normal circumstances the impact might extent to the surrounding region (e.g. within a 200 km radius), and will regional land owners or –users.	Under normal circumstances the effects of the impact might extent to a large geographical area (>200 km radius).
SEVERITY Refers to the direct physical or biophysical impact of the activity on the surrounding environment should it occur.	It is expected that the impact will have little or no affect (barely perceptible) on the integrity of the surrounding environment. Rehabilitation not needed or easily achieved.	It is expected that the Impact will have a perceptible impact on the surrounding environment, but it will maintain its function, even if slightly modified (overall integrity not compromised). Rehabilitation easily achieved.	It is expected that the impact will have an impact on the surrounding environment, but it will maintain its function, even if moderately modified (overall integrity not compromised). Rehabilitation easily achieved.	It is expected that the Impact will have a severe impact on the surrounding environment. Functioning may be severely impaired and may temporarily cease. Rehabilitation will be needed to restore system integrity.	It is expected that the impact will have a very severe to permanent impact on the surrounding environment. Functioning irreversibly impaired. Rehabilitation often impossible or unfeasible due to cost.

6.2. SIGNIFICANCE CATEGORIES

The formal NEMA EIA application process was developed to assess the significance of impacts on the surrounding environment (including socio-economic factors), associated with any specific development proposal in order to allow the competent authority to make informed decisions. Specialist studies must advise the environmental assessment practitioner (EAP) on the significance of impacts in his field of specialty. In order to do this, the specialist must identify all potentially significant environmental impacts, predict the nature of the impact and evaluate the significance of that impact should it occur. Potential significant impacts are evaluated, using the method described above, in order to determine its potential significance. The potential significance is then described in terms of the categories given in Table 5.

Table 8: Categories used to describe significance rating (adjusted from DEAT, 2002)

SIGNIFICANCE	DESCRIPTION
Insignificant or Positive (4-22)	There is no impact or the impact is insignificant in scale or magnitude as a result of low sensitivity to change or low intrinsic value of the site, or the impact may be positive.
Low (23-36)	An impact barely noticeable in scale or magnitude as a result of low sensitivity to change or low intrinsic value of the site, or will be of very short-term or is unlikely to occur. Impact is unlikely to have any real effect and no or little mitigation is required.
Medium Low (37-45)	Impact is of a low order and therefore likely to have little real effect. Mitigation is either easily achieved. Social, cultural and economic activities can continue unchanged, or impacts may have medium to short term effects on the social and/or natural environment within site boundaries.
Medium (46-55)	Impact is real, but not substantial. Mitigation is both feasible and fairly easily possible, but may require modification of the project design or layout. Social, cultural and economic activities of communities may be impacted, but can continue (albeit in a different form). These impacts will usually result in medium to long term effect on the social and/or natural environment, within site boundary.
Medium high (56-63)	Impact is real, substantial and undesirable, but mitigation is feasible. Modification of the project design or layout may be required. Social, cultural and economic activities may be impacted, but can continue (albeit in a different form). These impacts will usually result in medium to long-term effect on the social and/or natural environment, beyond site boundary within local area.
High (64-79)	An impact of high order. Mitigation is difficult, expensive, time-consuming or some combination of these. Social, cultural and economic activities of communities are disrupted and may come to a halt. These impacts will usually result in long-term change to the social and/or natural environment, beyond site boundaries, regional or widespread.
Unacceptable (80-100)	An impact of the highest order possible. There is no possible mitigation that could offset the impact. Social, cultural and economic activities of communities are disrupted to such an extent that these come to a halt. The impact will result in permanent change. Very often these impacts cannot be mitigated and usually result in very severe effects, beyond site boundaries, national or international.

7. DISCUSSING BIODIVERSITY SENSITIVITY

The aim of impact assessment is to determine the vulnerability of a habitat to a specific impact. In order to do so, the sensitivity of the habitat should be determined by identifying and assessing the most significant environmental aspects of the site against the potential impact(s). For this development the following biodiversity aspects was taken into account.

Location: The proposed development footprint will be relatively small (<6ha), near the centre of activity of farm and located in a much larger grazing camp still covered in natural vegetation. The quarry site will impact on a small ephemeral drainage line, while the road will cross a larger ephemeral water course.

Activity: The activity will result in the clearance of less than 6ha of indigenous vegetation, which will include the development of a new rock quarry and a new access route. The access road will be wider than normal farm roads to allow access for heavy machinery and trucks. The proposed development will thus result in the semi-permanent transformation of less than 6ha of natural vegetation (Bushmanland Arid Grassland) in relatively good condition.

Geology & Soils: The development will impact on two ephemeral drainage lines. A small rocky outcrop is located just north of the proposed quarry site but will not be impacted by the proposed development. The heritage impact assessment (Fairhurst *et. al*, 2022) flags the rocky outcrop as of potential significance and suggests a 50m buffer around this outcrop. The rocky outcrop was not evaluated during this study (as it falls outside the footprint) but from previous studies in this area is unlikely to support specialised plants species or vegetation differences of significance (it being too small). However, the deeper soils associate with the larger ephemeral water courses supports a higher concentration of larger indigenous trees, including protected species like *Vachellia erioloba*.

