

Scoping and Environmental Impact Assessment for the proposed development of the 279 MW Kwagga Wind Energy Facility 1 near Beaufort West, Western Cape



APPENDIX F.5

Aquatic Biodiversity and Species

APPENDIX F.5 – Site Sensitivity Verification for Aquatic Biodiversity

As required in Part A of the Government Gazette 43110, GN 320, a site sensitivity verification was undertaken in order to confirm the current land use and environmental sensitivity of the proposed project area. The details of the site sensitivity verification for Aquatic Biodiversity are noted below:

| | |
|----------------------------------|--|
| Date of Site Visit | 8 November 2020 |
| Specialist Name | Toni Belcher |
| Professional Registration No. | 400040/10 |
| Specialist Affiliation / Company | Toni Belcher Sole Proprietary |
| Specialist Topic | Aquatic Biodiversity |
| Proposed WEF Project Name | Kwagga 1 (Rem and Portion 1 of Farm Dwaalfontein Wes No. 377; Rem of Farm Dwaalfontein No. 379; and Portion 3 of Farm Tyger Poort No. 376) |

1. Description of the Proposed Project

Kwagga 1 is proposed to comprise of 45 turbines with a total installed generation capacity of up to 279 MW. The associated infrastructure will comprise of internal roads of approximately 45 km that will need to have a width of 6 to 8 m and internal transmission lines (preferably underground) that will follow the roads. The site will also contain offices (2 stacked containers), an Operation and Maintenance control centre, ablution facilities and guardhouse. Five alternative sub-station and four alternative laydown areas have been proposed for the site. A Battery Energy Storage System is being considered for the site.

It is proposed each WEF will make use of approximately 8333 kl per month during the construction stage of the projects. Water used during the Operation phase of the projects will primarily be for drinking and sanitation purposes. The Project Applicant proposes municipal water be trucked to the site, however, notes that alternative sources are still being investigated. At this stage, no water is planned to be abstracted from or discharged to any surface water systems.

2. Method of the Site Sensitivity Verification

This Site Sensitivity Verification was informed by a combination of desktop assessments of existing freshwater ecosystem information for the study area and surrounding catchments, as well as by a more detailed assessment of the freshwater features on the various farm portions that comprise the study area. The following websites were used to determine the aquatic biodiversity conservation importance mapping and presence of aquatic biota associated with the aquatic habitats in the site:

- National Environmental Screening Tool:
<https://screening.environment.gov.za/screeningtool/#/pages/welcome>
- South African National Biodiversity Institute Biodiversity GIS: <http://bgis.sanbi.org/>
- Western Cape Department of Agriculture CapeFarmMapper:
<https://gis.elsenburg.com/apps/cfm/>

- Freshwater Biodiversity Information System: <https://freshwaterbiodiversity.org/> and
- iNaturalist: <https://www.inaturalist.org/taxa>

The site was visited at the end of the rainy season for a single day on 8 November 2020 to verify the aquatic features occurring on the site. No additional site visits are deemed necessary.

The field visit comprised of delineation, characterisation and integrity assessments of the aquatic habitats within the site. Mapping of the freshwater features was undertaken using a GPS Tracker and mapped in PlanetGIS and Google Earth Professional.

The following techniques and methodologies were utilised to undertake the assessments:

1. The guideline document, “A Practical Field Procedure for the Identification and Delineation of Wetlands and Riparian Areas” document, as published by DWAF (2005) was followed for the delineation of the aquatic habitats;
2. The present ecological condition of the watercourses and wetlands was determined using national River Health Programme and Wet-Health methodologies;
3. The ecological importance and ecological sensitivity (EI&ES) assessment of the wetlands and watercourses were conducted according to the guidelines as developed by DWAF (1999); and
4. Recommendations are made concerning the adoption of buffer zones within the site were based on watercourse and wetland functioning and site characteristics.

3. Aquatic Features in the Study Area

The study area is located in the upper catchment of the Amos/Sout River (Figure 1), a tributary in the Groot/Gamtoos River System. Table 1 provides an overview and summary of the water resource information for the farm on which the development is proposed.

Table 1: Key water resources information for the proposed project development area

| Descriptor | Name / details | Notes |
|--|---|--|
| Water Management Area (WMA) | Fish to Tsitsikamma WMA | |
| Catchment Area | Kerneels, Vlei se Loop, Grasleegte and Witgras se Loop Rivers | Upper portion of the Swartbakens Tributary of the Amos River in the larger Groot/Gamtoos River Catchment |
| Quaternary Catchment | L12A (Amos River) | |
| Present Ecological state | C (moderately modified) | DWS (2012) assessment for the Swartbakens River (See Appendix B) |
| Ecological Importance and Ecological Sensitivity | Moderate | |
| Location of the centre of the site | 32°54'35.57"S | Latitude |
| | 22°39'45.38"E | Longitude |

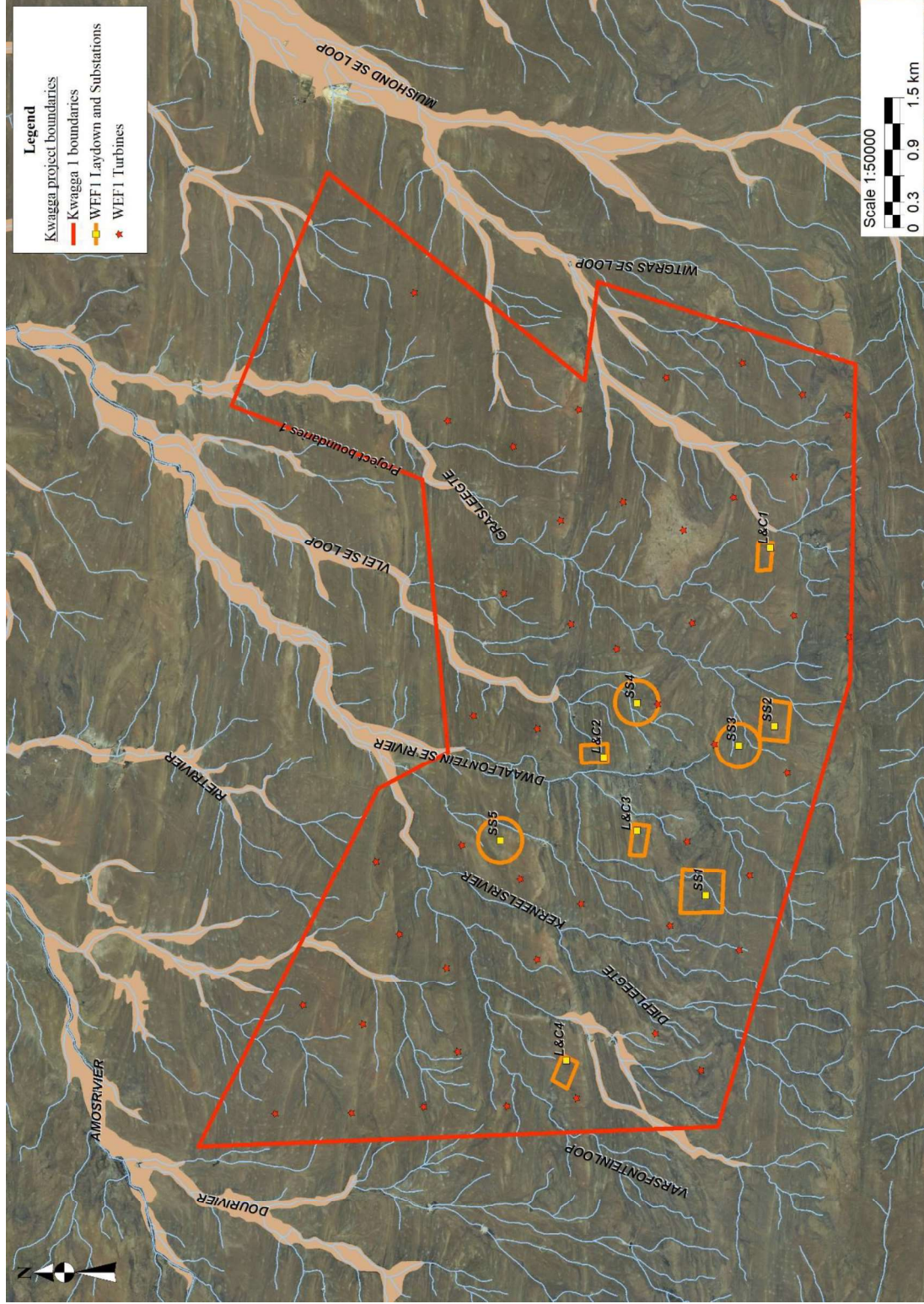


Figure 1. Orthophotograph of the site taken in 2016 showing the mapped watercourses within the site

3.1. Description of Aquatic Features

The aquatic features within the site comprise of the Varsfonteinloop, Kerneels, Vlei se Loop, Grasleegte and the Witgras se Loop Rivers (Figure 1). These are all tributaries of the Swartbakens River that drain in the north-easterly direction through the site to the Amos River, north of the site. The Amos River is joined by several other streams to form the Sout River. This river is joined by the Kariega River at Beervlei Dam to form the Groot River. The Groot River flows in a south-easterly direction to where it is joined by the Kouga River upstream of Hankey. These two rivers form the Gamtoos River which flows for a short distance before draining into the sea north-east of Jefferys Bay.

Within the study area, the streams fall within the foothill zones of the Great Karoo Ecoregion. The watercourses in this region, due to the low rainfall of the area, are non-perennial (ephemeral) rivers tending to only flow for relatively short periods immediately following rainfall events. They comprise primarily of gravel bed, single to multiple channels. The larger streams contain distinct riparian vegetation that comprises of a mix of low trees and shrubs such as *Vachellia karroo*, *Searsia lancea*, *Searsia pallens*, *Gymnosporia* sp., *Carissa haematocarpa*, *Melianthus comosus*, *Lycium* spp. and *Asparagus striatus* (Figure 2). The smaller watercourses have less distinct vegetation that tends to comprise of a low density of *Vachellia karroo* with *Stipagrostis namaquensis* and other grasses (Figure 3).



Figure 2. View of the Swartbakens River with its more significant riparian vegetation that is still in a largely natural ecological condition

Only localised impacts occurred along the rivers where the agricultural activities within the site have directly impacted on the watercourses. At these points that are typically along the access roads through the site, there has been some removal of indigenous riparian vegetation or habitat modification within the watercourse at the road crossing. There are about ten small instream dams within the property. Land use is largely livestock grazing that has also impacted on the vegetation in and adjacent to the watercourses. The invasion of alien vegetation along the watercourses is relatively low and comprises of invasive plants such as *Opuntia ficus-*

indica (prickly pear), *Xanthium strumarium* (cocklebur), *Tagetes minuta* (khaki weed) and *Hypochaeris radicata* (false dandelion).



Figure 3. View of the more disturbed Grasleegte River that contains a less distinct riparian vegetation comprising largely of low numbers of *Vachellia karroo*

3.2. Biodiversity Importance of the Aquatic Features

The catchment of the Swartbakens River is mapped as a Freshwater Ecosystem Priority Area Sub-catchment (Figure 4) while the river corridor is mapped as an aquatic Critical Biodiversity Area (Figure 5) with the wider river corridor also being mapped as a terrestrial Critical Biodiversity Area. These areas are considered to be in a natural condition and are required to meet biodiversity targets, for species, ecosystems or ecological processes and infrastructure. These areas should be maintained in a natural or near-natural state or where necessary rehabilitated. Only low-impact, biodiversity-sensitive land uses are considered appropriate.

All of the remaining watercourses are mapped as aquatic Ecological Support Areas that are not essential for meeting biodiversity targets, but that play an important role in delivering ecosystem services. The ecological functioning of these watercourses should not be compromised by the proposed project activities.

The only wetlands mapped within the site are wetlands associated with dams that are mapped as artificial Freshwater Ecosystem Priority Area Wetlands.

The Screening Tool has indicated that the catchment of the Swartbakens River is of very high sensitivity while that remainder of the site is considered of low Aquatic Biodiversity Combined Sensitivity (Figure 6). This is linked to the Freshwater Ecosystem Priority Area and aquatic Critical Biodiversity Area mapping of this river as mentioned above.

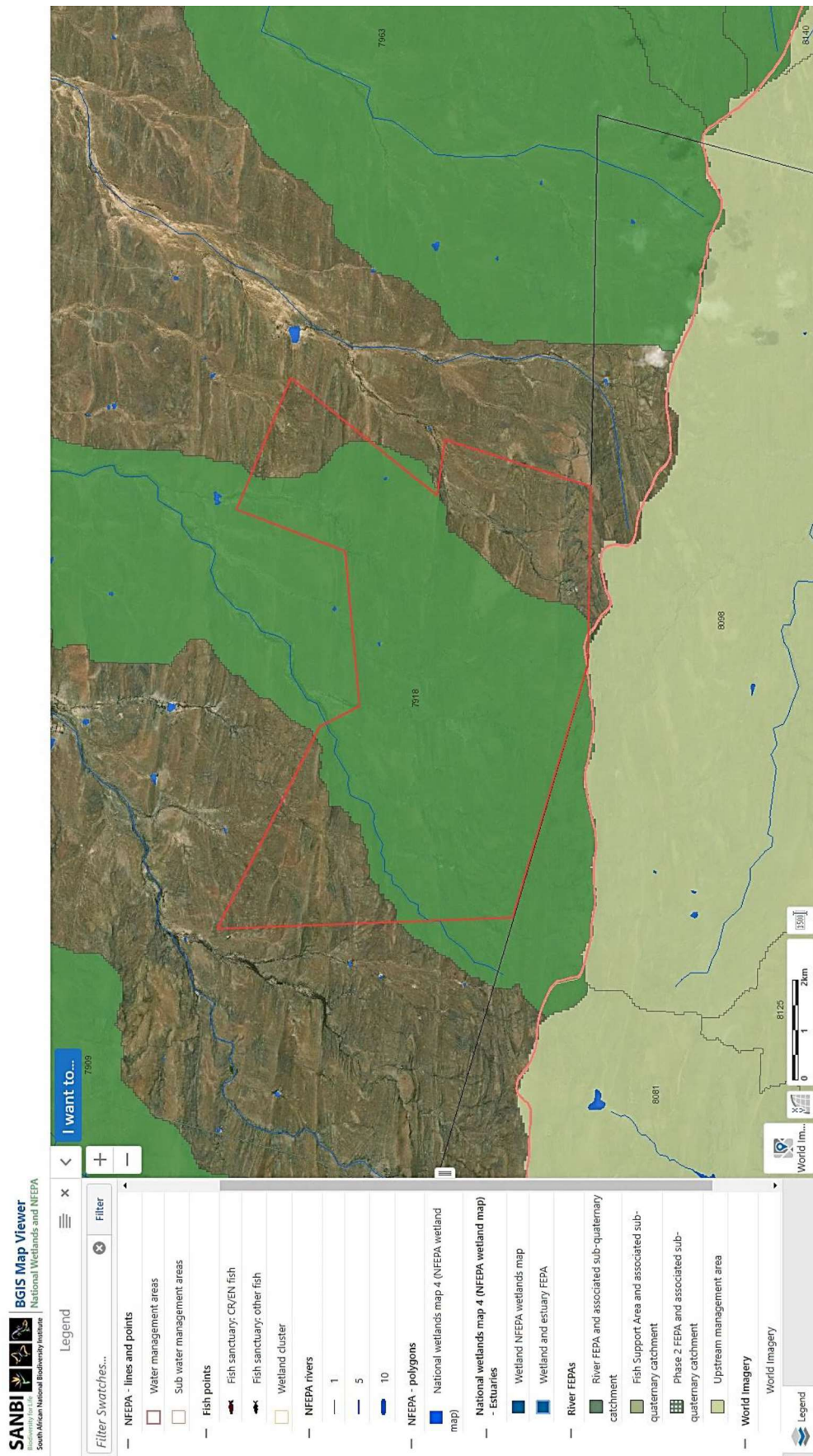


Figure 4. Freshwater Ecosystem Priority Area mapping for the site (2011 CSIR National Freshwater Ecosystem Priority Areas, obtained from SANBI Biodiversity GIS, November 2020)

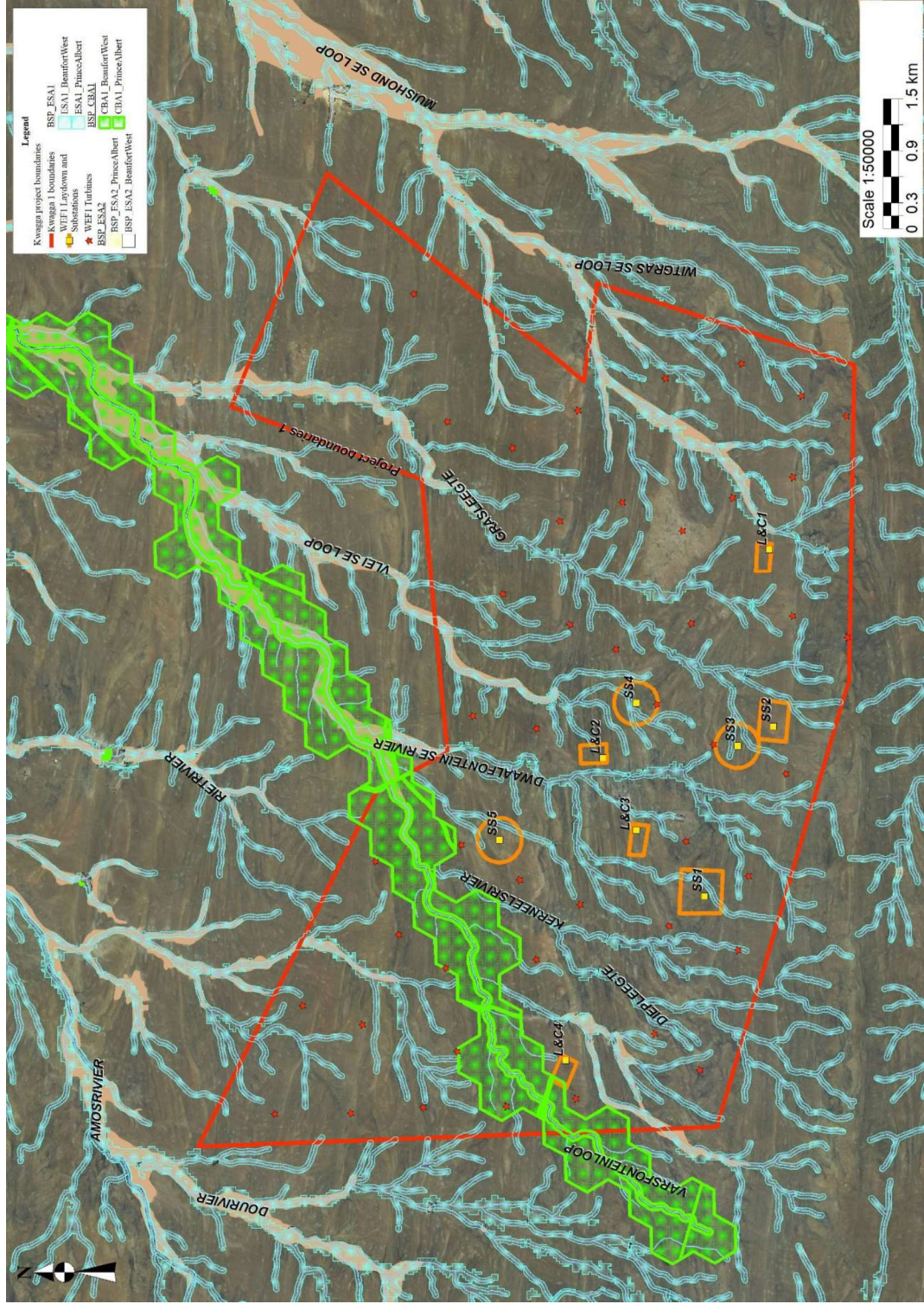


Figure 5. Aquatic Critical Biodiversity and Ecological Support Area mapping for the site

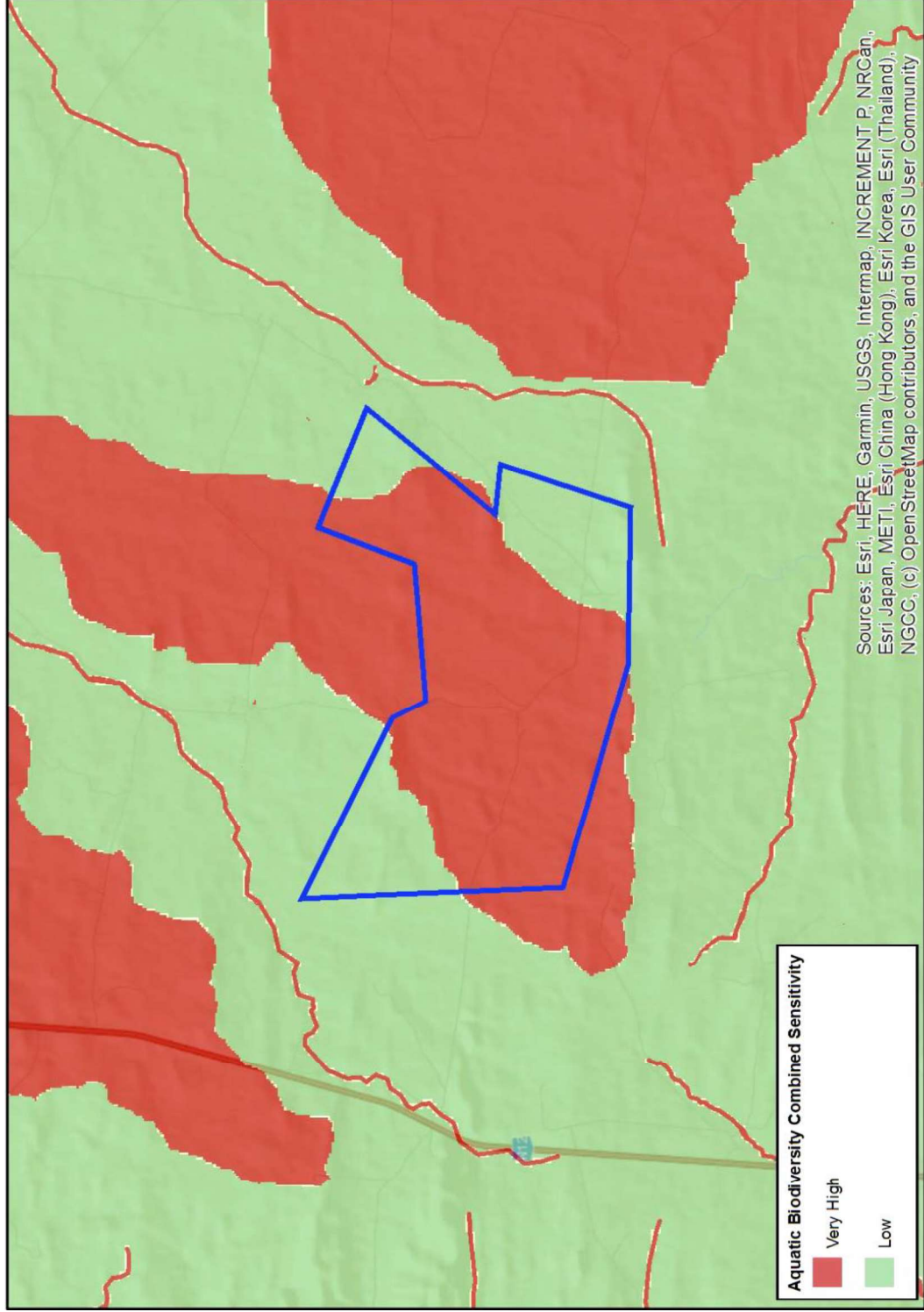


Figure 6. Screening Tool map of the site (blue polygon) for the mapped Aquatic Biodiversity Combined Sensitivity

3.3. Present Ecological Status, Ecological Importance and Sensitivity and Recommended Ecological Condition

The aquatic features within the site are all mostly in a **largely natural** (B Category) ecological condition and are considered of **moderate** ecological importance and sensitivity. The Swartbakens River and its larger tributaries, however, provide a more significant ecological corridor within the landscape that is deemed to be of **high** ecological importance and sensitivity. Where localised impacts to the watercourses have taken place the habitat integrity of the watercourse has been reduced in places to **moderately modified** (C Category) however these impacts are direct habitat disturbances and do not impact on the overall ecological integrity or ecological importance and sensitivity of the watercourses. It is recommended that the watercourses remain in their current ecological integrity of largely natural to moderately modified. The Swartbakens River, in particular, should remain in its current condition of largely natural, given its high ecological importance and sensitivity.