Land use and cover: Land use is focused on natural cattle grazing with intensive agriculture a secondary land-use. The possible impact on socio-economic activities is likely to be positive, as the activity is likely to result in more job opportunities.

Vegetation status: Bushmanland Arid Grassland is not considered a threatened vegetation type, with more than 99% remaining. However only 4% is formally conserved (Augrabies Falls National Park). Further conservation options must thus be investigated. The most significant aspect of this vegetation is the presence of several NFA protected tree species and a number of NCNCA protected plant species in or near to the proposed footprints. However, none of the NFA protected tree species needs to be impacted.

Conservation priority areas: The Northern Cape CBA Map (2016) identifies biodiversity priority areas, called Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs), which, together with protected areas, are important for the persistence of a viable representative sample of all ecosystem types and species as well as the long-term ecological functioning of the landscape (Holness & Oosthuysen, 2016). According to the Northern Cape Critical Biodiversity Areas (2016), the proposed footprint falls within a CBA (critical biodiversity area), but there are no alternative sites on this farm that will not impact on the same CBA. The proposed footprint will not impact on any recognised centre of endemism.

Connectivity: The proposed development is unlikely to have a significant impact on connectivity,

because of its small scale. The proposed site is also located relatively near to the centre of activity on the farm. Large areas of natural veld will remain around the proposed site and in the larger scheme of things the additional impact on connectivity will not be significant and connectivity will remain good.

Watercourses and wetlands: Please note that a separate freshwater report (Watsan Africa, 2022) was commissioned for this development. As a result this report will not address potential impacts on watercourses or wetlands, but only focus on the vegetation within the riparian zone.

Protected or endangered plant species: The proposed development will not impact on any red-listed species, but several NFA and NCNCA protected plant species were observed, most notably several *Vachellia erioloba* and two *Boscia albitrunca* trees. However, none of these NFA protected trees falls directly within the footprint and all of them will be easy to avoid (Refer to the recommendations in Table 4). But 6 plant species protected in terms of the NCNCA was observed and is likely to be impacted (including one *Boscia foetida* shrub/small tree). None of these plants are vulnerable or protected and most of them are still well represented in the surrounding veld (Refer to the recommendations in Table 5).

Invasive alien species: For most of the property, only the occasional Prosopis trees were observed. Special care must be taken with their removal to ensure that they do not re-sprout.

Veld fires: According to the National Veldfire risk classification (March 2010), Bushmanland Arid Grassland falls within an area with a Low fire risk classification. However, veld fire risk must be considered during construction.

7.1. IMPACT ASSESSMENT

The following table rates the significance of environmental impacts associated with the proposed development. It also evaluates the expected accumulative effect of the proposed development as well as the No-Go option.

Table 9: Impact assessment associated with the proposed activity

Impact assessment								
Aspect	**Mitigation**	**CV**	**Lik**	**Dur**	**Ext**	**Sev**	**Significance**	Short discussion
Geology & soils: Potential impact on special habitats (e.g. true quartz or "heuweltjies")	Without mitigation	3	1	4	1	2	24	Impact on riparian vegetation along ephemeral streams (within a CBA), protected trees associated with deeper sandy areas.
	With mitigation	3	1	1	1	1	12	NFA protected trees must be marked and protected during and operation.
Landuse and cover: Potential impact on socio-economic activities.	Without mitigation	3	1	4	1	1	21	Semi-permanent impact on approximately 6ha of indigenous veld (within a CBA) with a low grazing capacity.
	With mitigation	3	1	2	1	1	15	Potential beneficial socio-economic impact (job creation).
Vegetation status: Loss of vulnerable or endangered vegetation and associated habitat.	Without mitigation	3	3	4	1	1	27	Semi-permanent impact on approximately 6ha of Bushmanland Arid Grassland (Least threatened).
	With mitigation	3	2	2	1	1	18	Minimise the footprint and the impact on protected plant species wherever possible.
Conservation priority: Potential impact on protected areas, CBA's, ESA's or Centre's of Endemism.	Without mitigation	3	4	4	1	2	33	Semi-permanent impact on approximately 6ha of indigenous veld (within a CBA).
	With mitigation	3	3	3	1	1	24	Minimise the footprint and the impact on protected plant species wherever possible.
Connectivity: Potential loss of ecological migration corridors.	Without mitigation	3	2	4	1	1	24	Semi-permanent impact on approximately 6ha of indigenous veld (within a CBA).
	With mitigation	3	1	2	1	1	15	Minimise the footprint and the impact on protected plant species wherever possible.
Watercourses and wetlands: Potential impact on natural water courses and it's ecological support areas.	Without mitigation							Refer to the freshwater specialist study (Watsan Africa, 2022).
	With mitigation							
Protected & endangered plant species: Potential impact on threatened or protected plant species.	Without mitigation	3	4	4	1	2	33	The proposed development may impact on NFA protected trees and NCNCA protected plant species.
	With mitigation	3	2	2	1	1	18	Ensure that all NFA protected trees are identified and protected during construction and operation.