4. Outcome of Aquatic Assessment

The site visit confirmed that the Swartbakens River and many of its larger tributaries within the site were in a largely natural ecological condition and of high ecological importance and sensitivity due to the good riparian vegetation associated with these watercourses that provide important ecological corridors in the landscape for the movement of biota.

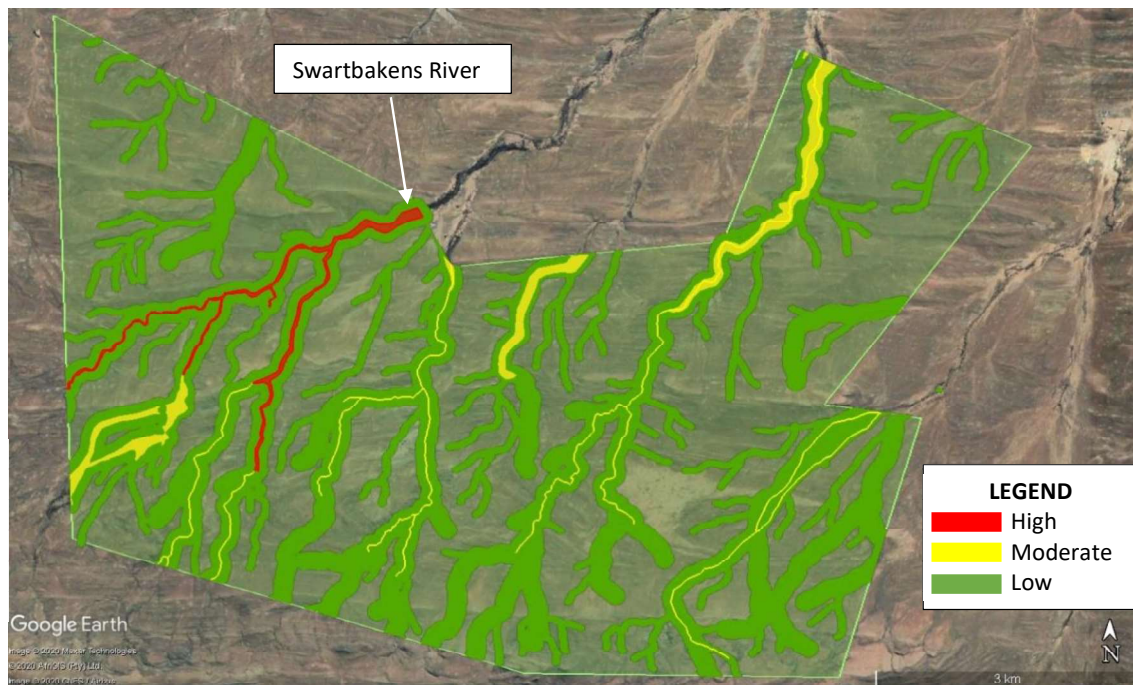


Figure 7. Google Earth image with the Aquatic Ecosystem Sensitivity mapping where the green area indicates low sensitivity, the yellow the moderate sensitivity and the red the high sensitivity areas

This assessment thus largely concurs with the **Very high/High** Aquatic Biodiversity Combined Sensitivity mapping of the screening tool for the Swartbakens River and its associated larger tributaries (Figure 7). The other larger watercourses within the site are deemed to be of **Moderate** sensitivity while the smaller watercourses, as well as the recommended buffer

areas (100m for the larger streams and 35m for the smaller watercourses), are considered as of **Low** Aquatic Biodiversity Combined Sensitivity.

5. Description of Potential Aquatic Ecosystem Impacts

Most of the potential aquatic ecosystem impacts of the proposed project are likely to take place during the construction phase.

The potential aquatic ecosystem impacts of all the proposed activities during construction include:

- Disturbance and possibly loss of aquatic habitats within the watercourses with the associated impact to sensitive aquatic biota;
- The removal of indigenous riparian and instream vegetation that has the potential to reduce the ecological integrity and functionality of the watercourses;
- Demand for water for construction could place stress on the existing available water resources;
- Road crossing structures if not adequately designed could impede flow in the watercourses;
- Alien vegetation infestation within the aquatic features due to disturbance; and
- Increased sedimentation and risks of contamination of surface water runoff during construction.

During the operational phase for all the proposed works, the potential impacts would include:

- Ongoing disturbance of aquatic features and associated vegetation along access roads or adjacent to the infrastructure that needs to be maintained;
- Modified runoff characteristics from hardened surfaces at the turbines and the substation as well as along the access roads that have the potential to result in erosion of hillslopes and watercourses; and
- Possible increase in water consumption and potential for water quality impacts (such as contamination from sewage generated onsite) as a result of the operation of the site.

During the decommissioning phase, the potential impacts would largely be associated with an increased disturbance of aquatic habitat due to the increased activity on the site. Increased sedimentation and risks of contamination of surface water runoff may also occur.

The cumulative impact of the project activities together with the existing activities in the area could have the potential to reduce the integrity of the watercourses if not properly mitigated and managed. By implementing suitable buffers (100m for the larger streams and 35m for the smaller watercourses is recommended) along the watercourses and minimising the works

within the river/stream corridors the impact of the proposed project activities would be low and unlikely to impact on the integrity of the aquatic ecosystems.

6. Consideration of propose project activities

Figure 8 shows the proposed project layout together with the aquatic ecosystem sensitivity mapping that includes the recommended buffer areas. References to project components below are indicated in Figure 8.

In terms of the proposed layout for Kwagga 1, it is recommended that:

1. Turbines: A few turbines would require a slight shift to move them outside of recommended buffers;
2. Laydown and office/compound area alternatives: The eastern-most laydown area (L&C1) would have the least potential aquatic ecosystem impact, followed by the next southern-most area (L&C3) that is located close to an existing disturbed area;
3. Substation alternatives: The south-eastern proposed sub-station (SS2) is largely outside of the recommended buffers. SS1, SS3 and SS4 have watercourse draining directly through the proposed sites while SS5 contains watercourses on the outer edge of the proposed area that could potentially be avoided; and
4. Road: The proposed upgraded access roads are largely associated with existing roads that would need to be widened and improved. Any widening should take place away from the watercourse to avoid impacting on the watercourse as far as possible. Crossings through the stream should preferably be perpendicular to the watercourse to minimise the length of road placed within the watercourse channel and riparian zone. Any crossing structures in the watercourses are recommended to be simple concrete slabs placed on the bed of the watercourses that will not impede flow in the watercourses.

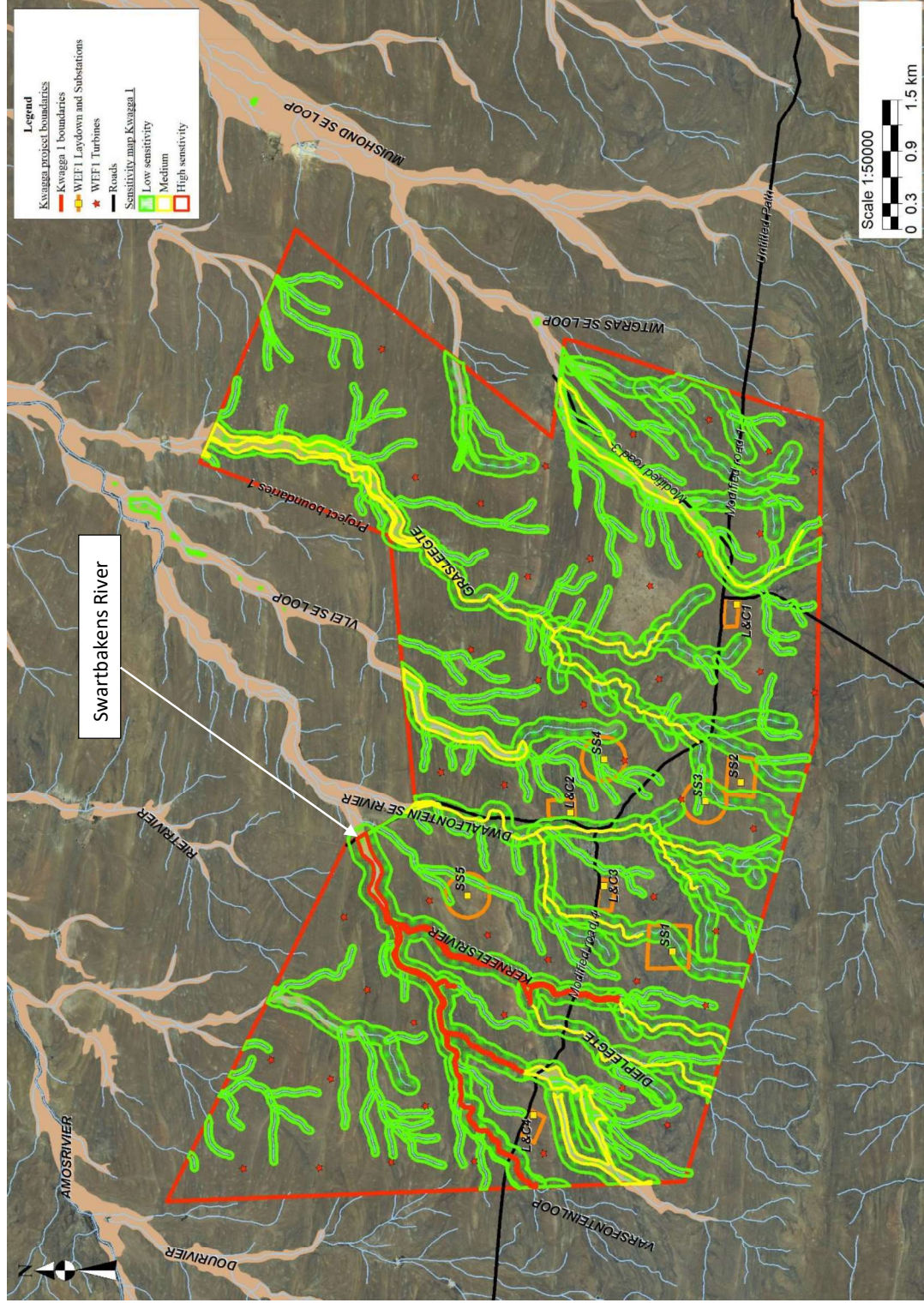


Figure 8. Orthophotograph with the aquatic sensitivity mapping shown together with the proposal layout

7. REFERENCES

- Department of Water Affairs and Forestry. (1998). *National Water Act*. Act 36. South Africa.
- Department of Water Affairs and Forestry. (1999b). *Resource Directed Measures for Protection of Water Resources. Volume 3: River Ecosystems Version 1.0*. Resource Directed Measures for Protection of Water Resources, Pretoria, South Africa.
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- Middleton, B.J., Midgley, D.C and Pitman, W.V., (1990). *Surface Water Resources of South Africa*. WRC Report No 298/1.2/94.
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- Van Ginkel, C. E., Glen, R. P., Gordon-Gray, K. D., Cilliers, C. J., Muasya, M. and P. P. van Deventer (2011) *Easy identification of some South African wetland plants*. WRC Report No TT 479/10
- WRC. (2011). *Atlas for Freshwater Ecosystem Priority Areas – Maps to support sustainable development of water resources* (WRC Report No. TT 500/11).

APPENDIX A: SPECIALIST DETAILS, EXPERTISE AND DECLARATION***Qualifications of Specialist Consultant***

Name: Antonia Belcher
Contact details: 53 Dummer St, Somerset West, 7130; Phone: 082 883 8055;
 Email: toni@bluescience.co.za
Profession: Aquatic Scientist (P. Sci. Nat. 400040/10)
Fields of Expertise: Specialist in freshwater assessments, monitoring and reporting
Years in Profession: 29+ years

Toni Belcher worked for the Department of Water Affairs and Forestry for more than 17 years. During this period she worked for the Directorate Water Quality Management, the Institute for Water Quality Studies and the Western Cape Regional Office and has built up a wide skills base on water resource management and water resource quality for rivers, estuaries and the coastal marine environment. Since leaving the Department in 2007, she has been working in her private capacity and was co-owner of BlueScience (Pty) Ltd, working in the field of water resource management and has been involved in more than 500 aquatic ecosystem assessments for environmental impact assessment and water use authorisation purposes. In 2006 she was awarded a Woman in Water award for Environmental Education and was a runner up for the Woman in Water prize for Water Research.

Professional Qualifications:

1984 Matriculation Lawson Brown High School
 1987 B.Sc. – Mathematics, Applied Mathematics University of Port Elizabeth
 1989 B.Sc. (Hons) – Oceanography University of Port Elizabeth
 1998 M.Sc. – Environmental Management (cum laude) Potchefstroom University

Key Skills: Areas of specialisation: Aquatic ecosystem assessments, Monitoring and evaluation of water resources, Water resource legislation and authorisations, River classification and Resource Quality Objectives, River Reserve determination and implementation, Water Quality Assessments, Biomonitoring, River and Wetland Rehabilitation Plans, Catchment management, River maintenance management, Water education.

Summary of Experience:

| | |
|----------------|--|
| 1987 – 1988 | Part-time field researcher, Department of Oceanography, University of Port Elizabeth |
| 1989 – 1990 | Mathematics tutor and administrator, Master Maths, Randburg and Braamfontein Colleges, Johannesburg |
| 1991 – 1995 | Water Pollution Control Officer, Water Quality Management, Department of Water Affairs, Pretoria |
| 1995 – 1999 | Hydrologist and Assistant Director, Institute for Water Quality Studies, Department of Water Affairs and Forestry, Pretoria |
| 1999 – 2007 | Assistant and Deputy Director, Water Resource Protection, Western Cape Regional Office, Department of Water Affairs, Cape Town |
| 2007 – 2012 | Self-employed – Aquatic Specialist |
| 2013 – 2020 | Senior Aquatic Specialist and part-owner, BlueScience |
| 2020 – present | Self-employed– Aquatic Specialist |

Declaration of Independence

I, Antonia Belcher, declare that –

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- all the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.



Signature of the Specialist

Toni Belcher Sole Proprietary

Name of Company:

20 November 2020

Date

APPENDIX B: PES, EI AND ES FOR THE MAJOR WATERCOURSES IN THE STUDY AREA (DWS, 2012)

| SELECT SQ REACH | SQR NAME | LENGTH km | STREAM ORDER | PES ASSESSED BY EXPERTS? (IF TRUE="Y") | REASONS NOT ASSESSED | PES CATEGORY DESCRIPTION | PES CATEGORY BASED ON MEDIAN OF METRICS |
|---|---------------|---|---------------------------------------|---|------------------------|--|---|
| L12A-07918 | Swartbakens | 21.96 | 1 | Y | | MODERATELY MODIFIED | C |
| MEAN EI CLASS | MEAN ES CLASS | DEFAULT ECOLOGICAL CATEGORY (EC) | RECOMMENDED ECOLOGICAL CATEGORY (REC) | | | | |
| MODERATE | MODERATE | C | #NUM! | | | | |
| PRESENT ECOLOGICAL STATE | | ECOLOGICAL IMPORTANCE | | | ECOLOGICAL SENSITIVITY | | |
| INSTREAM HABITAT CONTINUITY MOD | MODERATE | FISH SPP/SQ | | INVERT TAXA/SQ | 15.00 | FISH PHYS-CHEM SENS DESCRIPTION | |
| RIP/WETLAND ZONE CONTINUITY MOD | SMALL | FISH: AVERAGE CONFIDENCE | #DIV/0! | INVERT AVERAGE CONFIDENCE | 1.00 | FISH NO-FLOW SENSITIVITY DESCRIPTION | |
| POTENTIAL INSTREAM HABITAT MOD ACT. | MODERATE | FISH REPRESENTIVITY PER SECONDARY: CLASS | | INVERT REPRESENTIVITY PER SECONDARY, CLASS | MODERATE | INVERT PHYS-CHEM SENS DESCRIPTION | MODERATE |
| RIPARIAN-WETLAND ZONE MOD | SMALL | FISH REPRESENTIVITY PER SECONDARY: CLASS | | INVERT RARITY PER SECONDARY: CLASS | LOW | INVERTS VELOCITY SENSITIVITY | HIGH |
| POTENTIAL FLOW MOD ACT. | SERIOUS | FISH RARITY PER SECONDARY: CLASS | | ECOLOGICAL IMPORTANCE: RIPARIAN-WETLAND-INSTREAM VERTEBRATES (EX FISH) RATING | LOW | RIPARIAN-WETLAND-INSTREAM VERTEBRATES (EX FISH) INTOLERANCE WATER LEVEL/FLOW CHANGES DESCRIPTION | LOW |
| POTENTIAL PHYSICO-CHEMICAL MOD ACTIVITIES | SMALL | ECOLOGICAL IMPORTANCE: RIPARIAN-WETLAND-INSTREAM VERTEBRATES (EX FISH) RATING | LOW | HABITAT DIVERSITY CLASS | MODERATE | STREAM SIZE SENSITIVITY TO MODIFIED FLOW/WATER LEVEL CHANGES DESCRIPTION | HIGH |
| | | RIPARIAN-WETLAND NATURAL VEG RATING BASED ON % NATURAL VEG IN 500m (100%=5) | VERY HIGH | HABITAT SIZE (LENGTH) CLASS | MODERATE | RIPARIAN-WETLAND VEG INTOLERANCE TO WATER LEVEL CHANGES DESCRIPTION | LOW |
| | | RIPARIAN-WETLAND NATURAL VEG IMPORTANCE BASED ON EXPERT RATING | LOW | INSTREAM MIGRATION LINK CLASS | HIGH | | |
| | | | | RIPARIAN-WETLAND ZONE MIGRATION LINK | VERY HIGH | | |
| | | | | RIPARIAN-WETLAND ZONE HABITAT INTEGRITY CLASS | VERY HIGH | | |
| | | | | INSTREAM HABITAT INTEGRITY CLASS | HIGH | | |



environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

DETAILS OF THE SPECIALIST, DECLARATION OF INTEREST AND UNDERTAKING UNDER OATH

| | |
|--|-------------------------|
| File Reference Number: NEAS Reference Number: Date Received: | (For official use only) |
| | |
| | DEA/EIA/ |

Application for authorisation in terms of the National Environmental Management Act, Act No. 107 of 1998, as amended and the Environmental Impact Assessment (EIA) Regulations, 2014, as amended (the Regulations)

PROJECT TITLE

Scoping and Environmental Impact Assessment for the Proposed Development of the 279 MW Wind Energy Facility (i.e. Kwagga WEF 1), near Beaufort West, Western Cape

Kindly note the following:

1. This form must always be used for applications that must be subjected to Basic Assessment or Scoping & Environmental Impact Reporting where this Department is the Competent Authority.
2. This form is current as of 01 September 2018. It is the responsibility of the Applicant / Environmental Assessment Practitioner (EAP) to ascertain whether subsequent versions of the form have been published or produced by the Competent Authority. The latest available Departmental templates are available at <https://www.environment.gov.za/documents/forms>.
3. A copy of this form containing original signatures must be appended to all Draft and Final Reports submitted to the department for consideration.
4. All documentation delivered to the physical address contained in this form must be delivered during the official Departmental Officer Hours which is visible on the Departmental gate.
5. All EIA related documents (includes application forms, reports or any EIA related submissions) that are faxed; emailed; delivered to Security or placed in the Departmental Tender Box will not be accepted, only hardcopy submissions are accepted.

Departmental Details

Postal address:

Department of Environmental Affairs
Attention: Chief Director: Integrated Environmental Authorisations
Private Bag X447
Pretoria
0001

Physical address:

Department of Environmental Affairs
Attention: Chief Director: Integrated Environmental Authorisations
Environment House
473 Steve Biko Road
Arcadia

Queries must be directed to the Directorate: Coordination, Strategic Planning and Support at:
Email: EIAAdmin@environment.gov.za


1. SPECIALIST INFORMATION

| | | | | |
|--|--|-----------|---|------------------------------------|
| Specialist Company Name: | Toni Belcher Sole Proprietary | | | |
| B-BBEE | Contribution level (indicate 1 to 8 or non-compliant) | Level EME | 4 | Percentage Procurement recognition |
| Specialist name: | Toni Belcher | | | |
| Specialist Qualifications: | M.Sc | | | |
| Professional affiliation/registration: | SACNASP (400040/10 Ecological and Environmental Science) | | | |
| Physical address: | 53 Dummer Street, Somerset West | | | |
| Postal address: | 53 Dummer Street, Somerset West | | | |
| Postal code: | 7130 | Cell: | | +27 82 883 8055 |
| Telephone: | +27 82 883 8055 | Fax: | | - |
| E-mail: | toni@BlueScience.co.za | | | |

2. DECLARATION BY THE SPECIALIST

I, Antonia Belcher, declare that –

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- all the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.


Signature of the Specialist

Toni Belcher Sole Proprietary

Name of Company:

26 May 2021

Date

Details of Specialist, Declaration and Undertaking Under Oath

3. UNDERTAKING UNDER OATH/ AFFIRMATION

I, Antonia Belcher, swear under oath / affirm that all the information submitted or to be submitted for the purposes of this application is true and correct.



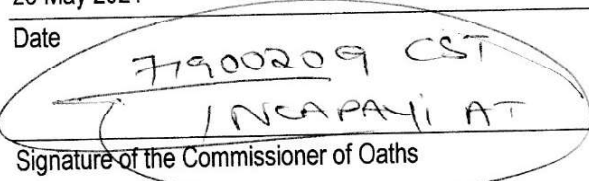
Signature of the Specialist

Toni Belcher Sole Proprietary

Name of Company

26 May 2021

Date



Signature of the Commissioner of Oaths

2021 - 05 - 26

Date



Scoping and Environmental Impact Assessment for the proposed development of the 279 MW Kwagga Wind Energy Facility 1 near Beaufort West, Western Cape



APPENDIX F.6

Terrestrial Biodiversity and Species

SITE SENSITIVITY VERIFICATION REPORT: SCOPING INPUTS

Kwagga Wind Energy Facility 1 (Pty) Ltd

TERRESTRIAL BIODIVERSITY AND SPECIES

| | |
|--|--|
| <i>Report prepared for:</i> CSIR – Environmental Management Services SMART PLACES: Sustainable Ecosystems P O Box 320 Stellenbosch, 7599 South Africa | <i>Report prepared by:</i> Ekotrust cc 7 St George Street Lionviham, Somerset West, 7130 South Africa |
|--|--|

V.2

19 January 2021

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REGULATIONS GOVERNING THIS REPORT

This report has been prepared in terms of the EIA Regulations under the National Environmental Management Act (Act No. 107 of 1998) (NEMA 2014, 2017, 2020).

Appointment of specialist

Ekotrust cc was commissioned by CSIR (EMS, SMART PLACES) Stellenbosch to provide an assessment on the terrestrial ecology and biodiversity of the Kwagga Wind Energy Facility 1 (WEF), located to the south of Beaufort West in the Western Cape.

Company profile:

Name of Company: Ekotrust cc
(Registration number: CK90/05465/23)
Sole Member: Dr Noel van Rooyen
Founding date: 1990

Ekotrust cc specialises in habitat evaluation, vegetation classification and mapping, floristic diversity assessments, rare species assessments, alien plant assessments and management, wildlife management, wildlife production and economic assessments, veld condition assessment, bush encroachment, fire management, carrying capacity, wildlife numbers and ratios.

Specialist declaration

We, Noel van Rooyen and Gretel van Rooyen, as the appointed independent specialists, hereby declare that we:

- act as independent specialists in this application;
- perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- regard the information contained in this report, as it relates to our specialist input/study, to be objective, true and correct within the framework of assumptions and limitations;
- do not have and will not have any business, financial, personal or other interest in the undertaking of the activity, other than remuneration for work performed in terms of the NEMA, the Environmental Impact Assessment Regulations 2014, and amendments 2017, NEMA 2020 Procedures for the assessment and minimum requirements for reporting on identified environmental themes in terms of Sections 24(5) (a) and (h) and 44 of the National Environmental Management Act, 1998, when applying for environmental authorisation, and any specific environmental management act;
- declare that there are no circumstances that may compromise our objectivity in performing such work;
- have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- will comply with the Act, Regulations and all other applicable legislation;
- have no, and will not engage in, conflicting interests in the undertaking of the activity;
- have no vested interest in the proposed activity proceeding;
- undertake to disclose to the applicant and the competent authority all material information in our possession that reasonably has or may have the potential of influencing any decision to be taken with respect to the

application by the competent authority; or the objectivity of any report, plan or document to be prepared by us for submission to the competent authority;

- all the particulars furnished by me in this form are true and correct; and
- realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

Indemnity and conditions relating to this report:

The observations, findings, recommendations and conclusions provided in the current report are based on the compilers' best scientific and professional knowledge and other available information. If new information should become available Ekotrust cc reserves the right to modify aspects of the report. This report (hard copy and/or electronic) must not be amended or extended without the prior written consent of the author. Furthermore, any recommendations, statements or conclusions drawn from or based on this report must make reference to the report. If these recommendations, statements or conclusions form part of a main report relating to the current investigation, this report must be included in its entirety (as an Appendix).

Although Ekotrust cc has exercised due care in preparing this report, it accepts no liability, and by receiving this document, the client indemnifies Ekotrust cc against all actions, claims, demands, losses, liabilities, costs, damages and expenses arising from or in connection with services rendered, and by the use of the information contained in this document.



Signature of specialists:



Name of specialists: Dr N van Rooyen

Prof. MW van Rooyen

Date: 19 January 2021

19 January 2021

GENERAL INFORMATION

Study site: Kwagga WEF 1: Farms or farm portions of Dwaalfontein West 377, Dwaalfontein 379 and Tyger Poort 376.

Client: ABO Wind Renewable Energies (Pty) Ltd: Kwagga Wind Energy Facility 1 (Pty) Ltd (Reg. no. 2020/258426/07)

Approximate size of property: 5185 ha

Environmental Assessment Practitioner (EAP):

CSIR: SMART PLACES
Environmental Management Services
PO Box 320
Stellenbosch 7599
Contact person: Lizande Kellerman
Tel. +27 (0) 21 888 2489
Mobile: 083 799 0949
e-mail: lkellerman@csir.co.za

Botanical assessment by:

This specialist assessment has been undertaken by Dr Noel van Rooyen and Prof Gretel van Rooyen of Ekotrust cc. The *curriculum vitae* of the specialists are included in Appendix D of this assessment.

Dr Noel van Rooyen Pr.Sci.Nat; Reg. no. 401430/83 - Botanical Sciences
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TERMS OF REFERENCE

The Scope of Work for the terrestrial biodiversity and ecology specialist study includes the following tasks:

- Compilation of a specialist study in adherence to:
 - o the gazette *Procedures for the assessment and minimum requirements for reporting on identified environmental themes in terms of Sections 24(5) (a) and (h) and 44 of the National Environmental Management Act, 1998, when applying for environmental authorisation* (GG 43110 / 320, 20 March 2020);
 - o any additional relevant legislation and guidelines that may be deemed necessary.
- The assessment should be based on existing information, national and provincial databases, SANBI mapping, professional experience and field work conducted.
- Undertake a site inspection to identify the site sensitivities, and verify them in terms of the National Web-Based Screening Tool (<https://screening.environment.gov.za/>).
- If needed, liaise with the South African National Biodiversity Institute (SANBI) to obtain information on sensitive species flagged in the National Web-Based Screening Tool (where species names are obscured / only numbered).
- Describe the terrestrial ecological features of the project area, with focus on features that are potentially impacted by the proposed project. The description should include the major habitat forms within the study site, giving due consideration to terrestrial ecology (flora and fauna), Species of Conservation Concern (SCC) or Protected Species.
- If applicable, specify development set-backs / buffers, and provide clear reasons for these recommendations.
- Map the sensitive ecological features within the proposed project area, showing any “no-go” areas (i.e. “very high” sensitivity).
- Provide input on the preferred infrastructure locations following the sensitivity analysis.
- Provide sensitive features spatial data in a useable GIS format (.kmz / .shp).
- Provide an assessment of direct, indirect and cumulative impacts associated with the proposed WEF, with and without mitigation.
- Address relevant concerns / comments raised by Interested and Affected Parties and Stakeholders, including the Competent Authority, during Public Participation Processes on the draft Basic Assessment Report (BAR).
- Identify relevant legislative requirements and permits that may be required.
- Recommend mitigation measures, best practice management actions, monitoring requirements, and rehabilitation guidelines for all identified impacts to be included in the Environmental Management Programme (EMPr).
- Update draft specialist study report after Environmental Assessment Practitioner (EAP) and client review (before public release) and after public review for submission to the Competent Authority for decision-making.
- Address any queries from the Competent Authority during the decision-making phase (as and when they arise).

LIMITATIONS, ASSUMPTIONS AND UNCERTAINTIES

The following assumptions, limitations or uncertainties are listed regarding the evaluation of the impacts of the proposed Kwagga Wind Energy Facility 1 (Pty) Ltd project on the terrestrial biodiversity and ecology:

- The site verification survey was conducted during very dry conditions at the end of October/beginning of November 2020, following four years of drought. Large-scale mortality of plants had occurred and conditions for vegetation surveys were appalling.
- Rare and threatened plant and animal species are generally uncommon and/or localised and the once-off survey may fail to locate such species.
- Furthermore, rare plant species usually occur in specialised and localised habitats and positive identifications of rare plant species are best done when the plants are in flower.
- No trapping (either camera trapping or by way of Sherman traps) was conducted for fauna, since these methods generally provide an underrepresentation of the full faunal diversity within the limited timeframe available.

1. INTRODUCTION

ABO Wind Renewable Energies (Pty) Ltd proposes to develop three Wind Energy Facilities (WEFs) and their associated infrastructure near Beaufort West in the Western Cape Province, on behalf of three separate project Applicants, namely:

- Kwagga 1 = Kwagga Wind Energy Facility 1 (Pty) Ltd (Reg. no. 2020/258426/07)
- Kwagga 2 = Kwagga Wind Energy Facility 2 (Pty) Ltd (Reg. no. 2020/429949/07)
- Kwagga 3 = Kwagga Wind Energy Facility 3 (Pty) Ltd (Reg. no. 2020/429978/07)

The WEFs will have a total installed capacity of: 279 MW (Kwagga 1); 341 MW (Kwagga 2); and 204.6 MW (Kwagga 3), respectively. Each WEF will consist of turbines, which have a hub height of up to 180 m and a rotor diameter of up to 200 m. Each turbine will have an output of approximately 6.2 MW. Each turbine will have a footprint of approximately 1 ha (which includes the crane pad). The temporary hardstand areas and construction period laydown areas will cover approximately 15 ha and six (6) ha, respectively. Kwagga 1 will comprise 45 turbines (34 turbines in the main/priority area and 11 turbines in the secondary area).

Scoping and Environmental Impact Assessment processes are required for the proposed development of Kwagga Wind Energy Facility 1 (WEF). As required in Part A of the Government Gazette 43110, GN 320, a site sensitivity verification must be undertaken in order to confirm the current land use and environmental sensitivity of the proposed project area.

This report presents the specialist assessment of the terrestrial biodiversity and ecology component of the Site Sensitivity Verification for the proposed Kwagga WEF 1 project.

2. APPROACH AND METHODOLOGY

2.1 Approach

The study commenced as a desktop study, followed by field-based surveys at the end of October and beginning of November 2020. The focus of the site visit was to undertake a site sensitivity verification in order to confirm the current land use and environmental sensitivity as identified in the screening tool. At the same time surveys (fauna and flora) of the Kwagga WEF 1 project were conducted to identify sensitive habitats, for the classification of the vegetation into habitats (or plant communities), compiling of species lists and to search for Species of Conservation Concern (SCC).

Hard copy and digital information from spatial databases, such as BGIS of the South African Biodiversity Institute (SANBI) for maps of Critical Biodiversity Areas, Protected Areas, Protected Area Expansion Strategy, Freshwater Ecosystem Priority Areas; the geological survey maps (3222 Beaufort West); land type maps (3222 Beaufort West); topocadastral maps (1:50 000 maps); vegetation types of Mucina & Rutherford (2006, 2018); NewPosa database of SANBI; and databases of the Animal Demography Unit, University of Cape Town, were sourced to provide information on the environment and biodiversity of the study area.

Satellite images (Google Earth) were used to stratify the area into relatively homogeneous terrain/vegetation units. The vegetation survey consisted of visiting the mapped units and systematically recording plant species on site, and estimating their cover. A total of 52 sites were surveyed on Kwagga 1. Physical habitat features were also noted. During the site visit, digital photographs were taken, and representative photographs of the different habitats are included in the report. The site was also surveyed for rare, threatened and/or endemic plant species during the site visit.

The animal survey was limited to day-time visual assessments on site. Animal species present on site were mainly attained by means of direct or indirect sighting methods (animals, spoor, burrows, scats, sounds), whilst traversing the site by vehicle or on foot. Red listed species are generally uncommon and/or localised and the survey may have been insufficient to record their presence at or near the proposed development.

2.2 Vegetation and flora

The plant species data were summarised in a phytosociological table and plant communities or habitats were identified, described and mapped. The checklist of plant species in Appendix B was compiled from own surveys and from the NewPosa database of the South African National Biodiversity Institute (newposa.sanbi.org). The IUCN status, conservation and protected status of all plant species provided in Appendix B were determined from available literature and Acts, e.g. NewPosa database (newposa.sanbi.org), and Red list database (redlist.sanbi.org) of the South African National Biodiversity Institute; NEM:BA (2007c) (ToPS list); WCNECO (1974, as amended 2000) and CITES (2019).

2.3 Fauna

Species lists (the term species is used here in a general sense to denote species, subspecies and varieties) of the faunal component were sourced from the Animal Demography Unit, University of Cape Town website (adu.uct.ac.za) and consulting of available databases and/or relevant literature, e.g. Skinner and Chimimba (2005),

Alexander and Marais (2007), Bates *et al.* (2014), Child *et al.* (2016), Leeming (2003) and Mecenero *et al.* (2013) to determine the diversity, conservation status and distribution of relevant faunal species.

2.4 Sensitivity assessment

Based on the environmental features and the species encountered in the on-site survey, a sensitivity assessment of each habitat was done (Chapter 5). Sensitive features are presented spatially in GIS format (provided as a separate .kmz file).

2.5 Sources of information

Vegetation:

- Vegetation types occurring in the area were obtained from Mucina & Rutherford (2006, 2018);
- Conservation status of the vegetation types was obtained from Mucina & Rutherford (2006), the National List of Threatened Ecosystems (NEMA 2011) and SANBI (2018a);
- Information on endemic species per national vegetation type was obtained from Mucina & Rutherford (2006);
- The Kwagga 1 site does not occur in any Centre of Endemism (Van Wyk & Smith 2001).
- A plant species checklist of the immediate region around the site was obtained from the NewPosa database of the South African National Biodiversity Institute (SANBI) (Appendix A) (website accessed November 2020).
- The IUCN Red List Category for the plant species was extracted from the Threatened Species Programme (Red List of South African plants; website accessed November 2020) as well as the NewPosa database of the South African National Biodiversity Institute (SANBI) (website accessed November 2020).
- WCNECO (1974 as amended in 2000) was consulted to establish provincially specially protected and protected status of plant species.
- The National Protected tree list (NFA 2019) was consulted.

Fauna

- Lists of mammals, reptiles, birds, frogs, scorpions, (Scorpiones), spiders (Arachnida), butterflies (Lepidoptera), lacewings (Neuroptera), dung beetles (Scarabinae) and dragonflies (Odonata) were extracted from the Animal Demography Unit, University of Cape Town website (<http://vmus.adu.org.za>; accessed November 2020) and supplemented by information gathered in Bates *et al.* (2014) for reptiles; Skinner and Chimimba (2005) for mammals; and Mecenero *et al.* (2013) for butterflies (Appendix B).
- The IUCN Red List Category for the animal species was extracted from Child *et al.* (2016), Bates *et al.* (2014) for reptiles; Skinner and Chimimba (2005) for mammals; and Mecenero *et al.* (2013) for butterflies. No IUCN Categories are however available for lacewings, dung beetles, spiders and scorpions.
- WCNECO (1974) was consulted to establish provincially specially protected and protected status of animal species.

Other

- The National Protected Areas Expansion Strategy (NPAES) was consulted for possible inclusion of the site into a protected area in future (biodiversityadvisor.sanbi.org; accessed November 2020).
- The Western Cape Biodiversity Area Maps were consulted for inclusion of the site into a Critical Biodiversity Area or Ecological Support Area (biodiversityadvisor.sanbi.org; accessed November 2020).

Regulatory framework



Figure 2: Google satellite image of the Kwagga 1 site.

3.2 Geology

The geology of the Kwagga 1 site is depicted in the geological map 3222 Beaufort West (Figure 3). The dominant geology consists of mudstone (red in places) with sandstone and thin greenish cherty beds (Pa) of the Abrahamskraal Formation, Beaufort Group. Some of the hills consist of very similar substrates and are described as mudstone (red in places) with siltstone and sandstone and thin greenish cherty beds near the base and thin pink tuff beds (Pt) (Teekloof Formation, Beaufort Group) (dark green shading in Figure 3). Alluvium occurs along the drainage lines.

3.3 Land Types

Land types denote areas that display a marked degree of uniformity with respect to terrain form, soil pattern and climate. A terrain unit within a land type is any part of the land surface with homogeneous form and slope. The Kwagga 1 site falls in the Fc164b unit (Figure 4). The Fc Land Type consists of Glenrosa and/or Mispah soil forms where lime is generally present in the entire landscape.

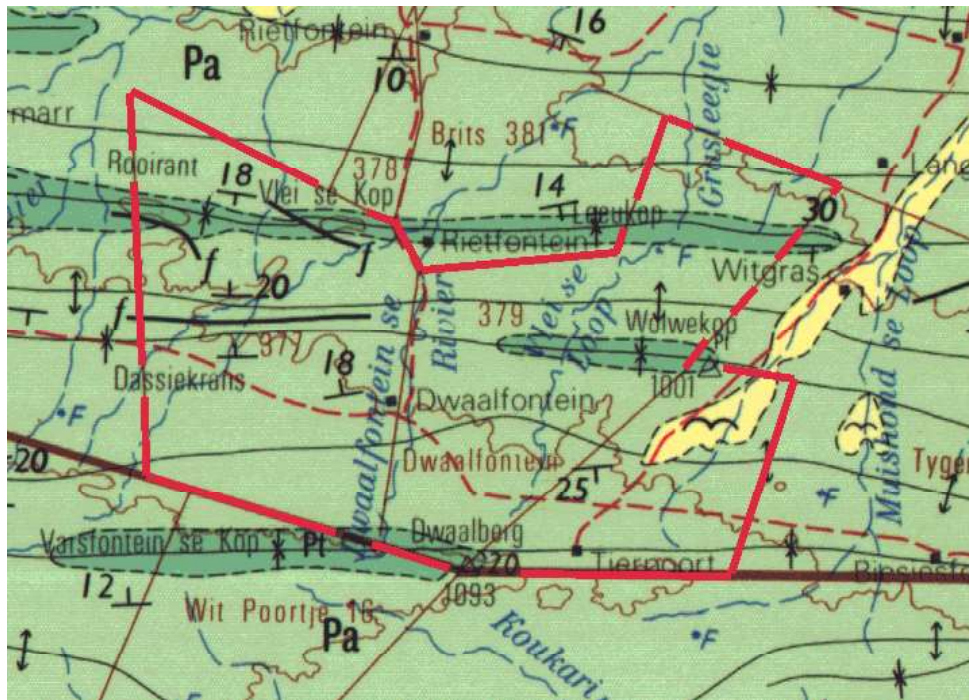


Figure 3: Geology of the Kwagga 1 site (Geological Survey 1979).

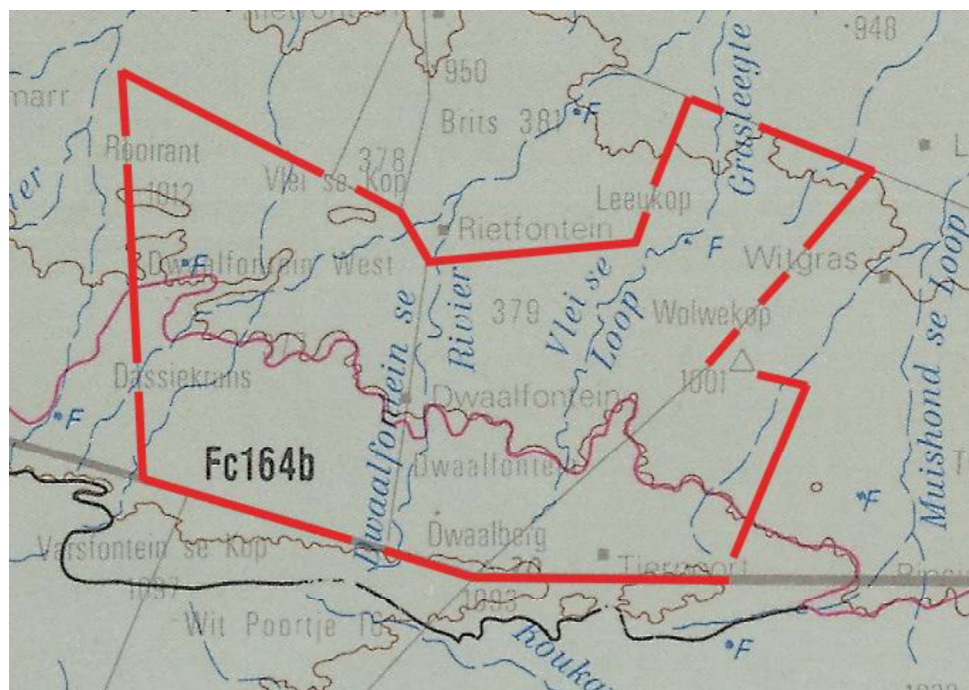


Figure 4: Land type of the Kwagga 1 site (Land Type Survey 1987).

3.4 National Environmental Management: Protected Areas Act (Act No. 10 of 2003) and National Protected Areas Expansion Strategy (NPAES)

The study site is not located in a protected area and does not form part of the NPAES (NPAES 2010).

3.5 Critical Biodiversity Areas (CBAs)

Critical Biodiversity Areas (CBAs) are areas required to meet biodiversity targets for ecosystems, species or ecological processes. CBAs are regarded as areas of high biodiversity and ecological value and need to be kept in a natural or near-natural state, with no further loss of habitat or species. The definitions for CBAs are (SANBI 2018):

- CBA 1: Areas that are irreplaceable for meeting biodiversity targets. There are no other options for conserving the ecosystems, species or ecological processes in these areas” (SANBI 2018).
- CBA 2: Areas that are the best option for meeting biodiversity targets, in the smallest area, while avoiding conflict with other land uses.