Invasive alien plant species: Potential invasive plant infestation as a result of the activities.	Without mitigation	3	2	3	2	2	27	Only the occasional Prosopis tree was observed and only near the larger ephemeral stream may the activity impact directly on Prosopis trees.
	With mitigation	3	1	2	1	1	15	Implement an effective alien eradication tree and ensure that all alien invasive trees within 10m of the disturbance footprint is removed.
Veld fire risk: Potential risk of veld fires as a result of the activities.	Without mitigation	3	2	2	2	2	24	Veld fire risk low.
	With mitigation	3	1	1	1	1	12	Address fire danger throughout construction.
Cumulative impacts: Cumulative impact associated with proposed activity.	Without mitigation	3	4	4	2	2	36	Semi-permanent impact (<6ha) on natural vegetation (LT), within a CBA, which might impact on protected plant species and ephemeral drainage lines.
	With mitigation	3	3	3	1	1	24	Refer to all the mitigation recommendations above.
The "No-Go" option: Potential impact associated with the No-Go alternative.	Without mitigation	3	1	1	1	1	12	No direct impact on natural veld or protected plant species, but no potential socio-economic gain.
	With mitigation						0	

According Table 9, the main impacts associated with the proposed development is:

- The impact on a critical biodiversity areas (CBA);
- The potential impact on protected tree and plant species.

However, because of the small scale of the activity even the cumulative impact is considered to be relatively LOW and with mitigation the impact can be reduced significantly to Low significance.

Figure 10: Site sensitivity map – indicating the locations of NFA protected plant species observed (*Vachellia erioloba* – Red and *Boscia albitrunca* – Green). Exact locations are given in Table 2).

8. IMPACT MINIMISATION RECOMMENDATIONS

The proposed development will result in the semi-permanent transformation of <6ha of natural veld to mining. According to the impact assessment given in Table 9, the proposed development is unlikely to result in any significant impact and with good environmental control, the development is likely to result in a Low impact on the environment.

With the correct mitigation it is considered highly unlikely that the proposed development will contributed significantly to any of the following:

- Significant loss of vegetation type and associated habitat.
- Loss of ecological processes (e.g. migration patterns, pollinators, river function etc.) due to construction and operational activities.
- Loss of local biodiversity and threatened plant species.
- Loss of ecosystem connectivity.

Having evaluated the proposed site and its immediate surroundings, it is unlikely that the proposed development will lead to any significant impact on the terrestrial biodiversity features because of its size as long as the impact minimisation recommendations are implemented.

8.1. MITIGATION MEASURES TO BE IMPLEMENTED

- All construction must be done in accordance with an approved construction and operational phase Environmental Management Plan (EMP), which must include the recommendations made in this report.
- A suitably qualified Environmental Control Officer must be appointed to monitor the construction phase in terms of the EMP and any other conditions pertaining to specialist studies.
- An application must be made to DENC for a flora permit in terms of the NCNCA with regards to impacts on species protected in terms of the act.
- Conservation of protected plant species (Refer to Table 4 **Photo 3**& Table 5):
  - ***Vachellia erioloba*** All mature individuals must be identified and protected during the construction operational phases. The road should stay at least 1m (preferably further) away from the drip line of the canopy of each tree. All efforts should be made to minimise the impact on these trees, no matter size or general condition (Refer to Table 4).
  - ***Boscia albitrunca:*** All mature individuals must be marked and protected. The road and quarry site should stay at least 1m away from the drip line of the canopy of each tree (Table 4).
- Conservation of provincially protected plant species (NCNCA) (Refer to Table 5).
- The final access route must be approved by a suitable qualified (botany) ECO.
- Before any work is done the site and access routes must be clearly demarcated (with the aim at minimal width/smallest footprint). The demarcation must include the total footprint necessary to execute the work, but must aim at minimum disturbance.
- Lay-down areas or construction sites must be located within already disturbed areas or areas of low ecological value and must be pre-approved by the ECO.

- All alien invasive species within the footprint and or within 10 m of the footprint must be removed responsibly.
    - Care must be taken with the eradication method to ensure that the removal does not impact or lead to additional impacts (e.g. spreading of the AIP due to incorrect eradication methods);
    - Care must be taken to dispose of alien plant material responsibly.
- Indiscriminate clearing of any area outside of the construction footprint must be avoided.
- All areas impacted as a result of construction must be rehabilitated on completion of the project.
    - This includes the removal of all excavated material, spoil and rocks, all construction related material and all waste material.
    - It also included replacing the topsoil back on top of the excavation as well as shaping the area to represent the original shape of the environment.
- An integrated waste management approach must be implemented during construction.
    - Construction related general and hazardous waste may only be disposed of at Municipal approved waste disposal sites.
    - All rubble and rubbish should be collected and removed from the site to a suitable registered waste disposal site.

9. REFERENCES

Acocks, J.P.H. 1953. Veld types of South Africa. *Mem. Bot. Surv. .S. Afr.* No. 28: 1-192.

Anderson, M. D. 2000. Ludwig's Bustard. In: Barnes, K. N. (ed.), *The Eskom Red Data Book of birds of South Africa, , Lesotho and Swaziland*, pp. 105-107. BirdLife South Africa, Johannesburg. In BirdLife International (2022) Species factsheet: *Neotis ludwigii*. Downloaded from http://www.birdlife.org on 07/09/2022.