The CBA map in Figure 5, indicates the presence of a CBA along the main watercourse on Dwaalfontein West. The main reasons provided for the mapping of the CBAs (Figure 5) were: (1) very high terrestrial sensitivity indicated in the shale gas SEA (without an indication of what caused the high sensitivity); (2) very high dry river sensitivity indicated in the shale gas SEA; (3) water resource protection (FEPAs); and presence of the Cape mountain zebra.

Development within Critical Biodiversity Areas is not encouraged. According to the Western Cape Biodiversity Spatial Plan Handbook (Pool-Stanvliet *et al.* 2017) permissible land uses are those that are compatible with maintaining the natural vegetation cover of CBAs in a healthy ecological state, and that do not result in loss or degradation of natural habitat. Undesirable land uses in terrestrial CBAs are those that cause loss of natural habitat or ecosystem functionality, such as: (i) mining or prospecting; (ii) intensive agriculture (cultivation) or plantation forestry; (iii) residential, commercial or industrial developments; (iv) game-proof fences in CBA corridors; (v) linear infrastructure that disrupts the connectivity of CBA corridors; and (vi) extensive or intensive grazing that results in species diversity being lost through selective or over-grazing (Pool-Stanvliet *et al.* 2017).

An Ecological Support Areas (ESA) is not essential for meeting biodiversity targets, but plays an important role in supporting the ecological functioning in a CBA. ESAs need to be maintained in at least a functional and often natural state, but some limited habitat loss may be acceptable. It is important that the project should not compromise the functional (natural) state of the ESAs as required by the conservation plan of the Western Cape (Pool-Stanvliet *et al.* 2017). The ESAs in Figure 5 follow the smaller watercourses.

Other Natural Areas (ONAs) have not been identified as a priority, but retain most of their natural character and perform a range of biodiversity and ecological infrastructure functions. Land use guidelines for Terrestrial Other Natural Areas (ONAs) are not required to meet biodiversity targets. ONAs represent the largest area in the region and form a matrix within which the CBAs and ESAs occur (Figure 5).

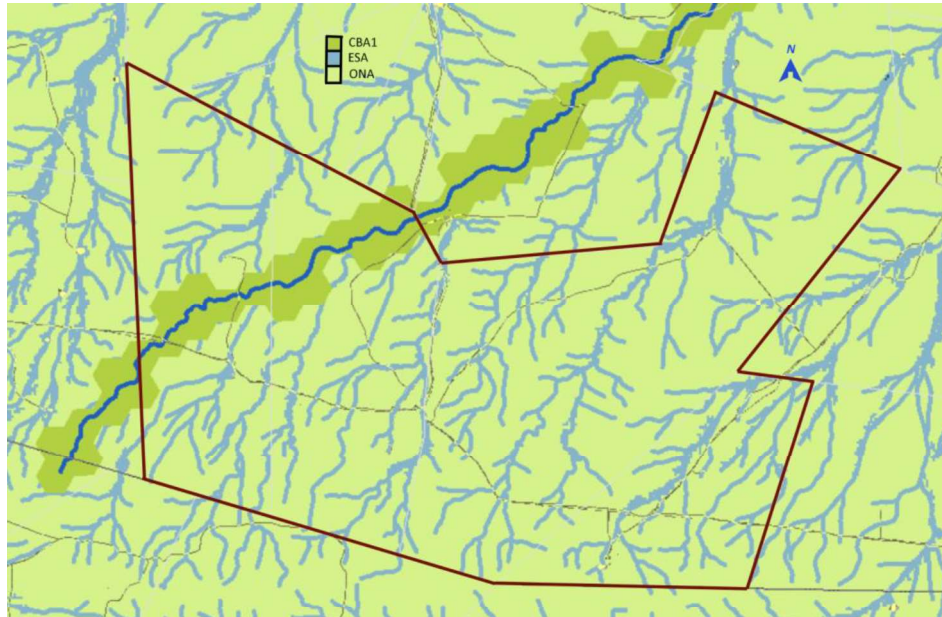


Figure 5: Critical Biodiversity Areas (CBAs), Ecological Support Areas (ESAs) and Other Natural Areas (ONAs) of the Kwagga 1 site and environs (biodiversityadvisor.sanbi.org).

3.6 Freshwater Ecosystem Priority Areas (FEPAs)

Almost the entire Kwagga 1 site is classified as a Freshwater Ecosystem Priority Area (FEPA). These are priority areas for conserving freshwater ecosystems and supporting sustainable use of water resources and upstream management areas (Driver *et al.* 2011) (Figure 6).

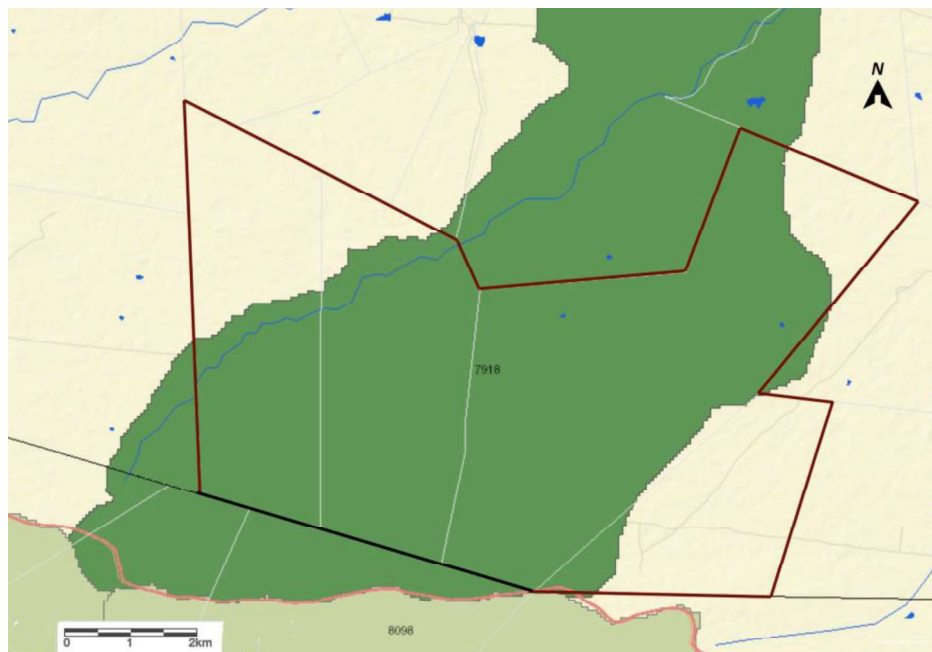


Figure 6: Freshwater priority areas (FEPA) in the Kwagga 1 site. Dark green indicates river and associated sub-quaternary catchment (or quinary catchment).

4. VEGETATION

4.1 Introduction

The site falls in the Nama-Karoo Biome and more specifically in the Lower Karoo Bioregion (NKI) between Beaufort West and Klaarstroom. The site does not fall within any Centre of Endemism according to Van Wyk and Smith (2001).

4.2 Broad-scale vegetation types

The site is located in the Gamka Karoo (NKI 1) vegetation type (Mucina & Rutherford 2006). The vegetation type covers 20 325 km² in South Africa and occurs between the Great Escarpment (Nuweveld Mountains) in the north and Cape Fold Belt Mountains (Swartberg Mountains) in the south. It occurs on irregular to slightly undulating plains covered with dwarf spiny shrubland, dominated by Karoo dwarf shrubs. Mudrock and sandstones of the Beaufort Group with some Ecca Group shales cover the area. The dominant shrub and dwarf shrub species are *Lycium* spp., *Rhigozum obovatum*, *Vachellia karroo*, *Searsia burchellii*, *Chrysocoma ciliata*, *Eriocephalus* spp., *Felicia muricata* and *Pentzia incana*. The most prominent grass species include *Aristida congesta*, *Aristida diffusa*, *Fingerhuthia africana*, *Stipagrostis ciliata*, *Stipagrostis obtusa* and *Eragrostis* spp.

The vegetation type is classified as "least threatened" with about 2% statutorily conserved in the Karoo National Park and some private nature reserves (Mucina & Rutherford 2006, NEMA 2011, SANBI 2018a). Only a small part has undergone transformation. Endemic plant species include *Chasmatophyllum stanleyi*, *Hereroa incurva*, *Hoodia dregei*, *Ruschia beaufortensis*, *Jamesbrittenia tenuifolia*, *Manulea karrooica* and *Piarranthus comptus*.

4.3 Description of habitats (plant communities)

The data of all vegetation surveys on Kwagga WEFs 1, 2 & 3 were combined to improve the identification of habitat types in the area. Overall, eight broad habitat types were distinguished within the combined area. Overall, the vegetation on the Kwagga 1 site is structurally fairly homogeneous with dwarf shrubs (Karoo bushes) being dominant. Nevertheless, based on species composition seven habitats (plant communities) were distinguished, described and mapped on Kwagga 1 (Figure 7).

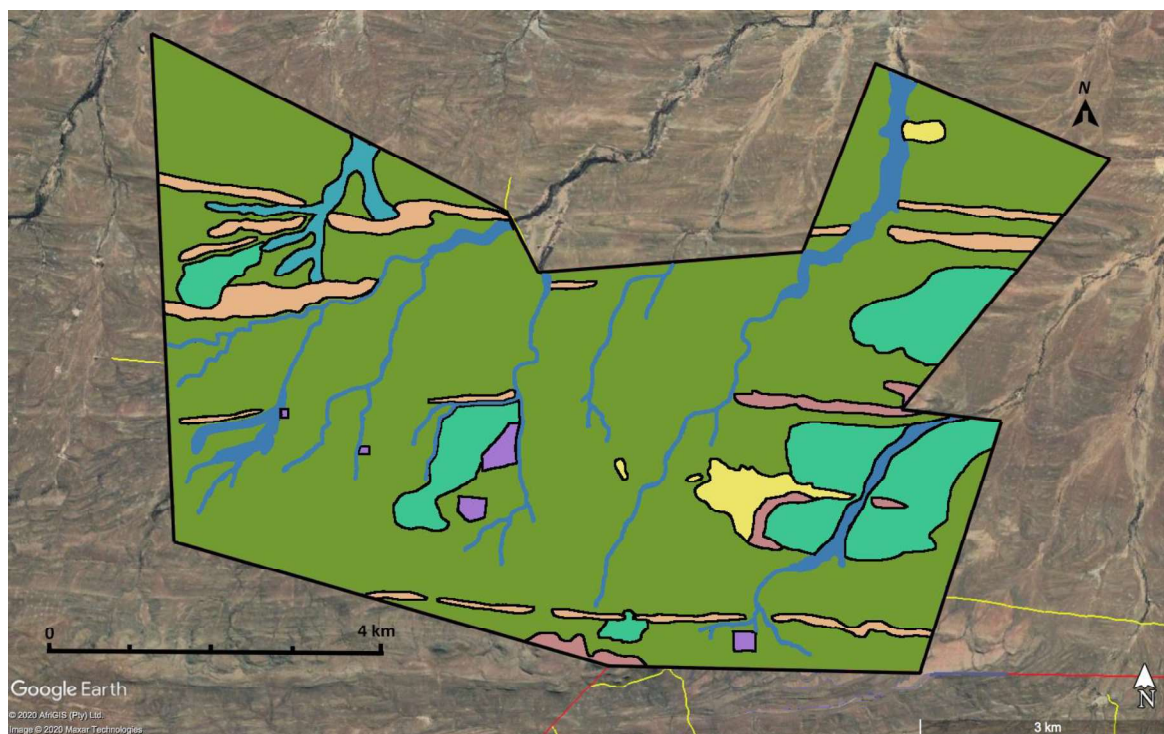


Figure 7: Vegetation map of the Kwagga 1 site.

Legend to Figure 7:

- | | | |
|---|----------------------|--|
| 1 | [Red square] | <i>Rhigozum obovatum</i> - <i>Trichodiadema decorum</i> dwarf shrubveld |
| 2 | [Orange square] | <i>Rhigozum obovatum</i> - <i>Sericocoma avolans</i> dwarf shrubveld |
| 3 | [Yellow square] | <i>Ruschia cradockensis</i> - <i>Crassula deltoidea</i> dwarf shrubveld |
| 4 | [Green square] | <i>Ruschia spinosa</i> - <i>Monsonia camdeboensis</i> dwarf shrubveld |
| 5 | [Light green square] | <i>Rhigozum obovatum</i> - <i>Pteronia viscosa</i> dwarf shrubveld |
| 6 | [Light blue square] | <i>Pentzia incana</i> - <i>Stipagrostis obtusa</i> dwarf shrubveld |
| 7 | [Dark blue square] | <i>Vachellia karroo</i> - <i>Lycium oxycarpum</i> bushveld of watercourses |
| | [Purple square] | Infrastructure |

Habitat 1. *Rhigozum obovatum* – *Trichodiadema decorum* dwarf shrubveld

This shrubveld covers small areas of Kwagga 1 and occurs on crests and scarps of hills, ridges and mountains in the eastern and southern parts of Kwagga 1 (Figures 7, 8 & 9). Surface rocks cover from 10% to >75% of the area, with a mean of 52%. Gravel covers from 10–30% of the soil surface with a mean of 16% cover. The shallow, well-drained yellow-brown, red-brown to brown, sandy loam soils are derived from mudrock.

The diagnostic species of this habitat (community) include *Bulbine triebneri*, *Trichodiadema decorum*, *Melica decumbens*, *Felicia muricata*, *Helichrysum zeyheri*, *Pelargonium laxum* and *Adromischus* cf. *triflorus* (species group 1, Appendix A).



Figure 8: The *Rhigozum obovatum* – *Trichodiadema decorum* dwarf shrubveld on crests and scarps of hills.



Figure 9: The *Rhigozum obovatum* – *Trichodiadema decorum* dwarf shrubveld on crests and scarps of mountains.

- Small trees (>3–6 m) have a mean canopy cover of less than 1% and are characterised by *Searsia pallens* and *Diospyros lycioides*.
- Shrubs cover on average 3% of the area and the most prominent species are *Rhigozum obovatum*, *Grewia robusta* and *Gymnosporia szyszyłowiczii*.
- Dwarf shrubs cover 11% of the habitat and include *Lycium cinereum*, *Pentzia incana*, *Hermannia linearifolia*, *Nenax microphylla*, *Gorteria alienata*, *Gnidia deserticola*, *Pentzia quinquefida*, *Lacomucinaea lineata*, *Pteronia glauca*, *Pteronia adenocarpa*, *Anacampseros albidiflora* and *Ruschia spinosa*.
- The grass layer is poorly developed and covers approximately 5% of the area. The dominant grass species include *Aristida adscensionis*, *Aristida congesta*, *Aristida diffusa*, *Digitaria argyrograpta* and *Tragus koelerioides*.
- Succulent species that are prominent in this habitat include *Euphorbia stellispina*, *Adromischus triflorus*, *Trichodiadema pomeridianum* and *Drosanthemum* spp.
- Herbaceous species have a mean canopy cover of less than 2%. The most common species include

Dianthus micropetalus, *Manulea* sp., *Gazania heterochaeta*, *Cuspidia cernua* and *Curio radicans*.

Rare and/or protected species in habitat 1:

SA Red data list: None

NEM:BA (ToPS): None

NFA: None

WCNCA: 18 species of the Aizoaceae including *Conophytum truncatum*; *Anacampseros albidiflora*, *A. telephiastrum*, *A. ustulata*, *Hoodia pilifera*

CITES: *Anacampseros albidiflora*, *A. telephiastrum*, *A. ustulata*, *Hoodia pilifera*, *Euphorbia stellispina*, *E. mauritanica*, *E. suffulta*

Endemic species: None

Habitat 2. *Rhigozum obovatum* – *Sericocoma avolans* dwarf shrubveld

This shrubveld occurs on the crest of hills and ridges in the north-western, north-eastern and southern parts of the site (Figures 7 & 10). Surface rocks cover from 10% to >75% of the area, with a mean of 52%. Gravel covers from 10–30% of the soil surface with a mean of 25%. The shallow, well-drained orange-brown, yellow-brown to red-brown, sandy loam soils are derived from mudrock.



Figure 10: The *Rhigozum obovatum* – *Sericocoma avolans* dwarf shrubveld on ridges and rocky outcrops.

There are no diagnostic species in this habitat, but the following species are common to habitats 1 & 2 (species group 2, Appendix A): *Eriocephalus brevifolius*, *Sericocoma avolans*, *Helichrysum pumilio*, *Hermannia linearifolia*, *Dianthus micropetalus*, *Osteospermum scariosum* and *Anacampseros albidiflora*.

- Small trees (>3–6 m) have a mean canopy cover of less than 1% and are represented by *Diospyros lycioides* and *Searsia pallens*.
- Shrubs cover on average 1% of the area and are characterised by *Rhigozum obovatum*, *Grewia robusta*, *Searsia burchellii* and *Gymnosporia szyszylowiczii*.
- Dwarf shrubs cover 13% of the habitat and include *Ruschia spinosa* (d), *Eriocephalus ericoides* (d), *Chrysocoma ciliata* (d), *Lycium cinereum*, *Asparagus aethiopicus*, *Pteronia empetrifolia*, *Pteronia adenocarpa*, *Eriocephalus brevifolius*, *Helichrysum pumilio*, *Hermannia linearifolia*, *Monsonia camdeboensis*, *Amphiglossa* sp., *Lacomucinaea lineata*, *Pteronia glauca* and *Nenax microphylla*.

- Prominent succulent species in this habitat include *Euphorbia stellispina*, *Euphorbia suffulta*, *Antimima* sp., *Mesembryanthemum (Phyllobolus)* sp., *Mesembryanthemum (Psilocalon)* sp., *Trichodiadema pomeridianum*, *Anacampseros albidiflora* and *Drosanthemum lique*.
- The grass layer is poorly developed and covers on average 4% of the area. The dominant grass species include *Aristida adscensionis*, *Aristida diffusa*, *Enneapogon desvauxii*, *Oropetium capense* and *Tragus koelerioides*.
- Herbaceous species have a mean canopy cover of less than 2%. The most common species include *Galenia sarcophylla*, *Sericocoma avolans*, *Dianthus micropetalus*, *Gazania heterochaeta* and *Curio radicans*.

Rare and/or protected species in habitat 2:

SA Red data list: None

NEM:BA (ToPS): None

NFA: None

WCNCA: 20 species of the Aizoaceae including *Conophytum truncatum*; *Pachypodium succulentum*, *Haworthiopsis nigra*, *Fockea comaru*, *Hoodia pilifera*, *Anacampseros albidiflora*, *A. telephiastrum*, *A. ustulata*, *Moraea* sp.

CITES: *Anacampseros albidiflora*, *A. telephiastrum*, *A. ustulata*, *Euphorbia stellispina*, *E. mauritanica*, *E. suffulta*, *Hoodia pilifera*,

Endemic species: None

Habitat 3. *Ruschia cradockensis* – *Crassula deltoidea* dwarf shrubveld

This dwarf shrubveld occurs on the rocky plains and low hills in the eastern parts of the site (Figures 7 & 11). Surface rocks cover from <10% to >75% of the site, with a mean of 37%. Quartzitic gravel covers from <10 to >50% of the soil surface with a mean of 23%. The shallow, well-drained orange-brown to yellow-brown, sandy loam soils are derived from mudrock.

The diagnostic species of this community include *Crassula deltoidea*, *Hereroa* sp. 1, *Anacampseros papyracea* and a *Justicia* sp. (species group 3, Appendix A).

- Small trees (>3–6 m) have a mean canopy cover less than 1% and are characterised by *Diospyros lycioides*.
- Shrubs cover on average 1% of the area and are represented by *Rhigozum obovatum* and *Grewia robusta*.
- Dwarf shrubs cover 13% of the habitat and include *Ruschia cradockensis* (d), *Eriocephalus ericoides* (d), *Ruschia spinosa* (d), *Nenax microphylla*, *Lycium cinereum*, *Pteronia empetrifolia*, *Felicia filifolia*, *Monsonia camdeboensis*, *Salsola* spp., *Lacomucinaea lineata*, *Asparagus aethiopicus*, *Gnidia deserticola*, *Pteronia glauca* and *Chrysocoma ciliata*,
- Prominent succulent species include *Anacampseros papyracea*, *Anacampseros ustulata*, *Euphorbia stellispina*, *Crassula deltoidea*, *Trichodiadema pomeridianum*, *Drosanthemum lique* and *Mesembryanthemum (Psilocalon)* sp.
- The grass layer is poorly developed with a mean cover of 6% of the area. The dominant grass species include *Aristida adscensionis*, *Aristida congesta*, *Aristida diffusa*, *Tragus koelerioides*, *Oropetium capense* and *Enneapogon desvauxii*.
- Herbaceous species cover less than 2%. The most common species include *Gazania heterochaeta* and *Curio radicans*.



Figure 11: The *Ruschia cradockensis* – *Crassula deltoidea* dwarf shrubveld on quartzitic rocky plains.

Rare and/or protected species in habitat 3:

SA Red data list: None

NEM:BA (ToPS): None

NFA: None

WCNCA: 18 species of the Aizoaceae including *Conophytum truncatum*, *Anacampseros albidiflora*, *A. ustulata*, *A. papyracea*

CITES: *Anacampseros albidiflora*, *A. ustulata*, *A. papyracea*, *Euphorbia stellispina*, *E. suffulta*

Endemic species: None

Habitat 4. *Ruschia spinosa* – *Monsonia camdeboensis* dwarf shrubveld

This shrubveld covers the rocky plains of most of Kwagga 1 (Figures 7, 12 & 13). Surface rocks cover from <10% to 30% of the site, with a mean of 14%. Reddish gravel cover ranges from <10 to >50% of the soil surface with a mean of 16%. The shallow, well-drained pink-brown, yellow-brown to red-brown, sandy loam soils are derived from mudrock.

The absence of species of species groups 1–5 characterise this habitat. There are no diagnostic species, but the following species are common to habitats 1–4 (species group 6, Appendix A): *Pteronia glauca*, *Tetragonia* spp., *Galenia fruticosa*, *Euphorbia suffulta*, *Pteronia paniculata*, *Antimima* sp. and *Felicia filifolia*.



Figure 12: The *Ruschia spinosa* – *Monsonia camdeboensis* dwarf shrubveld on rocky plains with reddish rocks and gravel in places.



Figure 13: The *Ruschia spinosa* – *Monsonia camdeboensis* dwarf shrubveld on rocky plains with reddish rocks and gravel in places.

- Small trees (>3–6 m) have a mean canopy cover of less than 1% and are represented by *Diospyros lycioides*.
- Shrubs cover on average 1% of the area and are characterised by *Rhigozum obovatum*, *Searsia burchellii*, *Gymnosporia szyszlowiczii* and *Grewia robusta*.
- Dwarf shrubs cover 14% of the habitat and include *Ruschia spinosa* (d), *Lycium cinereum*, *Ruschia cradockensis*, *Eriocephalus ericoides*, *Chrysocoma ciliata*, *Pteronia glauca*, *Monsonia camdeboensis*, *Asparagus aethiopicus*, *Lacomucinaea lineata*, *Galenia fruticosa*, *Pteronia paniculata*, *Pteronia adenocarpa*, *Pentzia incana*, *Hermannia grandiflora*, *Osteospermum sinuatum* and *Felicia filifolia*.
- Succulent species that are prominent in this habitat include *Euphorbia stellispina*, *Mesembryanthemum (Psilocalon) sp.*, *Mesembryanthemum guerichianum*, *Drosanthemum lique*, *Euphorbia suffulta*, *Antimima sp.*, *Kleinia longiflora* and *Trichodiadema pomeridianum*.

- The grass layer is poorly developed and covers on average 7% of the area. The dominant grass species include *Aristida adscensionis*, *Aristida congesta*, *Aristida diffusa*, *Enneapogon desvauxii* and *Oropetium capense*.
- Herbaceous species have a mean canopy cover of less than 1%. The most common species include *Curio radicans* and *Galenia sarcophylla*.

Rare and/or protected species in habitat 4:

SA Red data list: None

NEM:BA (ToPS): None

NFA: None

WCNCA: 14 species of the Aizoaceae; *Anacampseros albidiflora*, *Hoodia pilifera*, *Moraea* sp.

CITES: *Euphorbia stellispina*, *E. decepta*, *E. mauritanica*, *E. suffulta*, *Gonialoe variegata*, *Anacampseros albidiflora*, *Hoodia pilifera*

Endemic species: None

Habitat 5. *Rhigozum obovatum* – *Pteronia viscosa* dwarf shrubveld

This shrubveld occurs locally on somewhat deeper soils on the plains all over the site (Figures 7 & 14). Surface rock and gravel generally cover <10% of the soil surface. The grey-brown, orange-brown to red-brown, sandy loam soils are derived from mudrock.



Figure 14: The *Rhigozum obovatum* – *Pteronia viscosa* dwarf shrubveld on the sandy loam plains.

The absence of species of species groups 1–6 characterise this habitat. There are no diagnostic species in this habitat, but the following species are common to habitats 1–6 (species groups 7 & 9 Appendix A): *Searsia pallens*, *Rhigozum obovatum*, *Pteronia viscosa* and *Pteronia adenocarpa*.

- Small trees (>3–6 m) have a mean canopy cover of 1% and are characterised by *Vachellia karroo* and *Diospyros lycioides*.
- Shrubs cover approximately 4% of the area and are represented by *Rhigozum obovatum* (d), *Searsia burchellii*, *Gymnosporia szyszyłowiczii*, *Grewia robusta*, *Lycium oxycarpum* and *Cadaba aphylla*.
- Dwarf shrubs cover 13% of the habitat and include *Ruschia spinosa* (d), *Lycium cinereum* (d), *Eriocephalus ericoides* (d), *Tetraena chrysopteron*, *Pentzia incana*, *Asparagus aethiopicus*, *Lacomucinaea lineata*,

Chrysocoma ciliata and *Pteronia adenocarpa*.

- Prominent succulent species include *Euphorbia stellispina*, *Trichodiadema pomeridianum*, *Drosanthemum lique* and *Drosanthemum hispidum*.
- The grass layer is poorly developed and covers on average 9% of the area. The dominant grass species include *Aristida adscensionis*, *Aristida congesta*, *Aristida diffusa*, *Enneapogon desvauxii*, *Stipagrostis obtusa*, *Tragus berteronianus* and *Oropetium capense*.
- Herbaceous species have a mean canopy cover of less than 1%. The most common species include *Sesamum capense*, *Kewa salsoloides* and *Galenia sarcophylla*.

Rare and/or protected species in habitat 5:

SA Red data list: None

NEM:BA (ToPS): None

NFA: None

WCNCA: 13 species of the Aizoaceae, *Anacampseros albidiflora*, *Hoodia pilifera*

CITES: *Anacampseros albidiflora*, *Hoodia pilifera*, *Euphorbia stellispina*, *E. mauritanica*, *E. suffulta*

Endemic species: None

Habitat 6. *Pentzia incana* – *Stipagrostis obtusa* dwarf shrubveld

This dwarf shrubveld occurs on the sandy plains in a broad valley in the north-western part of the site (Figures 7 & 15). Surface rocks and gravel are mostly absent with a mean surface cover of less than 2% for rocks and gravel respectively. The intermediate to deep, grey-brown, orange-brown to red-brown, sandy to sandy loam soils are derived from mudrock.



Figure 15: The *Pentzia incana* – *Stipagrostis obtusa* dwarf shrubveld on plains with deep sandy to sandy loam soils.

The absence of species of species groups 1–7 characterise this habitat. There are no diagnostic species in this habitat, although species groups 8 & 11 are shared with habitat 7. The following species are shared with habitats 1–6 (species group 8, Appendix A): *Eriocephalus ericoides*, *Drosanthemum lique*, *Ruschia cradockensis*, *Pteronia sordida* and the grasses *Aristida congesta*, *Eragrostis obtusa* and *Enneapogon desvauxii*.

- Small trees (>3–6 m) have a mean canopy cover less than 1% and are characterised by *Diospyros lycioides*.

- Shrubs cover on average 1% of the area and are represented by *Lycium oxycarpum*, *Cadaba aphylla*, *Searsia burchellii* and *Gymnosporia szyszyłowiczii*.
- Dwarf shrubs cover 12% of the habitat and include *Pentzia incana* (d), *Lycium cinereum* (d), *Eriocephalus ericoides*, *Ruschia* spp., *Tetraena chrysopteron*, *Osteospermum sinuatum* and *Asparagus aethiopicus*.
- Prominent succulent species include *Mesembryanthemum guerichianum*, *Drosanthemum lique*, *Drosanthemum hispidum* and *Mesembryanthemum (Psilocaulon) sp.*
- The grass layer covers on average 21% of the area. The dominant grass species include *Aristida adscensionis*, *Aristida congesta*, *Stipagrostis obtusa*, *Tragus berteronianus*, *Enneapogon desvauxii* and *Sporobolus fimbriatus*.
- Herbaceous species have a mean canopy cover of less than 1%. The most common species include *Sesamum capense*, *Kewa salsoloides* and *Galenia sarcophylla*.

Rare and/or protected species in habitat 6:

SA Red data list: None
 NEM:BA (ToPS): None
 NFA: None
 WCNCA: 14 species of the Aizoaceae
 CITES: None
 Endemic species: None

Habitat 7. *Vachellia karroo* – *Lycium oxycarpum* bushveld of watercourses

This habitat is associated with the watercourses on site (Figures 7, 16 & 17). The shallow to deep grey to grey-brown sandy soils are alluvial in origin.

The diagnostic species of this community include *Setaria verticillata*, *Cenchrus ciliaris*, *Melianthus comosus*, *Searsia lancea*, *Stipagrostis namaquensis* and *Chloris virgata* (species group 10, Appendix A).



Figure 16: The *Vachellia karroo* – *Lycium oxycarpum* bushveld of ephemeral watercourses in the upper catchments.



Figure 17: The *Vachellia karroo* – *Lycium oxycarpum* bushveld of ephemeral watercourses in the lower catchments.

- Tall trees (>6 m) cover on average 2% of the area and the prominent species include *Vachellia karroo* and *Searsia lancea*.
- Small trees (>3–6 m) have a mean canopy cover of 12% and are characterised by *Diospyros lycioides* and *Searsia pallens*.
- Shrubs cover on average 23% of the area and are characterised by *Lycium oxycarpum*, *Searsia burchellii*, *Gymnosporia szyszyłowiczii*, *Carissa haematocarpa* and *Grewia robusta*.
- Dwarf shrubs cover 10% of the habitat and include *Lycium cinereum*, *Melianthus comosa*, *Oedera humilis*, *Tetraena lichtensteiniana*, *Salsola* spp. and *Pentzia incana*.
- Succulent species in this habitat include *Mesembryanthemum guerichianum*, *Mesembryanthemum noctiflorum*, *Malephora* sp., *Aptenia* sp., and *Mesembryanthemum (Psilocaulon)* sp.
- The grass layer is poorly developed and covers on average 9% of the area. The dominant grass species include *Setaria verticillata*, *Cenchrus ciliaris*, *Stipagrostis namaquensis*, *Stipagrostis ciliata*, *Chloris virgata* and *Cynodon incompletus*.
- Herbaceous species have a mean canopy cover of less than 2%. The most common species include *Leysera tenella*, *Galenia papulosa*, *Aptosimum indivisum*, *Arctotis leiocarpa* and *Kewa salsoloides*.

Rare and/or protected species in habitat 7:

SA Red data list: None
 NEM:BA (ToPS): None
 NFA: None
 WCNA: 14 species of the Aizoaceae, *Moraena* sp.
 CITES: None
 Endemic species: None

5. ECOLOGICAL SENSITIVITY ANALYSIS: VEGETATION

5.1 Introduction

Sensitivity is the vulnerability of a habitat to an impact, for example a wetland or ridge system would be more vulnerable to development than would a sandy plain. Several features of a site can be assessed to derive a sensitivity score, such as:

1. Threatened status of the regional vegetation type wherein the proposed site is situated:
 - the vegetation type is classified as Least Threatened.
2. Percentage of red listed plant species per habitat or site:
 - no red listed plant species were encountered during the site surveys.
3. Number of protected tree species per habitat or site:
 - no protected tree species occur in the region.
4. Percentage of provincially protected plant species per habitat:
 - The number of provincially protected species encountered was ranked from low to high.
5. Presence of endemic plant species per habitat or site (endemic to vegetation type):
 - no endemic plant species were encountered during the surveys.
6. Conservation value of association (habitat) or site:
 - overall the watercourses, rocky ridges and mountainous habitats (with scarps/cliffs) were considered as having a high conservation value.
7. Species richness per habitat or per sample plot (number of plant species):
 - species richness per habitat was ranked from low to high.
8. Degree of connectivity and/or fragmentation of the habitat, i.e. high connectivity and low fragmentation infers a low rating:
 - the only naturally fragmented habitats were the rocky ridges (habitat 1 & 2), which could occur within almost any of the broader habitat types.
9. Soil erosion potential:
 - in general the banks and floodplains along watercourses, as well as the mountainous areas and slopes are more prone to soil erosion.
10. Resilience (this is a measure of the ability of a particular habitat to recover after an impact, i.e. high resilience infers low rating).

5.2 Sensitivity model

During the field survey, 52 sites were surveyed at Kwagga 1 out of a total of 125 sample sites for Kwagga 1, 2 & 3. All identifiable plant species were noted and specific attention was given to protected species or species of conservation concern (SCC).

The following **sensitivity model** (Table 1) was applied to the data for each habitat on site. This was achieved by weighting each criterion and calculating the sum for the habitat, which reflects the sensitivity and sensitivity ranking. A brief description of the sensitivity rating of the parameters is provided below:

1. **Threatened status of the ecosystem** (depends on the percentage area intact, or degree of transformation) (Driver *et al.* 2005, Mucina & Rutherford 2006, NEM:BA 2011). The ecosystems are classified into the following categories:
 - Low sensitivity: If “Least Threatened”, the vegetation type has most of its habitat intact, i.e. more than 80%; or the vegetation type is adequately statutory or formally conserved in parks and reserves.
 - Moderate sensitivity: If “Vulnerable”, the vegetation type has from 60% to 80% of the ecosystem intact; less than 40% has been transformed which could result in some ecosystem functioning being altered, and/or the ecosystem is statutory poorly conserved. For example, the vegetation type is rich in plant species but is not a pristine example of a vegetation type, therefore some transformation or disturbance occurred, such as human structures and degraded veld due to overgrazing and/or bush encroachment.
 - High sensitivity: If “Endangered”, the vegetation type has from 40% to 60% of the ecosystem intact; or 40% to 60% transformed due to disturbance, cultivation or alien species; or the ecosystem is statutory poorly conserved e.g. less than about 3% conserved.
 - Very high sensitivity: If “Critically Endangered”, the vegetation type has only 16% to 36% of the ecosystem intact. The richer the ecosystem is in terms of species, the higher the percentage threshold.

Category rating:

| | | |
|-----------|------|-----|
| Low | (LT) | = 1 |
| Moderate | (VU) | = 2 |
| High | (EN) | = 3 |
| Very high | (CE) | = 4 |

2. **Percentage of red list plant species** (listed as threatened following IUCN threatened status): The rating is determined by the presence of redlisted flora in a habitat (calculated as percentage of the total number of species per habitat).

Category rating:

| | | |
|----------|-----------|-----|
| None | (0%) | = 0 |
| Low | (>0 – 2%) | = 1 |
| Moderate | (>2 – 5%) | = 2 |
| High | (>5%) | = 3 |

3. **Presence of protected tree species** (NFA 2019): The presence protected tree species in a habitat is rated as follows:

Category rating:

| | | |
|----------|-----------------|-----|
| None | (0 species) | = 0 |
| Low | (1 - 2 species) | = 1 |
| Moderate | (3 – 4 species) | = 2 |
| High | (>4 species) | = 3 |

4. **Percentage of Western Cape protected plant species:** Western Cape Nature and Environmental Conservation Ordinance, 1974 (No. 19 of 1974, as amended in 2000) (WCNECO, 1974) as well as CITES listed plant species (CITES 2019). The rating depends on the percentage of protected species in relation to the total plant species per habitat.

Category rating:

| | | |
|----------|-------------|-----|
| None | (0%) | = 0 |
| Low | (>0 - 10%) | = 1 |
| Moderate | (>10 – 20%) | = 2 |
| High | (>20%) | = 3 |

5. **Percentage of plant species endemic to the particular vegetation type of Mucina & Rutherford** (2006): Refers to the number of species expressed as a percentage of the total number of species per habitat.

Category rating:

| | | |
|----------|-----------|-----|
| None | (0%) | = 0 |
| Low | (>0 - 2%) | = 1 |
| Moderate | (2–5%) | = 2 |
| High | (>5%) | = 3 |

6. **Species richness per habitat:** Expressed as mean number of species per plot in a habitat.

Category rating:

| | | |
|----------|-----------|-----|
| Low | (<15) | = 1 |
| Moderate | (15 – 30) | = 2 |
| High | (>30) | = 3 |

7. **Conservation value of the habitat:** The assessment is made for the habitat in the broader region.

Category rating:

| | |
|----------|-----|
| Low | = 1 |
| Moderate | = 2 |
| High | = 3 |

8. **Degree of connectivity and/or fragmentation of the ecosystem:** The degree of connectivity with surrounding or adjacent natural areas and/or fragmentation of habitats, thus high degree of connectivity and low degree of fragmentation infer a high rating.

Category rating (note reverse order):

| | |
|----------|-----|
| Low | = 3 |
| Moderate | = 2 |
| High | = 1 |

9. **Erosion potential of the soil:** The erosion potential of the soil is indicated as low, moderate or high, e.g. coarse sandy soils on plains have a low erosion potential.

Category rating:

| | |
|----------|-----|
| Low | = 1 |
| Moderate | = 2 |
| High | = 3 |

10. **Resilience:** Is a measure of the ability of a particular road reserve habitat to recover to its current state after an impact, i.e. high resilience infers low rating.

Category rating (note reverse order):

| | |
|----------|-----|
| Low | = 3 |
| Moderate | = 2 |
| High | = 1 |

Each criterium is weighted as follows in the model:

| | |
|---|----|
| Threatened status of the vegetation type | x5 |
| Percentage of red list plant species | x4 |
| Presence of protected tree species | x3 |
| Percentage of Northern Cape or Western Cape protected species | x4 |
| Percentage of endemic species to vegetation type | x2 |
| Species richness | x2 |
| Conservation value (habitat) | x4 |
| Degree of connectivity/fragmentation of habitat | x2 |
| Erosion potential | x2 |
| Resilience | x3 |

5.2.2 Sensitivity rating

The sum of all criteria is obtained per habitat and interpreted as follows:

| | | | |
|---------|-------------|------|--------------------|
| ≤ 39 | = low | (L) | (rating scale = 1) |
| 40 – 54 | = moderate | (M) | (rating scale = 2) |
| 55 – 69 | = high | (H) | (rating scale = 3) |
| > 70 | = very high | (VH) | (rating scale = 4) |

In general, these sensitivity ratings are interpreted as follows:

- **Low** sensitivity means the sensitivity should not have an influence on the decision about the project. It is

usually applicable to habitats that have been transformed, especially by human activities. However, no protected species may be removed/destroyed without a permit.

- **Moderate** means a sensitivity rating that is real and sufficiently important to require management, e.g. mitigation measures, management or protection of the rare/threatened fauna and flora, protection of a specific habitat on the property and/or rehabilitation.
- **High** means a sensitivity rating where the habitat should be excluded from any development.
- **Very high** means a sensitivity rating that should influence the decision whether or not to proceed with the project.

Table 1: Sensitivity of the different plant communities identified on site (see Figure 18)

| Vegetation types | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|--------------------------------|----|----|----|----|----|----|----|----|
| Threatened status (x5) | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| % Red list species (x4) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Number of protected trees (x3) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| WCNECO/CITES species (x4) | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 8 |
| Endemic species (x2) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Species richness (x2) | 6 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| Conservation value (x4) | 8 | 8 | 4 | 4 | 4 | 4 | 4 | 12 |
| Connectivity (x2) | 4 | 4 | 2 | 2 | 2 | 2 | 2 | 4 |
| Erosion (x2) | 4 | 2 | 2 | 2 | 2 | 2 | 2 | 6 |
| Resilience (x3) | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 |
| Sum: | 45 | 40 | 34 | 34 | 34 | 34 | 34 | 44 |
| Sensitivity rating: | M | M | L | L | L | L | L | M |

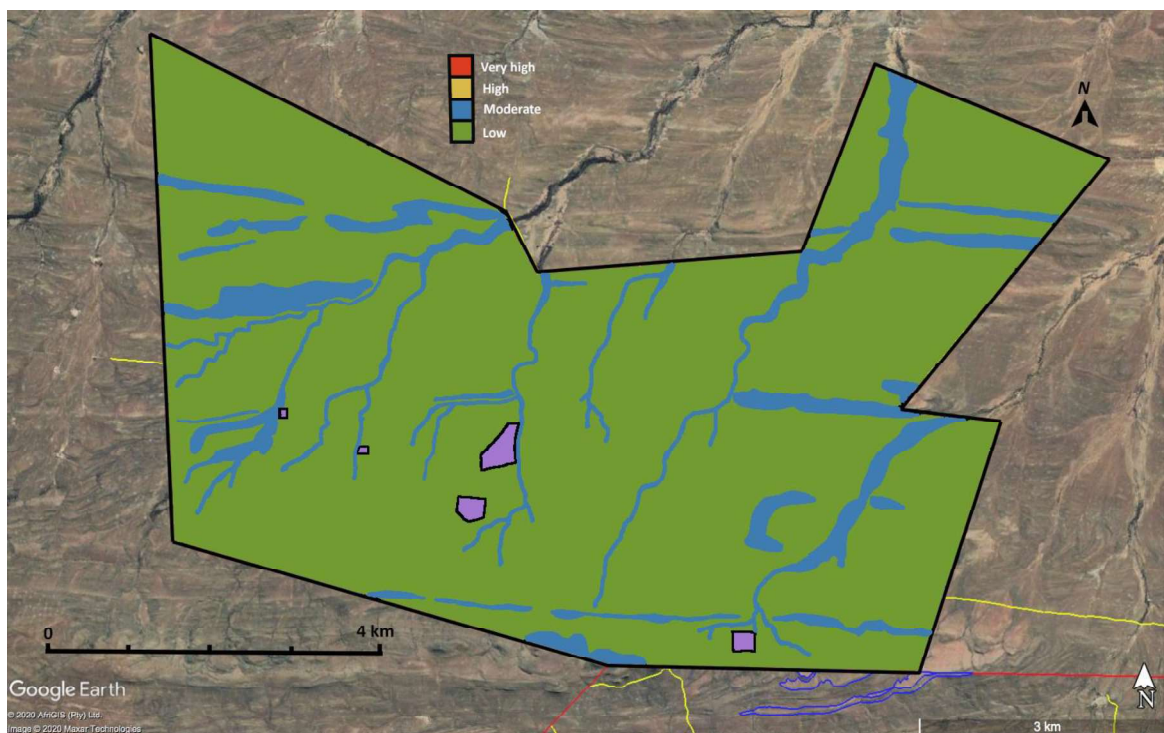


Figure 18: Sensitivity map of the Kwagga 1 site. The light purple areas, indicate homesteads or other highly disturbed areas. The sensitivity map is additionally provided as a .kmz file.

Overall, the mountainous parts (habitat 1 & 2) and drainage lines (habitat 7) were more sensitive than the plains. However, there are a number of protected and CITES listed species found on the rocky ridges (habitats 1 & 2) and the quartzitic rocky plains (habitat 3) which should be taken into account when selecting the sites for turbines.

No buffers are applicable to the development, except along the watercourses, where a standard 32 m buffer is applicable.

Furthermore, although none of the habitats were rated as highly sensitive from a vegetation point of view, this does not exclude the presence of protected and CITES listed species in the habitats. Protected and CITES listed species were not considered as being of conservation concern for the following reasons: In WCNECO (1974, 2000), a number of families and genera, for example the family Aizoaceae, (formerly Mesembryanthemaceae) and genera such as *Mesembryanthemum*, *Drosanthemum*, *Galenia*, *Ruschia* and *Tetragonia* are listed as either Specially Protected Species/Flora or Protected Species/Flora. This blank classification may be because of the presence of one or two species of vulnerable or higher conservation (IUCN) status in the genus. Unfortunately, this then includes many species that are either common, or even weedy, e.g. *Drosanthemum hispidum*, *Galenia namaensis*, *Mesembryanthemum guerichianum* or *Ruschia* species that do not need to be awarded special conservation status. To a large extent, Appendix II of CITES has the same weakness as WCNECO, because it often also simply lists all species within a genus, e.g. *Anacampseros* spp., all succulent *Euphorbia* spp. and *Hoodia* spp. Several species noted on site are provincially protected as well as CITES listed, although none have an IUCN red list status (see Appendix B). Permits will have to be obtained for the removal of the protected species.