Anon, 2008. Guideline regarding the determination of bioregions and the preparation and publication of Bioregional Plans. April 2008. Government Notice No. 291 of 16 March 2009.

Brooke R K. 1984. *South African Red Data Book–Birds*, Foundation for Research Development: CSIR, 1984.

De Villiers C.C., Driver, A., Brownlie, S., Clark, B., Day, E.G., Euston-Brown, D.I.W., Helme, N.A., Holmes, P.M., Job, N. & Rebelo, A.B. 2005. Fynbos Forum Ecosystem Guidelines for Environmental Assessment in the Western Cape. Fynbos Forum, c/o Botanical Society of South Africa: Conservation Unit, Kirstenbosch, Cape Town.

DEAT, 2002. Impact significance. Integrated Environmental Management, Information series 5. Department of Environmental Affairs and Tourism (DEAT). Pretoria.

Del Hoyo, J.; Elliott, A.; Sargatal, J. 1996. *Handbook of the Birds of the World, vol. 3: Hoatzin to Auks*. Lynx Edicions, Barcelona, Spain. In BirdLife International (2022) Species factsheet: *Neotis ludwigii*. Downloaded from http://www.birdlife.org on 07/09/2022.

Driver A., Sink, K.J., Nel, J.N., Holness, S., Van Niekerk, L., Daniels, F., Jonas, Z., Majiedt, P.A., Harris, L. & Maze, K. 2012. National Biodiversity Assessment 2011: An assessment of South Africa's biodiversity and ecosystems. Synthesis Report. South African National Biodiversity Institute and Department of Environmental Affairs, Pretoria

Driver, A., Maze, K., Rouget, M., Lombard, A.T., Nel, J.L., Turpie, J.K., Cowling, R.M., Desmet, P., Goodman, P., Harris, J., Jonas, Z., Reyers, B., Sink, K. & Strauss, T. 2005. National spatial biodiversity assessment 2004: priorities for biodiversity conservation in South Africa. Strelitzia, 17. South African National Biodiversity Institute, Pretoria.

Edwards, R. 2011. Environmental impact assessment method. Unpublished report for SiVest (Pty) Ltd. Environmental division. 9 May 2011.

Ferguson-Lees, J. and Christie, D.A. 2001. *Raptors of the World*. Christopher Helm, London.

Herholdt J J. 1988. The distribution of Stanley's and Ludwig's Bustards in southern Africa: A review. *Ostrich*, 59(1): 8-13. In BirdLife International (2022) Species factsheet: *Neotis ludwigii*. Downloaded from http://www.birdlife.org on 07/09/2022.

Hilton-Taylor, C. 2000. The IUCN red list of threatened species. IUCN, Gland, Switzerland and Cambridge, United Kingdom.

Holness, S. & Oosthuysen, E. 2016. Critical Biodiversity Areas of the Northern Cape: Technical Report. Available from the Biodiversity GIS website at http://bgis.sanbi.org/project.asp

Jenkins, A.; Smallie, J. 2009. Terminal velocity: end of the line for Ludwig's Bustard? *Africa – Birds & Birding* 14(2): 34-39. In BirdLife International (2022) Species factsheet: *Neotis ludwigii*. Downloaded from http://www.birdlife.org on 07/09/2022.

Le Roux, A. 2015. Wild flowers of Namaqualand. A botanical society guide. Fourth revised edition. Struik Nature. Cape Town.

Low, A.B. & Rebelo, A.(T.)G. (eds.) 1996. *Vegetation of South Africa, Lesotho and Swaziland.* Department of Environmental Affairs and Tourism, Pretoria.

Manning, J. 2008. Namaqualand Eco Guide. Briza Publications. Pretoria

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

Mucina, L., Rutherford, M.C., Palmer, A.R., Milton, S.J., Scott, L., Lloyd, J.W., Van der Merwe, B., Hoare, D.B., Bezuidenhout, H., Vlok, J.H.J., Euston-Brown, D.I.W., Powrie, L.W. and Dold, A.P. 2006. Nama-Karoo Biome. In Mucina, L. &Rutherford, M.C. 2006. (Eds.). The Vegetation of South Africa. Lesotho & Swaziland. Strelitzia 19. South African National Biodiversity Institute, Pretoria. Pp. 325 – 347.

Pool-Starvliet, R. 2017. Northern Cape Biodiversity Spatial Plan Handbook. Biodiversity GIS Home. **http://bgis.sanbi.org.**

Rouget, M., Reyers, B., Jonas, Z., Desmet, P., Driver, A., Maze, K., Egoh, B. & Cowling, R.M. 2004. South Africa National Spatial Biodiversity Assessment 2004: Technical report. Volume 1: Terrestrial Component. Pretoria: South African National Biodiversity Institute.

Shearing, D. 1994. Karoo. South African Wild Flower Guide 6. Botanical Society of South Africa. Kirstenbosch.

Skowno, A.L., Matlata, M., Slingsby, J.,Kirkwood,D., Raimondo, D.C., Von Staden, L., Holness, S.D., Lotter, M., Pence, G Daniels, F., Driver, A., Desmet, P.G., Dayaram, A. 2019b. Terrestrial ecosystem threat status assessment 2018 – comparison with 2011 assessment for provincial agencies. National Biodiversity Assessment 2018 Technical Report. South African National Biodiversity Institute, Pretoria.