6. FAUNA

7.1 Mammals

The site falls within the distribution range of 20 terrestrial mammal species (<http://vmus.adu.org.za>) (Appendix C).

7.1.1 IUCN threatened mammal species

No IUCN threatened mammal species were listed for the environs of the Kwagga 1 site on the website of the Animal Demography Unit, University of Cape Town. However, the riverine rabbit (*Bunolagus monticularis*) is flagged as medium sensitivity for the site by the 'screening tool'. According to Collins & Du Toit (2016) the riverine rabbit has been sighted in the region, but is unlikely to occur on the Kwagga 1 site. Favourable habitat for the riverine rabbit does not appear to be present of the Kwagga 1 site. Due to intensive grazing by livestock exacerbated by the current drought, the vegetation on site and along many of the drainage lines was degraded.

Among the rodents, Litledale's whistling rat (*Parotomys littedalei*) is listed as Near Threatened (a category that is not a threatened category in the IUCN classification).

7.2 Reptiles

Thirty-two reptiles are listed for the region. The Karoo dwarf tortoise (*Chersobius boulengeri*) is listed as IUCN **Endangered** and is also in CITES Appendix II. The Karoo dwarf tortoise is an endemic species occurring in the region. With proper mitigation measures negative impacts to the Karoo dwarf tortoise could be avoided.

The most common tortoise on site is the leopard tortoise or bergskilpad *Stigmochelys pardalis*.

Other CITES II listed Chelonians are:

| | |
|--|------------------------|
| <i>Chersina angulata</i> | Angulate tortoise |
| <i>Psammobates tentorius tentorius</i> | Karoo tent tortoise |
| <i>Psammobates tentorius verroxii</i> | Verrox's tent tortoise |

Comment:

The available fauna lists for the immediate region of the Kwagga 1 site show that the area has been poorly collected in the past. The following additional mammals were either sighted or confirmed by two landowners on site:

Mammals:

Artiodactyla:

| | | |
|---------------------------------|--------------------|------------------------|
| <i>Sylvicapra grimmia</i> | Grey (bush) duiker | (WC protected species) |
| <i>Tragelaphus strepsiceros</i> | Greater Kudu | (WC protected species) |
| <i>Oryx gazella</i> | Gemsbok | (WC protected species) |

Carnivores:

| | |
|------------------------|---------------------|
| <i>Canis mesomelas</i> | Black-backed jackal |
|------------------------|---------------------|

Caracal caracal Caracal
Otocyon megalotis Bat-eared fox (WC protected species)
Cynictis penicillata Yellow mongoose

Primates:
Chlorocebus pygerythrus Vervet monkey

Lagomorpha (Hares and rabbits):
Lepus capensis Cape hare

7. SCREENING REPORT

7.1 Summary of screening tool results

7.1.1 Plant Species Theme

The screening tool rated the sensitivity of the Plant Species Theme as **Low** (Figure 19) and no species were highlighted as being of concern.

| Very High sensitivity | High sensitivity | Medium sensitivity | Low sensitivity |
|-----------------------|------------------|--------------------|-----------------|
| | | | X |

| Sensitivity | Feature(s) |
|-------------|-----------------|
| Low | Low sensitivity |

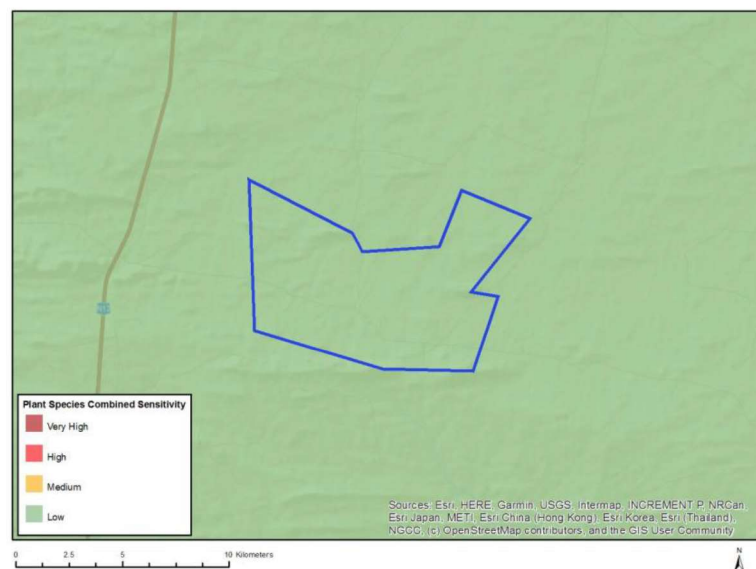


Figure 19: Map and outcome of Plant Species Theme sensitivity generated by the screening tool.

7.1.2 Animal theme

The screening tool rated the sensitivity of the Animal Species Theme as **High** (Figure 20). Animal species highlighted by the screening tool for the region included the riverine rabbit (*Bunolagus monticularis*) and Karoo dwarf tortoise (*Chersobius boulengeri*).

| Very high sensitivity | High sensitivity | Medium sensitivity | Low sensitivity |
|-----------------------|------------------|--------------------|-----------------|
| | x | | |

| Sensitivity | Feature(s) |
|-------------|---|
| Medium | Mammalia- <i>Bunolagus monticularis</i> |
| Medium | Reptilia- <i>Chersobius boulengeri</i> |

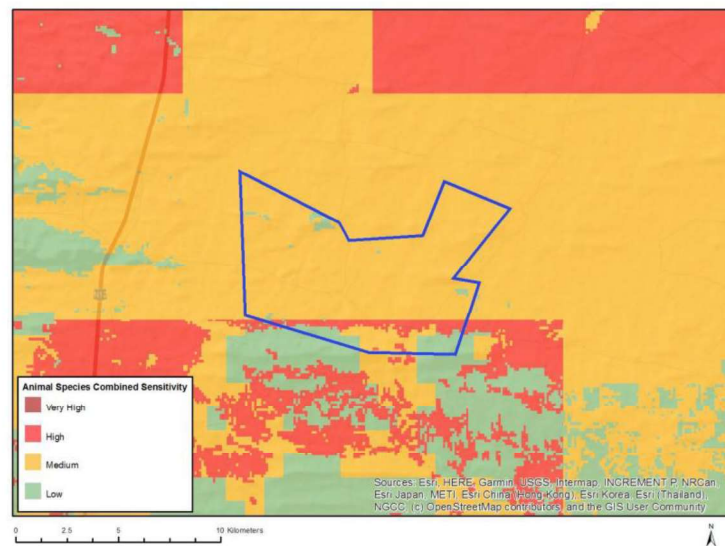


Figure 20: Map and outcome of Animal Species Theme sensitivity generated by the screening tool.

7.1.3 Relative Terrestrial Biodiversity theme

The screening tool rated the sensitivity of the Relative Terrestrial Biodiversity theme as **Very High** (Figure 21). The following features were highlighted:

| Very high sensitivity | High sensitivity | Medium sensitivity | Low sensitivity |
|-----------------------|------------------|--------------------|-----------------|
| x | | | |

| Sensitivity | Feature(s) |
|-------------|---|
| Very high | Critical Biodiversity Area 1 |
| Very high | Ecological Support Area 1 |
| Very high | Ecological Support Area 2 |
| Very high | Freshwater ecosystem priority area quinary catchments |
| Low | Low Sensitivity |

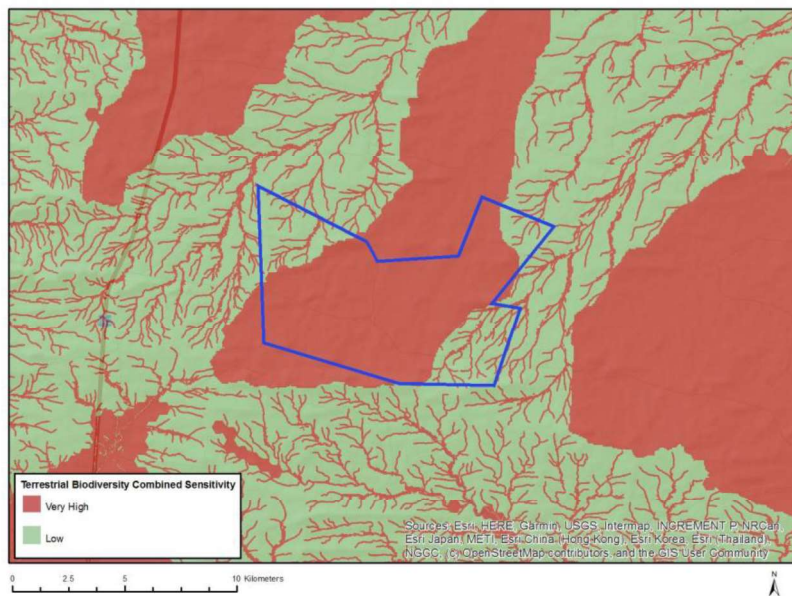


Figure 21: Map and outcome of Relative Terrestrial Biodiversity sensitivity generated by the screening tool.

7.2 Screening tool in relation to background study and site verification

7.2.1 Plant theme

Our background study corresponded with the screening tool that the vegetation and flora are listed as **low** sensitivity. However, many provincially protected/specially protected and CITES II listed species were recorded on site. These species are mostly associated with cliffs, scarps and rocky ridges (outcrops) and turbines should not be positioned on the narrow rocky outcrops or cliffs that form a small part of the habitat.

7.2.2 Animal theme

According to Collins & Du Toit (2016) the riverine rabbit has been sighted in the region, but is unlikely to occur on the Kwagga 1 site. Furthermore, the Animal Demography Unit's mammal database has no record of the riverine rabbit in the 3222D degree square. Our site survey did not confirm ideal habitat for the riverine rabbit. Furthermore, due to intensive grazing by livestock exacerbated by the current drought, the vegetation on site and along many of the drainage lines was degraded.

Our background study confirmed the probable presence of the Karoo dwarf tortoise (Animal Demography Unit reptile map) although it was not recorded during the site visit.

7.2.3 Relative terrestrial biodiversity theme

This theme considers the presence of protected areas, National Protected Area Expansion Strategy (NPAES), CBA, ESA and National Freshwater Ecosystem Priority Area (NFEPA). The study area is not located in a protected area and the vegetation type on site is listed as least threatened.

Our background study indicated that the development will have no impact on existing protected areas nor affect the NPAES. Turbines should not be located within the area demarcated as CBA. Overall the impact of the development within the identified CBAs and ESAs is believed to be small.

The Freshwater Ecosystem Priority Areas (FEPAs) or water catchments are priority areas for conserving freshwater ecosystems and supporting sustainable use of water resources and upstream management areas. The screening tool classified the entire area covered by the FEPA as having a very high sensitivity. However, based on the site assessment of the vegetation most of the area was rated as being of low or moderate sensitivity.

8. SITE SENSITIVITY VERIFICATION

Prior to commencing with the Terrestrial Biodiversity Specialist Assessment in accordance with the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Terrestrial Biodiversity (Government Notice 320, dated 20 March 2020), a site sensitivity verification was undertaken in order to confirm the current land use and environmental sensitivity of the proposed project area as identified by the National Web-Based Environmental Screening Tool (Screening Tool).

The details of the site sensitivity verification are noted below:

| | |
|---|---|
| Date of site visit | 29 October 2020 to 5 November 2020 |
| Specialist name | N. van Rooyen; M.W van Rooyen |
| Professional registration number | 401430/83 Botanical Science (NvR); 400509/14 Ecological Science (MvR) |
| Specialist affiliation / company | Ekotruster cc |

The site sensitivity verification was undertaken using the following means:

- desk top analysis using satellite imagery;
- consulting geological, land type and vegetation type maps of the region;
- consulting provincial datasets on the latest versions of the mapping of CBAs, ESAs, ONAs, NPAES and PAs;
- checking distribution ranges of IUCN red listed species and species highlighted by the screening tool;
- compiling plant and animal species checklist for the region; and
- on-site inspection.

To verify the site sensitivity of the screening tool, Google satellite images were studied beforehand and the site stratified into relatively homogenous physiographic-physionomic units or habitats. Sites were then selected to represent these habitats. During the field survey, 52 sampling sites were surveyed at the proposed Kwagga 1 development.

Animal Theme

Screening tool: The screening tool rated the sensitivity of the Animal Species Theme as **High**.

Site verification:

Mammals:

- Our background study concurred with the possible presence of the riverine rabbit (Collins *et al.* 2016) **in the region but not on the proposed development site**. Furthermore, due to intensive grazing by livestock exacerbated by the current drought, the vegetation on site and along many of the drainage lines was degraded.
- As a precautionary measure developments along the drainage lines should nevertheless be discouraged and a 32 m buffer zone is applicable.

Reptiles:

- Our background study confirmed the presence of the Karoo dwarf tortoise within the 3222D degree square. With proper mitigation measures negative impacts to the Karoo dwarf tortoise could be avoided.

We would rate the sensitivity of the Animal Theme as **Medium** based on the information provided above.

Plant Theme

Screening tool: The screening tool rated the sensitivity of the Plant Species Theme as **Low**.

Site verification:

- Our background study corresponded with the screening tool that the plant theme is considered as of a **low** sensitivity. However, many provincially protected/specially protected and CITES II listed species were recorded on site. These species are mostly associated with cliffs, scarps and rocky ridges (outcrops) and permits are needed for the removal of these species.

Relative Terrestrial Biodiversity Theme

Screening tool: The screening tool rated the sensitivity of the Relative Terrestrial Biodiversity theme as **Very High**.

Site verification:

- This theme considers the presence of protected areas, National Protected Area Expansion Strategy (NPAES), CBAs, ESAs and National Freshwater Ecosystem Priority Area (FEPAs). Our background study concurred with the findings of the screening tool on the presence of these features.
- The Freshwater Ecosystem Priority Areas (FEPAs) or water catchments are priority areas for conserving freshwater ecosystems and supporting sustainable use of water resources and upstream management areas. The screening tool classified the entire area covered by the FEPA as having a very high sensitivity. However, based on the site assessment of the vegetation most of the area was rated as being of low to moderate sensitivity.

Outcome of the site sensitivity verification:

- We concur that the Plant Theme's site sensitivity is **Low**.
- We would suggest the Animal Theme's site sensitivity to be rated as **Medium**.
- Unfortunately, the screening tool limits the sensitivity of the relative terrestrial biodiversity theme to either Very High or Low. This is an issue which should be revisited by the Department of Environment,

Forestry and Fisheries (DEFF) since it does not give a proper representation of the site conditions. Although we agree with the delineation of the CBA and its categorization as Very High, the entire FEPA quinary catchment cannot be considered as Very High. The proportion of the site with a very high sensitivity should therefore be greatly reduced. Thus, if the same 4-tiered scale were to be applied to this theme, as in the case of the other themes, we would rate it as **Medium**.

9. ENVIRONMENTAL IMPACTS

The following is a list of potential impacts that may occur due to the proposed development. A full description of the impacts will be presented in the specialist EIA report.

9.1 Impacts during the construction phase

9.1.1 Direct impacts during the construction phase

- Potential impact 1: The clearing of natural vegetation and resultant loss of faunal habitat;
- Potential impact 2: The loss of threatened, protected, CITES listed and endemic plants/animals;
- Potential impact 3: Direct faunal mortalities due to construction and increased traffic;
- Potential impact 4: Increased noise and light levels; and
- Potential impact 5: Increased dust deposition.

9.1.2 Indirect impacts during the construction phase

- Potential impact 1: Establishment of alien vegetation as a result of the clearing of the vegetation;
- Potential impact 2: Increased water run-off and erosion; and
- Potential impact 3: Changes in animal behaviour.

9.2 Impacts during the operational phase

9.2.1 Direct impacts during the operational phase

- Potential impact 1: Direct faunal mortalities; and
- Potential impact 2: Increased light and noise levels.

9.2.2 Indirect impacts during the operational phase

- Potential impact 1: Establishment of alien vegetation will continue; and
- Potential impact 2: Changes in animal behaviour.

3.5 Impacts during the decommissioning phase

9.3.1 Direct impacts during the decommissioning phase

- Potential impact 1: Some clearing of natural vegetation due to removal of infrastructure.
- Potential impact 2: Possible ingestion or ensnarement of animals due to waste material lying around.

9.3.2 Indirect impacts during the decommissioning phase

- Potential impact 1: Establishment of alien vegetation

9.4 Cumulative impacts

- Cumulative impact 1: Vegetation loss and habitat destruction and concomitant loss of SCC;
- Cumulative impact 2: Compromising integrity of CBA, ESA and NPAES;
- Cumulative impact 3: Increased water run-off and erosion; and
- Cumulative impact 4: Possible loss of landscape connectivity and disruption of broad-scale ecological processes.

Preferred infrastructure locations:

Turbines:

- Turbines should not be located within or near watercourses or on mountains and rocky ridges where small 'cliffs' are present or on the crest of ridges where the rocky outcrop is present (Figure 22). Patches of quartzitic gravel should also be avoided if possible (part of habitat 3).



Figure 22: Example of a "cliff" which should be avoided in placement of wind turbines.

On-site substations:

Most of the locations of sites selected for substations are acceptable. However, the presence of watercourses (drainage lines) will necessitate a slightly different placement in the landscape (micro-siting). The best option from an ecological viewpoint will be WEF2 followed by Site 02 and Site 03.

Laydown areas:

- All alternatives are acceptable.

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APPENDIX A

SYNOPTIC TABLE OF PLANT COMMUNITIES

| Community | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Species group 1 | | | | | | | | |
| <i>Bulbine triebneri</i> | 3 | | | | | | 1 | 1 |
| <i>Trichodiadema decorum</i> | 2 | 1 | | 1 | | | | |
| <i>Melica decumbens</i> | 2 | | | | | | | 1 |
| <i>Manulea</i> sp. | 2 | 1 | | 1 | | | | |
| <i>Felicia muricata</i> | 2 | | 1 | | | | | |
| <i>Helichrysum zeyheri</i> | 2 | | 1 | | | | | |
| <i>Pelargonium laxum</i> | 2 | 1 | | | | | | |
| <i>Adromischus</i> cf. <i>triflorus</i> | 2 | | | | | | | |
| <i>Pteronia tricephala</i> | 1 | | | | | | | |
| Species group 2 | | | | | | | | |
| <i>Hermannia linearifolia</i> | 3 | 2 | | 1 | | | | |
| <i>Eriocephalus brevifolius</i> | 2 | 1 | | | 1 | | | |
| <i>Sericocoma avolans</i> | 1 | 2 | | | | | | |
| <i>Helichrysum pumilio</i> | 2 | 1 | | | 1 | 1 | | |
| <i>Dianthus micropetalus</i> | 2 | 2 | 1 | | | | | |
| <i>Osteospermum scariosum</i> | 2 | 1 | 1 | | 1 | | | |
| <i>Anacampseros albidiflora</i> | 2 | 1 | 1 | 1 | 1 | 1 | | |
| Species group 3 | | | | | | | | |
| <i>Crassula deltoidea</i> | 1 | 1 | 3 | | 1 | | | |
| <i>Hereroa</i> sp. 1 | | 1 | 3 | | | | | |
| <i>Anacampseros papyracea</i> | | | 3 | | | | | |
| <i>Trichodiadema barbatum</i> | | | 1 | | | | | |
| <i>Faucaria</i> sp. | | | 1 | | | | | |
| <i>Justicia</i> sp. | | | 1 | 1 | | | | |
| Species group 4 | | | | | | | | |
| <i>Tragus koelerioides</i> | 3 | 3 | 3 | | | | | |
| <i>Digitaria argyrogapta</i> | 4 | 1 | 2 | 1 | | | 1 | 2 |
| <i>Amphiglossa</i> species | 2 | 2 | 2 | | 1 | | | |
| <i>Eragrostis obtusa</i> | 2 | 1 | 1 | 1 | | 1 | 1 | 1 |
| <i>Mesembryanthemum (Phyllobolus)</i> sp. | 1 | 2 | 1 | 1 | | | | |
| <i>Eriocephalus spinescens</i> | 1 | 1 | 2 | | | | 1 | |
| <i>Crassula muscosa</i> | 1 | 1 | 1 | | 1 | | | |
| Species group 5 | | | | | | | | |
| <i>Nenax microphylla</i> | 4 | 2 | 3 | 2 | 1 | 1 | 1 | |
| <i>Hirpicium alienatum</i> | 5 | 2 | 1 | 2 | | 1 | | 1 |
| <i>Gnidia deserticola</i> | 4 | 2 | 2 | 2 | | | | |
| <i>Helichrysum lucilioides</i> | 3 | 2 | 3 | 1 | | | | |
| <i>Pteronia empetrifolia</i> | 2 | 3 | 3 | 1 | 1 | | | |
| <i>Gazania heterochaeta</i> | 2 | 2 | 3 | 2 | 1 | | 1 | |
| <i>Anacampseros ustulata</i> | 1 | 1 | 3 | 3 | | | | |
| <i>Cuspidia cernua</i> | 1 | 1 | 1 | 1 | | 1 | | 1 |
| Species group 6 | | | | | | | | |
| <i>Pteronia glauca</i> | 2 | 3 | 3 | 2 | 2 | | 1 | |
| <i>Tetragonia</i> spp. | 2 | 2 | 2 | 1 | 1 | | | |
| <i>Euphorbia suffulta</i> | 1 | 2 | 1 | 1 | 2 | 1 | | |
| <i>Galenia fruticosa</i> | 1 | 1 | 1 | 1 | 2 | | | |
| <i>Antimima</i> sp. | | 2 | 1 | 1 | 1 | | | |
| <i>Felicia filifolia</i> | | 1 | 2 | 1 | 1 | | 1 | |
| <i>Pteronia paniculata</i> | | 1 | 2 | 1 | 1 | | | |
| Species group 7 | | | | | | | | |
| <i>Rhigozum obovatum</i> | 5 | 5 | 4 | 4 | 5 | 5 | | 1 |
| <i>Euphorbia stellispina</i> | 3 | 4 | 3 | 2 | 3 | 2 | | |
| <i>Trichodiadema pomeridianum</i> | 3 | 2 | 3 | 2 | 2 | 2 | | 1 |