Skowno, A.L., Raimondo, D.C., Poole, C.J., Fizzotti, B. & Slingsby, J.A. (eds.). 2019a. South African National Biodiversity Assessment 2018 Technical Report Volume 1: Terrestrial Realm. South African National Biodiversity Institute, Pretoria. http://hdl.handle.net/20.500.12143/6370

Fairhurst, S., Engelbrecht, J., Butler, E. & Fivaz, H. 2022. Phase 1 HIA for a proposed aggregate quarry on Alheit farm plot 2372 near Kakamas with the Kai !Garib Local Municipality, ZF Mcgawu District Municipality, Northern Cape. Unpublished report prepared for EnviroAfrica. Ubique Heritage Consultants. 25 August 2022.

South African National Biodiversity Institute. Statistics: Red List of South African Plants version (as updated). Downloaded from Redlist.sanbi.org on 2019/06.

South African National Biodiversity Institute. 2012. Vegetation map of South Africa, Lesotho and Swaziland [vector geospatial dataset] 2012.

South African National Biodiversity Institute. 2012. Vegetation map of South Africa, Lesotho and Swaziland [vector geospatial dataset] 2012.

South African National Biodiversity Institute. 2016. Botanical Database of Southern Africa (BODATSA) [dataset]. Doi: to be assigned

South African National Biodiversity Institute. 2020. Statistics: Red List of South African Plants version 2020.1. Downloaded from Redlist.sanbi.org on 2022/09/01

Taylor, M.R. 2015. Martial Egale Polemaetus bellicosus. In: Taylor, M. R.; Peacock, F.; Wanless, R. M. (ed.), *The 2015 Eskom Red Data Book of Birds of South Africa, Lesotho and Swaziland*, pp. 113-115. BirdLife South Africa, Johannesburg, South Africa. In BirdLife International (2022) Species factsheet: *Neotis ludwigii*. Downloaded from http://www.birdlife.org on 07/09/2022.

The Eskom Red Data Book of Birds of South Africa, Lesotho and Swaziland. Taylor, MR, Peacock F, Wanless RW (eds). 2015. BirdLife South Africa, Johannesburg, South Africa. In BirdLife International (2022) Species factsheet: *Neotis ludwigii*. Downloaded from http://www.birdlife.org on 07/09/2022.

Van Wyk, A.E., & Smith, G.F. 2001. Regions of floristic endemism in South Africa. A review with emphasis on succulents. Umdaus press. Hatfield.

Watsan Africa, 2022. Witvlei Boerdery Trust. Proposed rock quarry, Plot 2372 of Alheidt, Kakamas. Unpublished report prepared for EnviroAfrica in terms of the NEMA EIA regulations. August 2022.

APPENDIX 1: CURRICULUM VITAE – P.J.J. BOTES

Curriculum Vitae: Peet JJ Botes

Address: 22 Buitekant Street, Bredasdorp, 7280; **Cell**: 082 921 5949

Nationality:	South African
ID No.:	670329 5028 081
Language:	Afrikaans / English
Profession:	Environmental Consultant & Auditing
Specializations:	Botanical & Biodiversity Impact Assessments
	Environmental Compliance Audits
	Environmental Impact Assessment
	Environmental Management Systems
Qualifications:	**BSc** (Botany & Zoology), with Nature Conservation III & IV as extra subjects; Dept. of Natural Sciences, Stellenbosch University 1989.
	Hons. BSc (Plant Ecology), Stellenbosch University, 1989
	More than 20 years of experience in the Environmental Management Field (Since 1997 to present).
Professional affiliation:	Registered Professional Botanical, Environmental and Ecological Scientist at SACNASP (South African Council for Natural Scientific Professions) since 2005.
SACNAP Reg. No.:	400184/05

BRIEF RESUME OF RELEVANT EXPERIENCE

1997-2005: Employed by the Overberg Test Range (a Division of Denel), responsible for managing the environmental department of OTB, developing and implementing an ISO14001 environmental management system, ensuring environmental compliance, performing environmental risk assessments with regards to missile tests and planning the management of the 26 000 ha of natural veld, working closely with CapeNature (De Hoop Nature Reserve).

2005-2010: Joined Enviroscientific, as an independent environmental consultant specializing in wastewater management, botanical and biodiversity assessments, developing environmental management plans and strategies, environmental control work as well as doing environmental compliance audits and was also responsible for helping develop the biodiversity part of the Farming for the Future audit system implemented by Woolworths. During his time with Enviroscientific he performed more than 400 biodiversity and environmental legal compliance audits.

2010-2017: Joined EnviroAfrica, as an independent Environmental Assessment Practitioner and Biodiversity Specialist, responsible for Environmental Impact Assessments, Biodiversity & Botanical specialist reports and Environmental Compliance Audits. During this time Mr Botes compiled more than 70 specialist Biodiversity & Botanical impact assessment reports ranging from agricultural-, infrastructure pipelines- and solar developments.

2017-Present: Establish a small independent consultancy (PB Consult) specialising in Environmental Audits, Biodiversity and Botanical specialist studies as well as Environmental Impact Assessment.

LIST OF MOST RELEVANT BOTANICAL & BIODIVERSITY STUDIES

Botes. P. 2007:	Botanical assessment. Schaapkraal, Erf 644, Mitchell's Plain. A preliminary assessment of the vegetation in terms of the Fynbos Forum: Ecosystem guidelines. 13 November 2007.
Botes. P. 2008:	Botanical assessment. Schaapkraal Erf 1129, Cape Town. A preliminary assessment of the vegetation using the Fynbos Forum Terms of Reference: Ecosystem guidelines for environmental Assessment in the Northern Cape. 20 July 2008.
Botes, P. 2010(a):	Botanical assessment. Proposed subdivision of Erf 902, 34 Eskom Street, Napier. A Botanical scan and an assessment of the natural vegetation of the site to assess to what degree the site contributes towards conservation targets for the ecosystem. 15 September 2010.
Botes, P. 2010(b):	Botanical assessment. Proposed Loeriesfontein low cost housing project. A preliminary Botanical Assessment of the natural veld with regards to the proposed low cost housing project in/adjacent to Loeriesfontein, taking into consideration the National Spatial Biodiversity Assessment of South Africa. 10 August 2010.
Botes, P. 2010(c):	Botanical assessment: Proposed Sparrenberg dam, on Sparrenberg Farm, Ceres. . A Botanical scan and an assessment of the natural vegetation of the site. 15 September 2010.
Botes, P. 2011:	Botanical scan. Proposed Cathbert development on the Farm Wolfe Kloof, Paarl (Revised). A botanical scan of Portion 2 of the Farm Wolfe Kloof No. 966 (Cathbert) with regards to the proposed Cathbert Development, taking into consideration the National Spatial Biodiversity Assessment of South Africa. 28 September 2011.
Botes, P. 2012(a):	Proposed Danielskuil Keren Energy Holdings Solar Facility on Erf 753, Danielskuil. A Biodiversity Assessment (with botanical input) taking into consideration the findings of the National Spatial Biodiversity Assessment of South Africa. 17 March 2012.
Botes, P. 2012(b):	Proposed Disselfontein Keren Energy Holdings Solar Facility on Farm Disselfontein no. 77, Hopetown. A Biodiversity Assessment (with botanical input) taking into consideration the findings of the National Spatial Biodiversity Assessment of South Africa. 28 March 2012.
Botes, P. 2012(c):	Proposed Kakamas Keren Energy Holdings Solar Facility on Remainder of the Farm 666, Kakamas. A Biodiversity Assessment (with botanical input) taking into consideration the findings of the National Spatial Biodiversity Assessment of South Africa. 13 March 2012.
Botes, P. 2012(d):	Proposed Keimoes Keren Energy Holdings Solar Facility at Keimoes. A Biodiversity Assessment (with botanical input) taking into consideration the findings of the National Spatial Biodiversity Assessment of South Africa. 9 March 2012.
Botes, P. 2012(e):	Proposed Leeu-Gamka Keren Energy Holdings Solar Facility on Portion 40 of the Farm Kruidfontein no. 33, Prince Albert. A Biodiversity Assessment (with botanical input) taking into consideration the findings of the National Spatial Biodiversity Assessment of South Africa. 27 March 2012.
Botes, P. 2012(f):	Proposed Mount Roper Keren Energy Holdings Solar Facility on Farm 321, Kuruman. A Biodiversity Assessment (with botanical input) taking into consideration the findings of the National Spatial Biodiversity Assessment of South Africa. 28 March 2012.
Botes, P. 2012(g):	Proposed Whitebank Keren Energy Holdings Solar Facility on Farm no. 379, Kuruman. A Biodiversity Assessment (with botanical input) taking into consideration the findings of the National Spatial Biodiversity Assessment of South Africa. 27 March 2012.

Botes, P. 2012(h): Proposed Vanrhynsdorp Keren Energy Holdings Solar Facility on Farm Duinen Farm no. 258, Vanrhynsdorp. A Biodiversity Assessment (with botanical input) taking into consideration the findings of the National Spatial Biodiversity Assessment of South Africa. 13 April 2012.

Botes, P. 2012(i): Askham (Kameelduin) proposed low cost housing, Mier Municipality Residential Project, Northern Cape. A preliminary Biodiversity & Botanical scan in order to identify significant environmental features (and to identify the need for additional studies if required. 1 November 2012.

Botes, P. 2013(a): Groot Mier proposed low cost housing, Mier Municipality Residential Project, Northern Cape. A preliminary Biodiversity & Botanical scan in order to identify significant environmental features (and to identify the need for additional studies if required. January 2013.

Botes, P. 2013(b): Loubos proposed low cost housing, Mier Municipality Residential Project, Northern Cape. A preliminary Biodiversity & Botanical scan in order to identify significant environmental features (and to identify the need for additional studies if required. January 2013.

Botes, P. 2013(c): Noenieput proposed low cost housing, Mier Municipality Residential Project, Northern Cape. A preliminary Biodiversity & Botanical scan in order to identify significant environmental features (and to identify the need for additional studies if required. January 2013.