| | | | | | | | |
|--------------------------------------|---|---|---|---|---|---|---|
| <i>Monsonia camdeboensis</i> | 2 | 3 | 3 | 1 | 3 | 1 | |
| <i>Oropetium capense</i> | 2 | 2 | 4 | 4 | 1 | 2 | |
| <i>Pteronia adenocarpa</i> | 2 | 3 | 1 | | 2 | 2 | |
| <i>Asparagus striatus</i> | 2 | 2 | 1 | 2 | 1 | 1 | |
| <i>Curio radicans</i> | 1 | 2 | 1 | 1 | 2 | 1 | |
| <i>Pentzia quinquefida</i> | 3 | 1 | 1 | | 1 | 1 | |
| <i>Searsia pallens</i> | 2 | 1 | | 1 | | 3 | 1 |
| <i>Pteronia viscosa</i> | 1 | 1 | | | 1 | 3 | 1 |
| <i>Trachyandra sp.</i> | 1 | 1 | 1 | 2 | 1 | 2 | |
| Species group 8 | | | | | | | |
| <i>Stipagrostis obtusa</i> | | 1 | 1 | 1 | 1 | 3 | 3 |
| <i>Tragus berteronianus</i> | 1 | 1 | 1 | 1 | 1 | 2 | 1 |
| <i>Sesamum capense</i> | | | | | | 3 | 2 |
| <i>Ruschia sp.</i> | 1 | 1 | 1 | 1 | | | 3 |
| Species group 9 | | | | | | | |
| <i>Eriocephalus ericoides</i> | 5 | 5 | 5 | 5 | 5 | 5 | 3 |
| <i>Aristida congesta</i> | 3 | 2 | 5 | 5 | 5 | | 5 |
| <i>Aristida diffusa</i> | 5 | 5 | 3 | 3 | 3 | 3 | 1 |
| <i>Ruschia spinosa</i> | 4 | 5 | 5 | 2 | 4 | 4 | 2 |
| <i>Drosanthemum lique</i> | 2 | 3 | 3 | 2 | 4 | 3 | 5 |
| <i>Enneapogon desvauxii</i> | 1 | 3 | 3 | 3 | 4 | 5 | 2 |
| <i>Asparagus mucronatus</i> | 3 | 2 | 2 | 2 | 2 | | 1 |
| <i>Ruschia cradockensis</i> | 1 | 1 | 5 | 1 | 3 | 1 | 2 |
| <i>Pteronia sordida</i> | 1 | 1 | 1 | | 1 | 1 | 2 |
| Species group 10 | | | | | | | |
| <i>Setaria verticillata</i> | 1 | | | | | 1 | 5 |
| <i>Cenchrus ciliaris</i> | | | | | | | 4 |
| <i>Melianthus comosus</i> | | | | | | | 3 |
| <i>Searsia lancea</i> | | | | | | | 3 |
| <i>Stipagrostis namaquensis</i> | | | | | | | 3 |
| <i>Oedera humilis</i> | | 1 | | | | 1 | 2 |
| <i>Leysera tenella</i> | | 1 | | | | | 2 |
| <i>Eragrostis sp.</i> | | | | | | | 2 |
| <i>Chloris virgata</i> | | | | | | 1 | 2 |
| <i>Amaranthus sp.</i> | | | | | | | 2 |
| <i>Tetraena lichtensteiniana</i> | | | | | | 1 | 1 |
| <i>Argemone ochroleuca</i> | | | | | | | 2 |
| <i>Malephora sp.</i> | | | | | | | 2 |
| <i>Aptosimum indivisum</i> | | | 1 | | | | 2 |
| <i>Viscum rotundifolium</i> | 1 | | | | | 1 | 2 |
| <i>Cynodon incompletus</i> | | | | | | | 2 |
| <i>Tagetes minuta</i> | | | | | | | 2 |
| <i>Aptenia sp.</i> | | | | | | | 2 |
| <i>Polygogon monspeliensis</i> | | | | | | | 2 |
| <i>Arctotis leiocarpa</i> | | | | | | | 2 |
| <i>Eragrostis rotifer</i> | | | | | | | 2 |
| <i>Bassia salsoloides</i> | | | | | | | 2 |
| <i>Galenia papulosa</i> | | | 1 | | | 1 | 1 |
| <i>Tetragonia acanthocarpa</i> | 1 | 1 | | | | | 1 |
| <i>Stipagrostis ciliata</i> | | | | | | 1 | 1 |
| <i>Mesembryanthemum articulatum</i> | | | | | | 1 | 1 |
| <i>Gazania krebsiana</i> | | | | | | | 1 |
| Species group 11 | | | | | | | |
| <i>Lycium oxycarpum</i> | 1 | | | | | 3 | 3 |
| <i>Vachellia karroo</i> | 1 | 1 | 1 | 1 | | 2 | 1 |
| <i>Tetraena chrysopteron</i> | | | 1 | 1 | 1 | 3 | 3 |
| <i>Kewa salsoloides</i> | | | 1 | 1 | | 2 | 2 |
| Species group 12 | | | | | | | |
| <i>Asparagus burchellii</i> | 1 | 1 | 1 | 1 | 1 | 3 | 2 |
| <i>Mesembryanthemum guerichianum</i> | | 1 | 1 | 1 | 2 | 1 | 2 |
| <i>Galenia sarcophylla</i> | | 2 | | 1 | 1 | 2 | 1 |
| <i>Salsola spp.</i> | 1 | | 3 | 1 | 1 | 1 | 1 |
| <i>Mesembryanthemum noctiflorum</i> | 1 | 1 | 2 | 1 | 1 | 1 | 1 |
| <i>Cadaba aphylla</i> | 1 | 1 | 1 | | 1 | 2 | 2 |
| Species group 13 | | | | | | | |
| <i>Aristida adscensionis</i> | 3 | 3 | 5 | 5 | 5 | 5 | 5 |
| <i>Chrysocoma ciliata</i> | 4 | 4 | 3 | 3 | 3 | 3 | 1 |
| <i>Lacomucinaea lineatum</i> | 4 | 2 | 3 | 3 | 3 | 4 | 2 |
| <i>Lycium cinereum</i> | 3 | 2 | 4 | 5 | 4 | 5 | 5 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| <i>Asparagus aethiopicus</i> | 2 | 3 | 5 | 4 | 4 | 4 | 4 | 3 |
| <i>Pentzia incana</i> | 4 | 1 | 2 | 2 | 2 | 4 | 4 | 4 |
| <i>Diospyros lycioides</i> | 2 | 2 | 3 | 2 | 1 | 3 | 2 | 4 |
| <i>Searsia burchellii</i> | 4 | 3 | 1 | 1 | 2 | 4 | 1 | 4 |
| <i>Mesembryanthemum (Psilocalaon) sp.</i> | 2 | 2 | 3 | 2 | 5 | 1 | 1 | 1 |
| <i>Grewia robusta</i> | 5 | 2 | 2 | 2 | 1 | 4 | 1 | 3 |
| <i>Gymnosporia szyszlowiczii</i> | 2 | 2 | 1 | 1 | 3 | 3 | 2 | 4 |
| <i>Drosanthemum hispidum</i> | 2 | 1 | 2 | 1 | 1 | 2 | 3 | 2 |
| <i>Hermannia grandiflora</i> | 2 | 1 | 2 | 2 | 1 | 1 | 1 | 1 |
| <i>Sporobolus fimbriatus</i> | 2 | 1 | 1 | | | | 1 | 3 |

Species group 14

| | | | | | | | | |
|------------------------------------|---|---|---|---|---|---|---|---|
| <i>Felicia sp.</i> | 1 | 1 | 1 | 1 | | 1 | | |
| <i>Crassula subaphylla</i> | 1 | | | 1 | 1 | | 1 | |
| <i>Crassula corallina</i> | 1 | 1 | | 1 | | | 1 | |
| <i>Hermannia desertorum</i> | 1 | 1 | | 1 | | | | |
| <i>Pteronia sp.</i> | 1 | 1 | | | | | | |
| <i>Sceletium tortuosum</i> | 1 | 1 | | | 1 | 1 | | |
| <i>Euphorbia mauritanica</i> | 1 | 1 | | 1 | 1 | | | |
| <i>Astroloba foliolosa</i> | 1 | 1 | | 1 | | | | |
| <i>Anacampseros telephiastrum</i> | 1 | 1 | | | | | | |
| <i>Conophytum truncatum</i> | 1 | 1 | 1 | | | | | |
| <i>Hoodia pilifera</i> | 1 | 1 | | | 1 | 1 | | |
| <i>Melolobium candicans</i> | 1 | | | | | | 1 | 1 |
| <i>Carissa haematocarpa</i> | 1 | | 1 | | | | | 1 |
| <i>Crassula hemisphaerica</i> | 1 | | 1 | | | 2 | | |
| <i>Albuca sp.</i> | 1 | | | 1 | | 1 | 1 | |
| <i>Drimia intricata</i> | 1 | 1 | 1 | | | | | |
| <i>Lepidium africanum</i> | 1 | | | | | | | 1 |
| <i>Hermannia cuneifolia</i> | 1 | 1 | | | 1 | 1 | | |
| <i>Dipcadi sp.</i> | 1 | 1 | | 1 | | | | |
| <i>Osteospermum sinuata</i> | | 1 | 1 | | 1 | | 1 | 1 |
| <i>Eriacephalus cf. decussatus</i> | | 1 | 1 | | | | | 1 |
| <i>Selago sp.</i> | | 1 | 1 | | | | | 1 |
| <i>Moraea sp.</i> | | 1 | | | 1 | | | 1 |
| <i>Blepharis sp.</i> | | | | | 1 | 1 | | 1 |
| <i>Osteospermum sp.</i> | 1 | | | | | | | |
| <i>Mesembryanthemum tetragonum</i> | 1 | | | | 1 | | | |
| <i>Fingerhuthia africana</i> | 1 | | | | | | 1 | |
| <i>Ledebouria sp.</i> | 1 | | | | | | | |
| <i>Chasmatophyllum musculinum</i> | 1 | | | | | | 1 | |
| <i>Barleria rigida</i> | 1 | | | | | | | |
| <i>Pteronia staezelinoides</i> | 1 | | | | | | | |
| <i>Pegolettia retrofracta</i> | 1 | | | | 1 | | | |
| <i>Hereroa sp.</i> | 1 | | 1 | | | | | |
| <i>Digitaria eriantha</i> | 1 | | | | | | | 1 |
| <i>Solanum giftbergense</i> | 1 | | | | | | | |
| <i>Albuca maxima</i> | 1 | | | | | | | |
| <i>Asparagus capensis</i> | 1 | | | | | | | |
| <i>Bulbine frutescens</i> | 1 | | | | | | | |
| <i>Lessertia fruticosa</i> | 1 | | | | | | | |
| <i>Adromischus sp.</i> | 1 | | | | | | | |
| <i>Galenia namaensis</i> | 1 | | | | | | | |
| <i>Hermannia spinosa</i> | 1 | | | | | | | 1 |
| <i>Atriplex vestita</i> | 1 | | | | | 1 | | |
| <i>Melolobium cf. microphyllum</i> | 1 | | | | | | | |
| <i>Euclea undulata</i> | 1 | | | | | | | |
| <i>Limeum aethiopicum</i> | 1 | 1 | | | | | | |
| <i>Garuleum bipinnatum</i> | 1 | | | | | | | |
| <i>Pentameris cf. airoides</i> | | 1 | | | | | | |
| <i>Senecio acaulis</i> | | 1 | 1 | | | | | |
| <i>Lotononis sp.</i> | | 1 | 1 | | | | | |
| <i>Fockea comaru</i> | | 1 | | | | | | |
| <i>Pentzia sphaerocephala</i> | | 1 | | | | | | |
| <i>Mesembryanthemum sp. 3</i> | | 1 | | | | | 1 | |
| <i>Haworthiopsis nigra</i> | | 1 | | | | | | |
| <i>Pharnaceum sp.</i> | | 1 | | | | | | |
| <i>Monsonia crassicaule</i> | | 1 | | | | | | |
| <i>Drimia sp.</i> | | 1 | | | | | | |
| <i>Enneapogon cenchroides</i> | | 1 | | | | | | |
| <i>Crassula pyramidalis</i> | | 1 | | | | | | |

| | | | | |
|-------------------------------------|---|---|---|---|
| <i>Pachypodium succulentum</i> | 1 | | | |
| <i>Hermannia coccocarpa</i> | 1 | | | 1 |
| <i>Hermannia vestita</i> | 1 | | 1 | |
| <i>Kleinia longiflora</i> | | 1 | 1 | |
| <i>Curio rowleyanus</i> | | 1 | 1 | |
| <i>Asparagus capensis</i> | | 1 | | |
| <i>Lessertia sp.</i> | | 1 | | |
| <i>Mesembryanthemum sp. 2</i> | | 1 | | 1 |
| <i>Crassula capitella</i> | | | 1 | 1 |
| <i>Ornithogalum species</i> | | | 1 | |
| <i>Euphorbia decepta</i> | | | 1 | |
| <i>Athanasia minuta</i> | | | 1 | 1 |
| <i>Oedera oppositifolia</i> | | | 1 | 1 |
| <i>Salsola kali</i> | | | 1 | |
| <i>Osteospermum spinescens</i> | | | 1 | |
| <i>Plinthus karoocicus</i> | | | | 1 |
| <i>Gonialoe variegata</i> | | | 1 | |
| <i>Crassothonna sedifolia</i> | | | 1 | |
| <i>Aizoon canariense</i> | | | 1 | 1 |
| <i>Tetraena rigida</i> | | | | 1 |
| <i>Opuntia aurantiaca</i> | | | | 1 |
| <i>Tetragonia microptera</i> | | | | 1 |
| <i>Dicoma capensis</i> | | | | 1 |
| <i>Blepharis mitrata</i> | | | | 1 |
| <i>Peliostomum leucorrhizum</i> | | | | 1 |
| <i>Malephora crassa</i> | | | | 1 |
| <i>Opuntia ficus-indica</i> | | | | 1 |
| <i>Ursinia nana</i> | | | | 1 |
| <i>Amphiglossa triflora</i> | | | | 1 |
| <i>Nemesia sp.</i> | | | | 1 |
| <i>Stipagrostis uniplumis</i> | | | | 1 |
| <i>Mesembryanthemum sp. 1</i> | | | | 1 |
| <i>Solanum sp.</i> | | | | 1 |
| <i>Hermannia comosa</i> | | | | 1 |
| <i>Chenopodium sp.</i> | | | | 1 |
| <i>Datura ferox</i> | | | | 1 |
| <i>Ehrharta sp.</i> | | | | 1 |
| <i>Senecio sp.</i> | | | | 1 |
| <i>Mesembryanthemum cf. nitidum</i> | | | | 1 |
| <i>Asparagus retrofractus</i> | | | | 1 |
| <i>Hermannia sp.</i> | | | | 1 |
| <i>Jamesbrittenia species</i> | | | | 1 |
| <i>Atriplex semibaccata</i> | | | | 1 |
| <i>Bromus pectinatus</i> | | | | 1 |
| <i>Fuirena sp.</i> | | | | 1 |
| <i>Osteospermum acanthospermum</i> | | | | 1 |
| <i>Pseudoschoenus inanis</i> | | | | 1 |
| <i>Afroscirpoides dioecus</i> | | | | 1 |
| <i>Emex australis</i> | | | | 1 |
| <i>Erodium cicutarium</i> | | | | 1 |
| <i>Helichrysum leontonyx</i> | | | | 1 |
| <i>Malva parviflora</i> | | | | 1 |
| <i>Sebaea sp.</i> | | | | 1 |
| <i>Sporobolus sp.</i> | | | | 1 |
| <i>Sonchus sp.</i> | | | | 1 |
| <i>Cyperus sp.</i> | | | | 1 |
| <i>Leptochloa fusca</i> | | | | 1 |
| <i>Lasiopogon muscoides</i> | | | | 1 |
| <i>Sporobolus ioclados</i> | | | | 1 |
| <i>Arctotis argentea</i> | | | | 1 |

APPENDIX B

PLANT SPECIES CHECKLISTS

¹IUCN category²Western Cape Nature and Environmental Conservation Ordinance (WCNECO)³CITES = Convention on the International Trade in Endangered Species of Wild Fauna and Flora (CITES 2020)⁴Species of Conservation Concern⁵ALIEN = ALIEN AND INVASIVE SPECIES⁶NAT = NATURALISED⁷Plants observed during October/November 2020 site visit⁸Newposa list (SANBI)

| FAMILY | SPECIES | IUCN ¹ | WC ² | CITES ³ | SCC ⁴ | ALIEN ⁵ | NAT ⁶ | CURRENT ⁷ | NEWPOSA ⁸ |
|-------------|--|-------------------|-----------------|--------------------|------------------|--------------------|------------------|----------------------|----------------------|
| Acanthaceae | <i>Barleria rigida</i> | | | | | | | x | |
| Acanthaceae | <i>Blepharis capensis</i> | LC | | | | | | | x |
| Acanthaceae | <i>Blepharis mitrata</i> | LC | | | | | | x | x |
| Acanthaceae | <i>Blepharis</i> sp. | - | | | | | | x | |
| Acanthaceae | <i>Justicia</i> sp. | - | | | | | | x | |
| Aizoaceae | <i>Aizoon canariense</i> | LC | x | | | | | x | |
| Aizoaceae | <i>Antimima</i> sp. | - | x | | | | | x | |
| Aizoaceae | <i>Aptenia</i> sp. | - | x | | | | | x | |
| Aizoaceae | <i>Chasmatophyllum musculinum</i> | LC | x | | | | | x | |
| Aizoaceae | <i>Hereroa</i> sp. 1 | - | x | | | | | x | |
| Aizoaceae | <i>Conophytum truncatum</i> | LC | x | | x | | | x | |
| Aizoaceae | <i>Delosperma</i> sp. | - | x | | | | | | x |
| Aizoaceae | <i>Drosanthemum hispidum</i> | LC | x | | | | | x | x |
| Aizoaceae | <i>Drosanthemum lique</i> | LC | x | | | | | x | x |
| Aizoaceae | <i>Drosanthemum</i> sp. | - | x | | | | | | x |
| Aizoaceae | <i>Faucaria</i> sp. | - | x | | | | | x | |
| Aizoaceae | <i>Galenia acutifolia</i> | LC | x | | | | | | x |
| Aizoaceae | <i>Galenia fruticosa</i> | LC | x | | | | | x | x |
| Aizoaceae | <i>Galenia glandulifera</i> | LC | x | | | | | | x |
| Aizoaceae | <i>Galenia namaensis</i> | LC | x | | | | | x | |
| Aizoaceae | <i>Galenia papulosa</i> | LC | x | | | | | x | x |
| Aizoaceae | <i>Galenia sarcophylla</i> | LC | x | | | | | x | |
| Aizoaceae | <i>Galenia secunda</i> | LC | x | | | | | | x |
| Aizoaceae | <i>Hereroa</i> sp. 2 | - | x | | | | | x | |
| Aizoaceae | <i>Leipoldtia</i> sp. | - | x | | | | | | x |
| Aizoaceae | <i>Malephora crassa</i> | LC | x | | | | | x | |
| Aizoaceae | <i>Malephora latipetala</i> | LC | x | | | | | | x |
| Aizoaceae | <i>Malephora</i> sp. | - | x | | | | | x | x |
| Aizoaceae | <i>Mesembryanthemum articulatum</i> | LC | x | | | | | x | x |
| Aizoaceae | <i>Mesembryanthemum crystallinum</i> | LC | x | | | | | | x |
| Aizoaceae | <i>Mesembryanthemum geniculiflorum</i> | LC | x | | | | | | x |
| Aizoaceae | <i>Mesembryanthemum guerichianum</i> | LC | x | | | | | x | |
| Aizoaceae | <i>Mesembryanthemum nitidum</i> | LC | x | | | | | x | x |
| Aizoaceae | <i>Mesembryanthemum noctiflorum</i> subsp. <i>stramineum</i> | LC | x | | | | | x | x |
| Aizoaceae | <i>Mesembryanthemum nodiflorum</i> | LC | x | | | | | | x |
| Aizoaceae | <i>Mesembryanthemum</i> sp. 1 | - | x | | | | | x | |
| Aizoaceae | <i>Mesembryanthemum</i> sp. 2 | - | x | | | | | x | |
| Aizoaceae | <i>Mesembryanthemum</i> sp. 3 | - | x | | | | | x | |
| Aizoaceae | <i>Mesembryanthemum splendens</i> | LC | x | | | | | | x |