Botes, P. 2013(d): Rietfontein proposed low cost housing, Mier Municipality Residential Project, Northern Cape. A preliminary Biodiversity & Botanical scan in order to identify significant environmental features (and to identify the need for additional studies if required. January 2013.

Botes, P. 2013(e): Welkom proposed low cost housing, Mier Municipality Residential Project, Northern Cape. A preliminary Biodiversity & Botanical scan in order to identify significant environmental features (and to identify the need for additional studies if required. January 2013.

Botes, P. 2013(f): Zypherfontein Dam Biodiversity & Botanical Scan. Proposed construction of a new irrigation dam on Portions 1, 3, 5 & 6 of the Farm Zypherfontein No. 66, Vanrhynsdorp (Northern Cape) and a scan of the proposed associated agricultural enlargement. September 2013.

Botes, P. 2013(g): Onseepkans Canal: Repair and upgrade of the Onseepkans Water Supply and Flood Protection Infrastructure, Northern Cape. A Biodiversity & Botanical scan in order to identify significant environmental features (and to identify the need for additional studies if required). August 2013.

Botes, P. 2013(h): Biodiversity scoping assessment with regards to a Jetty Construction On Erf 327, Malagas (Matjiespoort). 24 October 2013.

Botes, P. 2013(i): Jacobsbaai pump station and rising main (Saldanha Bay Municipality). A Botanical Scan of the area that will be impacted by the proposed Jacobsbaai pump station and rising main. 30 October 2013.

Botes, P. 2014(a): Brandvlei Bulk Water Supply: Proposed construction of a 51 km new bulk water supply pipeline (replacing the existing pipeline) from Romanskolk Reservoir to the Brandvlei Reservoir, Brandvlei (Northern Cape Province). A preliminary Biodiversity & Botanical scan in order to identify significant environmental features (and to identify the need for additional studies if required). 24 February 2014.

Botes, P. & McDonald Dr. D. 2014: Loeriesfontein Bulk Water Supply: Proposed construction of a new bulk water supply pipeline and associated infrastructure from the farm Rheeboksfontein to Loeriesfontein Reservoir, Loeriesfontein. Botanical scan of the proposed route to determine the possible impact on vegetation and plant species. 30 May 2014.

Botes, P. 2014(b): Kalahari-East Water Supply Scheme Extension: Phase 1. Proposed extension of the Kalahari-East Water Supply Scheme and associated infrastructure to the Mier Municipality, ZF Mgcawu District Municipality, Mier Local Municipality (Northern Cape Province). Biodiversity & Botanical scan of the proposed route to determine the possible impact on biodiversity with emphasis on vegetation and plant species. 1 July 2014.

Botes, P. 2014(c): The proposed Freudenberg Farm Homestead, Farm no. 419/0, Tulbagh (Wolseley Area). A Botanical scan of possible remaining natural veld on the property. 26 August 2014.

Botes, P. 2014(d): Postmasburg WWTW: Proposed relocation of the Postmasburg wastewater treatment works and associated infrastructure, ZF Mgcawu District Municipality, Tsantsabane Local Municipality (Northern Cape Province). Biodiversity and botanical scan of the proposed pipeline route and WWTW site. 30 October 2014.

Botes, P. 2015(a): Jacobsbaai pump station and rising main (Saldanha Bay Municipality) (Revision). A Botanical Scan of the area that will be impacted by the proposed Jacobsbaai pump station and rising main. 21 January 2015.

Botes, P. 2015(b): Steenkampspan proving ground. Proposed establishment of a high speed proving (& associated infrastructure) on the farm Steenkampspan (No. 419/6), Upington, ZF Mgcawu (Siyanda) District Municipality, Northern Cape Province. Biodiversity and Botanical Scan of the proposed footprint. 20 February 2015.

Botes, P 2015(c): Proposed Bredasdorp Feedlot, Portion 10 of Farm 159, Bredasdorp, Cape Agulhas Municipality, Northern Cape Province. A Botanical scan of the area that will be impacted. 28 July 2015.

Botes, P. 2016(a): OWK Raisin processing facility, Upington, Erf 151, Kenhardt, Northern Cape Province. A Botanical scan of the proposed footprint. 26 May 2016.

Botes, P. 2016(b): Onseepkans Agricultural development. The proposed development of ±250 ha of new agricultural land at Onseepkans, Northern Cape Province. Biodiversity and Botanical Scan. January 2016.

Botes, P. 2016(c): Henkries Mega-Agripark development. The proposed development of ±150 ha of high potential agricultural land at Henkries, Northern Cape Province. Biodiversity and Botanical Scan of the proposed footprint. 28 February 2016.

Botes, P. 2016(d): Proposed Namaqualand Regional Water Supply Scheme high priority bulk water supply infrastructure upgrades from Okiep to Concordia and Corolusberg. Biodiversity Assessment of the proposed footprint. March 2016.

Botes, P. 2017: The proposed new Namaqua N7 Truck Stop on Portion 62 of the Farm Biesjesfontein No. 218, Springbok, Northern Cape Province. Botanical scan of the proposed footprint. 10 July 2017.

Botes, P. 2018(a): Kamiesberg Bulk Water Supply – Ground water desalination, borehole- and reservoir development, Kamiesberg, Northern Cape Province. Botanical scan of the proposed footprint. 20 February 2018

Botes, P. 2018(b): Rooifontein Bulk Water Supply – Ground water desalination, borehole- and reservoir development, Rooifontein, Northern Cape Province. Botanical scan of the proposed footprint. 23 February 2018

Botes, P. 2018(c): Paulshoek Bulk Water Supply – Ground water desalination, borehole- and reservoir development, Paulshoek, Northern Cape Province. Botanical scan of the proposed footprint. 27 March 2018.

Botes, P. 2018(d): Kakamas Waste Water Treatment Works Upgrade – Construction of a new WWTW and rising main, Khai !Garib Local Municipality, Northern Cape Province. Botanical assessment of the proposed footprint. 1 August 2018.

Botes, P. 2018(e): Kakamas Bulk Water Supply – New bulk water supply line for Kakamas, Lutzburg & Cillie, Khai !Garib Local Municipality, Northern Cape Province. Botanical assessment of the proposed footprint. 4 August 2018.

Botes, P. 2018(f): Wagenboom Weir & Pipeline – Construction of a new pipeline and weir with the Snel River, Breede River Local Municipality, Northern Cape Province. Botanical assessment of the proposed footprint. 7 August 2018.

Botes, P. 2018(g): Steynville (Hopetown) outfall sewer pipeline – Proposed development of a new sewer outfall pipeline, Hopetown, Northern Cape Province. Botanical assessment of the proposed footprint. 8 October 2018.

Botes, P. 2018(h): Tripple D farm agricultural development – Development of a further 60 ha of vineyards, Erf 1178, Kakamas, Northern Cape Province. Botanical assessment of the proposed footprint. 8 October 2018.

Botes, P. 2018(i): Steynville (Hopetown) outfall sewer pipeline – Proposed development of a new sewer outfall pipeline, Hopetown, Northern Cape Province. Botanical assessment of the proposed footprint. 8 October 2018.

Botes, P. 2019(a): Lethabo Park Extension – Proposed extension of Lethabo Park (Housing Development) on the remainder of the Farm Roodepan No. 70, Erf 17725 and Erf 15089, Roodepan Kimberley. Sol Plaaitje Local Municipality, Northern Cape Province. Botanical assessment of the proposed footprint (with biodiversity inputs). 15 May 2019.

Botes, P. 2019(b): Verneujkpan Trust agricultural development – The proposed development of an additional ±250 ha of agricultural land on Farms 1763, 2372 & 2363, Kakamas, Northern Cape Province. 27 June 2019.

Botes, P. 2020(a): Gamakor & Noodkamp Low cost housing – Botanical Assessment of the proposed formalization of the Gamakor and Noodkamp housing development on the remainder and portion 128 of the Farm Kousas No. 459 and Ervin 1470, 1474 and 1480, Gordonia road, Keimoes. Kai !Gariep Local Municipality, Northern Cape Province. 6 February 2020.

Botes, P. 2020(b): Feldspar Prospecting & Mining, Farm Rozynen Bosch 104, Kakamas. Botanical assessment of the proposed prospecting and mining activities on Portion 5 of The Farm Rozynen Bosch No. 104, Kakamas, Khai !Garib Local Municipality, Northern Cape Province. 12 February 2020.

Botes, P. 2020(c): Boegoeberg housing project – Botanical assessment of the proposed formalization and development of 550 new erven on the remainders of farms 142 & 144 and Plot 1890, Boegoeberg settlement, !Kheis Local Municipality, Northern Cape Province. 1 July 2020.

Botes, P. 2020(d): Komaggas Bulk Water supply upgrade – Botanical assessment of the proposed upgrade of the existing Buffelsrivier to Komaggas BWS system, Rem. of Farm 200, Nama Khoi Local Municipality, Northern Cape Province. 8 July 2020.

Botes, P. 2020(e): Grootdrink housing project – Botanical assessment of the proposed formalization and development of 370 new erven on Erf 131, Grootdrink and Plot 2627, Boegoeberg Settlement, next to Grootdrink, !Kheis Local Municipality, Northern Cape Province. 14 July 2020.

Botes, P. 2020(f): Opwag housing project – Botanical assessment of the proposed formalization and development of 730 new erven on Plot 2642, Boegoeberg Settlement and Farm Boegoeberg Settlement NO.48/16, Opwag, !Kheis Local Municipality, Northern Cape Province. 16 July 2020.

Botes, P. 2020(g): Wegdraai housing project – Botanical assessment of the Proposed formalization and development of 360 new erven on Erven 1, 45 & 47, Wegdraai, !Kheis Local Municipality, Northern Cape Province. 17 July 2020.

Botes, P. 2020(h): Topline (Saalskop) housing project – Botanical assessment of the pproposed formalization and development of 248 new erven on Erven 1, 16, 87, Saalskop & Plot 2777, Boegoeberg Settlement, Topline, !Kheis Local Municipality, Northern Cape Province. 18 July 2020.

Botes, P. 2020(i): Gariep housing project – Botanical assessment of the proposed formalization and development of 135 new erven on Plot 113, Gariep Settlement, !Kheis Local Municipality, Northern Cape Province. 20 July 2020.