| | | | | | | | | |
|-------------------|--|----|---|---|---|--|---|---|
| Aizoaceae | <i>Mesembryanthemum splendens</i> subsp. <i>pentagonum</i> | LC | x | | | | | x |
| Aizoaceae | <i>Mesembryanthemum splendens</i> subsp. <i>splendens</i> | LC | x | | | | | x |
| Aizoaceae | <i>Mesembryanthemum tetragonum</i> | LC | x | | | | x | x |
| Aizoaceae | <i>Mesembryanthemum vaginatum</i> | LC | x | | | | | x |
| Aizoaceae | <i>Mesembryanthemum (Phyllobolus)</i> sp. | - | x | | | | x | |
| Aizoaceae | <i>Plinthus karoocicus</i> | LC | x | | | | | x |
| Aizoaceae | <i>Mesembryanthemum (Psilocolon)</i> sp. | - | x | | | | x | |
| Aizoaceae | <i>Rhinephyllum graniforme</i> | LC | x | | | | | x |
| Aizoaceae | <i>Ruschia centrocapsula</i> | LC | x | | | | | x |
| Aizoaceae | <i>Ruschia cradockensis</i> | LC | x | | | | x | |
| Aizoaceae | <i>Ruschia</i> sp. | - | x | | | | x | x |
| Aizoaceae | <i>Ruschia spinosa</i> | LC | x | | | | x | |
| Aizoaceae | <i>Mesembryanthemum tortuosum</i> | LC | x | | x | | x | |
| Aizoaceae | <i>Tetragonia acanthocarpa</i> | LC | x | | | | x | |
| Aizoaceae | <i>Tetragonia fruticosa</i> | LC | x | | | | | x |
| Aizoaceae | <i>Tetragonia haworthii</i> | LC | x | | | | | x |
| Aizoaceae | <i>Tetragonia microptera</i> | LC | x | | | | x | x |
| Aizoaceae | <i>Tetragonia</i> spp. | - | x | | | | x | |
| Aizoaceae | <i>Trichodiadema barbatum</i> | LC | x | | | | x | x |
| Aizoaceae | <i>Trichodiadema decorum</i> | LC | x | | | | x | x |
| Aizoaceae | <i>Trichodiadema pomeridianum</i> | LC | x | | | | x | x |
| Amaranthaceae | <i>Amaranthus</i> spp. | - | | | | | x | x |
| Amaranthaceae | <i>Atriplex lindleyi</i> subsp. <i>inflata</i> | NE | | | | | x | x |
| Amaranthaceae | <i>Atriplex nummularia</i> subsp. <i>nummularia</i> | NE | | | | | x | x |
| Amaranthaceae | <i>Atriplex semibaccata</i> | NE | | | | | x | x |
| Amaranthaceae | <i>Atriplex suberecta</i> | NE | | | | | x | x |
| Amaranthaceae | <i>Atriplex vestita</i> | LC | | | | | x | |
| Amaranthaceae | <i>Bassia salsoloides</i> | LC | | | | | x | |
| Amaranthaceae | <i>Chenopodium mucronatum</i> | LC | | | | | | x |
| Amaranthaceae | <i>Chenopodium</i> sp. | - | | | | | x | |
| Amaranthaceae | <i>Salsola adisca</i> | LC | | | | | | x |
| Amaranthaceae | <i>Salsola kali</i> | NE | | | | | x | x |
| Amaranthaceae | <i>Salsola</i> spp. | - | | | | | x | |
| Amaranthaceae | <i>Sericocoma avolans</i> | LC | | | | | x | |
| Amaryllidaceae | <i>Ammocharis coranica</i> | LC | | | | | | x |
| Anacampserotaceae | <i>Anacampseros albidiflora</i> | LC | x | x | x | | x | |
| Anacampserotaceae | <i>Anacampseros arachnoides</i> | LC | x | x | x | | | x |
| Anacampserotaceae | <i>Anacampseros filamentosa</i> subsp. <i>filamentosa</i> | LC | x | x | x | | | x |
| Anacampserotaceae | <i>Anacampseros papyracea</i> | LC | x | x | x | | x | |
| Anacampserotaceae | <i>Anacampseros telephiastrum</i> | LC | x | x | x | | x | |
| Anacampserotaceae | <i>Anacampseros ustulata</i> | LC | x | x | x | | x | x |
| Anacardiaceae | <i>Schinus molle</i> | NE | | | | | x | x |
| Anacardiaceae | <i>Searsia burchellii</i> | LC | | | | | x | |
| Anacardiaceae | <i>Searsia lancea</i> | LC | | | | | x | |
| Anacardiaceae | <i>Searsia pallens</i> | LC | | | | | x | |
| Apiaceae | <i>Berula thunbergii</i> | LC | | | | | | x |
| Apocynaceae | <i>Carissa haematocarpa</i> | LC | | | | | x | |
| Apocynaceae | <i>Ceropegia fimbriata</i> | | | | | | | x |
| Apocynaceae | <i>Cynanchum viminale</i> | LC | | | | | | x |
| Apocynaceae | <i>Fockea comaru</i> | LC | x | | x | | x | |
| Apocynaceae | <i>Gomphocarpus filiformis</i> | LC | x | | | | | x |
| Apocynaceae | <i>Hoodia pilifera</i> subsp. <i>annulata</i> | LC | x | x | x | | x | x |
| Apocynaceae | <i>Huernia barbata</i> subsp. <i>barbata</i> | LC | x | x | x | | | x |
| Apocynaceae | <i>Pachypodium succulentum</i> | LC | x | x | x | | x | |
| Apocynaceae | <i>Piaranthus comptus</i> | LC | x | | x | | | x |
| Apocynaceae | <i>Piaranthus geminatus</i> subsp. <i>geminatus</i> | LC | x | | x | | | x |
| Apocynaceae | <i>Stapelia engleriana</i> | DD | x | | x | | | x |
| Apocynaceae | <i>Stapeliopsis pillansii</i> | LC | x | | x | | | x |
| Asparagaceae | <i>Asparagus aethiopicus</i> | LC | | | | | x | x |
| Asparagaceae | <i>Asparagus burchellii</i> | LC | | | | | x | |
| Asparagaceae | <i>Asparagus capensis</i> var. <i>capensis</i> | LC | | | | | x | x |
| Asparagaceae | <i>Asparagus exuvialis</i> forma <i>exuvialis</i> | NE | | | | | | x |
| Asparagaceae | <i>Asparagus mucronatus</i> | LC | | | | | x | |
| Asparagaceae | <i>Asparagus recurvispinus</i> | LC | | | | | | x |
| Asparagaceae | <i>Asparagus retrofractus</i> | LC | | | | | x | |
| Asparagaceae | <i>Asparagus striatus</i> | LC | | | | | x | |
| Asparagaceae | <i>Asparagus suaveolens</i> | LC | | | | | | x |
| Asphodelaceae | <i>Aloe claviflora</i> | LC | | | | | x | |
| Asphodelaceae | <i>Astroloba foliolosa</i> | LC | | | x | | x | |
| Asphodelaceae | <i>Bulbine frutescens</i> | LC | | | | | x | x |

| | | | | | | | |
|---------------|---|----|---|--|---|---|---|
| Asphodelaceae | <i>Bulbine triebneri</i> | LC | | | | x | |
| Asphodelaceae | <i>Gonialoe variegata</i> | LC | x | | | x | x |
| Asphodelaceae | <i>Haworthiopsis nigra</i> var. <i>nigra</i> | NE | x | | x | x | x |
| Asphodelaceae | <i>Trachyandra karrooica</i> | LC | | | | | x |
| Asphodelaceae | <i>Trachyandra</i> sp. | - | | | | x | |
| Asteraceae | <i>Amellus strigosus</i> subsp. <i>strigosus</i> | LC | | | | | x |
| Asteraceae | <i>Amphiglossa</i> sp. | - | | | | x | |
| Asteraceae | <i>Amphiglossa triflora</i> | LC | | | | x | x |
| Asteraceae | <i>Arctotis argentea</i> | LC | | | | x | |
| Asteraceae | <i>Arctotis dregei</i> | LC | | | | | x |
| Asteraceae | <i>Arctotis leiocarpa</i> | LC | | | | x | |
| Asteraceae | <i>Arctotis venusta</i> | LC | | | | | x |
| Asteraceae | <i>Athanasia minuta</i> | LC | | | | x | |
| Asteraceae | <i>Berkheya spinosa</i> | LC | | | | | x |
| Asteraceae | <i>Chrysocoma ciliata</i> | LC | | | | x | x |
| Asteraceae | <i>Cotula coronopifolia</i> | LC | | | | | x |
| Asteraceae | <i>Crassothonna protecta</i> | LC | | | | | x |
| Asteraceae | <i>Crassothonna sedifolia</i> | LC | | | | x | |
| Asteraceae | <i>Curio radicans</i> | LC | | | | x | x |
| Asteraceae | <i>Curio rowleyanus</i> | DD | | | | x | x |
| Asteraceae | <i>Cuspidia cernua</i> subsp. <i>annua</i> | LC | | | | x | x |
| Asteraceae | <i>Dicoma capensis</i> | LC | | | | x | |
| Asteraceae | <i>Eriocephalus brevifolius</i> | LC | | | | x | |
| Asteraceae | <i>Eriocephalus ericoides</i> | LC | | | | x | |
| Asteraceae | <i>Eriocephalus decussatus</i> | LC | | | | x | |
| Asteraceae | <i>Eriocephalus spinescens</i> | LC | | | | x | x |
| Asteraceae | <i>Euryops imbricatus</i> | LC | | | | | x |
| Asteraceae | <i>Felicia fascicularis</i> | LC | | | | | x |
| Asteraceae | <i>Felicia filifolia</i> | LC | | | | x | |
| Asteraceae | <i>Felicia muricata</i> subsp. <i>muricata</i> | LC | | | | x | x |
| Asteraceae | <i>Felicia</i> sp. | - | | | | x | |
| Asteraceae | <i>Garuleum bipinnatum</i> | LC | | | | x | |
| Asteraceae | <i>Gazania heterochaeta</i> | LC | | | | x | |
| Asteraceae | <i>Gazania krebsiana</i> subsp. <i>arctotoides</i> | LC | | | | | x |
| Asteraceae | <i>Gazania krebsiana</i> subsp. <i>krebsiana</i> | LC | | | | x | x |
| Asteraceae | <i>Geigeria filifolia</i> | LC | | | | | x |
| Asteraceae | <i>Gorteria alienata</i> | LC | | | | x | x |
| Asteraceae | <i>Helichrysum asperum</i> var. <i>albidulum</i> | LC | | | | | x |
| Asteraceae | <i>Helichrysum leontonyx</i> | LC | | | | x | |
| Asteraceae | <i>Helichrysum lucilioides</i> | LC | | | | x | |
| Asteraceae | <i>Helichrysum pumilio</i> | LC | | | | x | |
| Asteraceae | <i>Helichrysum rutilans</i> | LC | | | | | x |
| Asteraceae | <i>Helichrysum simulans</i> | LC | | | | | x |
| Asteraceae | <i>Helichrysum zeyheri</i> | LC | | | | x | |
| Asteraceae | <i>Ifloga glomerata</i> | LC | | | | | x |
| Asteraceae | <i>Kleinia longiflora</i> | LC | | | | x | |
| Asteraceae | <i>Lasiopogon glomerulatus</i> | LC | | | | | x |
| Asteraceae | <i>Lasiopogon muscoides</i> | LC | | | | x | |
| Asteraceae | <i>Leysera tenella</i> | LC | | | | x | x |
| Asteraceae | <i>Macledium spinosum</i> | LC | | | | | x |
| Asteraceae | <i>Oedera humilis</i> | LC | | | | x | x |
| Asteraceae | <i>Oedera oppositifolia</i> | LC | | | | x | |
| Asteraceae | <i>Oncosiphon piluliferus</i> | LC | | | | | x |
| Asteraceae | <i>Osteospermum acanthospermum</i> | LC | | | | x | |
| Asteraceae | <i>Osteospermum calendulaceum</i> | LC | | | | | x |
| Asteraceae | <i>Osteospermum microphyllum</i> | LC | | | | | x |
| Asteraceae | <i>Osteospermum scariosum</i> var. <i>scariosum</i> | NE | | | | x | x |
| Asteraceae | <i>Osteospermum sinuatum</i> var. <i>sinuatum</i> | LC | | | | x | x |
| Asteraceae | <i>Osteospermum</i> sp. | - | | | | x | |
| Asteraceae | <i>Osteospermum spinescens</i> | LC | | | | x | |
| Asteraceae | <i>Pegolettia retrofracta</i> | LC | | | | x | |
| Asteraceae | <i>Pentzia incana</i> | LC | | | | x | x |
| Asteraceae | <i>Pentzia quinquefida</i> | LC | | | | x | |
| Asteraceae | <i>Pentzia sphaerocephala</i> | LC | | | | x | |
| Asteraceae | <i>Phymaspermum parvifolium</i> | LC | | | | | x |
| Asteraceae | <i>Pteronia adenocarpa</i> | LC | | | | x | x |
| Asteraceae | <i>Pteronia ciliata</i> | LC | | | | x | |
| Asteraceae | <i>Pteronia empetrifolia</i> | LC | | | | x | x |
| Asteraceae | <i>Pteronia glauca</i> | LC | | | | x | x |
| Asteraceae | <i>Pteronia glomerata</i> | LC | | | | | x |

| | | | | | | | |
|-----------------|---|----|---|--|----|---|---|
| Asteraceae | <i>Pteronia paniculata</i> | LC | | | | x | |
| Asteraceae | <i>Pteronia sordida</i> | LC | | | | x | |
| Asteraceae | <i>Pteronia staehelinoides</i> | LC | | | | x | |
| Asteraceae | <i>Pteronia tricephala</i> | LC | | | | x | |
| Asteraceae | <i>Pteronia viscosa</i> | LC | | | | x | x |
| Asteraceae | <i>Senecio acaulis</i> | LC | | | | x | |
| Asteraceae | <i>Senecio acutifolius</i> | LC | | | | | x |
| Asteraceae | <i>Senecio angustifolius</i> | LC | | | | | x |
| Asteraceae | <i>Senecio</i> sp. | - | | | | x | |
| Asteraceae | <i>Seriphium plumosum</i> | - | | | | | x |
| Asteraceae | <i>Sonchus</i> sp. | - | | | | x | |
| Asteraceae | <i>Tagetes minuta</i> | NE | | | X | x | |
| Asteraceae | <i>Ursinia nana</i> subsp. <i>nana</i> | LC | | | | x | x |
| Bignoniaceae | <i>Rhigozum obovatum</i> | LC | | | | x | |
| Brassicaceae | <i>Cardamine africana</i> | LC | | | | | x |
| Brassicaceae | <i>Heliophila crithmifolia</i> | LC | | | | | x |
| Brassicaceae | <i>Lepidium africanum</i> subsp. <i>africanum</i> | LC | | | | x | x |
| Brassicaceae | <i>Lepidium africanum</i> subsp. <i>divaricatum</i> | LC | | | | | x |
| Brassicaceae | <i>Lepidium desertorum</i> | LC | | | | | x |
| Brassicaceae | <i>Lepidium englerianum</i> | LC | | | | | x |
| Brassicaceae | <i>Sisymbrium capense</i> | LC | | | | | x |
| Cactaceae | <i>Cylindropuntia pallida</i> | NE | | | 1b | | x |
| Cactaceae | <i>Opuntia aurantiaca</i> | NE | | | 1b | x | |
| Cactaceae | <i>Opuntia ficus-indica</i> | NE | | | 1b | x | |
| Capparaceae | <i>Cadaba aphylla</i> | LC | | | | x | |
| Caryophyllaceae | <i>Dianthus micropetalus</i> | LC | | | | x | |
| Celastraceae | <i>Gymnosporia buxifolia</i> | LC | | | | | x |
| Celastraceae | <i>Gymnosporia linearis</i> subsp. <i>linearis</i> | LC | | | | | x |
| Celastraceae | <i>Gymnosporia szyszyłowiczii</i> | LC | | | | x | |
| Convolvulaceae | <i>Convolvulus sagittatus</i> | LC | | | | | x |
| Crassulaceae | <i>Adromischus filicaulis</i> | LC | | | x | | x |
| Crassulaceae | <i>Adromischus filicaulis</i> subsp. <i>marlothii</i> | LC | | | x | | x |
| Crassulaceae | <i>Adromischus liebenbergii</i> | LC | | | x | | x |
| Crassulaceae | <i>Adromischus</i> sp. | - | | | | x | |
| Crassulaceae | <i>Adromischus triflorus</i> | LC | | | x | x | x |
| Crassulaceae | <i>Crassula capitella</i> | LC | | | | x | |
| Crassulaceae | <i>Crassula corallina</i> subsp. <i>corallina</i> | LC | | | | x | x |
| Crassulaceae | <i>Crassula deltoidea</i> | LC | | | | x | |
| Crassulaceae | <i>Crassula hemisphaerica</i> | LC | | | x | x | |
| Crassulaceae | <i>Crassula muscosa</i> | LC | | | | x | |
| Crassulaceae | <i>Crassula pyramidalis</i> | LC | x | | x | x | |
| Crassulaceae | <i>Crassula subaphylla</i> | LC | | | | x | |
| Cucurbitaceae | <i>Cucumis africanus</i> | LC | | | | | x |
| Cyperaceae | <i>Afroscirpoides dioecus</i> | LC | | | | x | |
| Cyperaceae | <i>Cyperus</i> sp. | - | | | | x | |
| Cyperaceae | <i>Fuirena</i> sp. | - | | | | x | |
| Cyperaceae | <i>Pseudoschoenus inanis</i> | LC | | | | x | |
| Cyperaceae | <i>Schoenoplectus decipiens</i> | LC | | | | | x |
| Ebenaceae | <i>Diospyros lycioides</i> subsp. <i>lycioides</i> | LC | | | | x | x |
| Ebenaceae | <i>Euclea undulata</i> | LC | | | | x | x |
| Ericaceae | <i>Erica bolusanthus</i> | LC | | | | | x |
| Euphorbiaceae | <i>Euphorbia decepta</i> | LC | | | x | x | |
| Euphorbiaceae | <i>Euphorbia ferox</i> | LC | | | x | x | |
| Euphorbiaceae | <i>Euphorbia mauritanica</i> | LC | | | x | x | |
| Euphorbiaceae | <i>Euphorbia pillansii</i> | LC | | | x | x | |
| Euphorbiaceae | <i>Euphorbia stellispina</i> | LC | | | x | x | |
| Euphorbiaceae | <i>Euphorbia suffulta</i> | LC | | | x | x | |
| Fabaceae | <i>Acacia podalyriifolia</i> | NE | | | x | | x |
| Fabaceae | <i>Indigofera sessilifolia</i> | LC | | | | | x |
| Fabaceae | <i>Lessertia annularis</i> | LC | | | | | x |
| Fabaceae | <i>Lessertia fruticosa</i> | | | | | x | |
| Fabaceae | <i>Lessertia</i> sp. | - | | | | x | |
| Fabaceae | <i>Lotononis pungens</i> | LC | | | | | x |
| Fabaceae | <i>Lotononis</i> sp. | - | | | | x | |
| Fabaceae | <i>Medicago laciniata</i> var. <i>laciniata</i> | NE | | | | | x |
| Fabaceae | <i>Melolobium canescens</i> | LC | | | | | x |
| Fabaceae | <i>Melolobium</i> cf. <i>microphyllum</i> | LC | | | | x | |
| Fabaceae | <i>Prosopis glandulosa</i> var. <i>glandulosa</i> | NE | | | 1b | | x |
| Fabaceae | <i>Psoralea aphylla</i> | LC | | | | | x |
| Fabaceae | <i>Vachellia karroo</i> | LC | | | | x | |

| | | | | | | |
|----------------|---|----|---|---|---|---|
| Gentianaceae | <i>Sebaea</i> sp. | - | | | x | |
| Geraniaceae | <i>Erodium cicutarium</i> | NE | | x | x | x |
| Geraniaceae | <i>Monsonia camdeboensis</i> | LC | | | x | x |
| Geraniaceae | <i>Monsonia crassicaule</i> | LC | | | x | |
| Geraniaceae | <i>Monsonia salmoniflora</i> | LC | | | | x |
| Geraniaceae | <i>Pelargonium carnosum</i> subsp. <i>carnosum</i> | LC | x | | x | x |
| Geraniaceae | <i>Pelargonium laxum</i> | LC | x | | x | |
| Geraniaceae | <i>Pelargonium malacoides</i> | LC | x | | | x |
| Hyacinthaceae | <i>Albuca canadensis</i> | LC | | | | x |
| Hyacinthaceae | <i>Albuca exuviata</i> | LC | | | | x |
| Hyacinthaceae | <i>Albuca maxima</i> | LC | | | x | |
| Hyacinthaceae | <i>Albuca secunda</i> | LC | | | | x |
| Hyacinthaceae | <i>Albuca</i> sp. | - | | | x | |
| Hyacinthaceae | <i>Albuca unifolia</i> | LC | | | | x |
| Hyacinthaceae | <i>Dipcadi</i> sp. | - | | | x | |
| Hyacinthaceae | <i>Drimia anomala</i> | LC | | | | x |
| Hyacinthaceae | <i>Drimia intricata</i> | LC | | | x | |
| Hyacinthaceae | <i>Drimia physodes</i> | LC | | | | x |
| Hyacinthaceae | <i>Drimia</i> sp. | - | | | x | |
| Hyacinthaceae | <i>Drimia toxicaria</i> | LC | | | | x |
| Hyacinthaceae | <i>Lachenalia aurioliae</i> | LC | x | | | x |
| Hyacinthaceae | <i>Lachenalia bowkeri</i> | LC | x | | | x |
| Hyacinthaceae | <i>Lachenalia</i> sp. | - | | | | x |
| Hyacinthaceae | <i>Ledebouria</i> sp. | - | | | x | |
| Hyacinthaceae | <i>Ornithogalum</i> sp. | - | | | x | |
| Iridaceae | <i>Babiana sambucina</i> subsp. <i>sambucina</i> | LC | x | x | | x |
| Iridaceae | <i>Ixia orientalis</i> | LC | x | x | | x |
| Iridaceae | <i>Moraea</i> sp. | - | x | | x | |
| Iridaceae | <i>Romulea fibrosa</i> | LC | x | x | | x |
| Iridaceae | <i>Tritonia florentiae</i> | LC | x | x | | x |
| Iridaceae | <i>Tritonia tugwelliae</i> | LC | x | x | | x |
| Kewaceae | <i>Kewa bowkeriana</i> | LC | | | | x |
| Kewaceae | <i>Kewa salsoloides</i> | LC | | | x | |
| Lamiaceae | <i>Salvia verbenaca</i> | LC | | | | x |
| Limeaceae | <i>Limeum aethiopicum</i> var. <i>aethiopicum</i> | NE | | | x | x |
| Loranthaceae | <i>Moquiiniella rubra</i> | LC | | | | x |
| Malvaceae | <i>Grewia robusta</i> | LC | | | x | x |
| Malvaceae | <i>Hermannia burkei</i> | LC | | | | x |
| Malvaceae | <i>Hermannia coccocarpa</i> | LC | | | x | x |
| Malvaceae | <i>Hermannia comosa</i> | LC | | | x | |
| Malvaceae | <i>Hermannia cuneifolia</i> var. <i>cuneifolia</i> | LC | | | x | x |
| Malvaceae | <i>Hermannia cuneifolia</i> var. <i>glabrescens</i> | LC | | | | x |
| Malvaceae | <i>Hermannia desertorum</i> | LC | | | x | x |
| Malvaceae | <i>Hermannia grandiflora</i> | LC | | | x | x |
| Malvaceae | <i>Hermannia jacobaeifolia</i> | LC | | | | x |
| Malvaceae | <i>Hermannia linearifolia</i> | LC | | | x | x |
| Malvaceae | <i>Hermannia</i> sp. | - | | | x | |
| Malvaceae | <i>Hermannia spinosa</i> | LC | | | x | |
| Malvaceae | <i>Hermannia vestita</i> | LC | | | x | |
| Malvaceae | <i>Hibiscus pusillus</i> | LC | | | | x |
| Malvaceae | <i>Malva parviflora</i> var. <i>parviflora</i> | NE | | x | x | x |
| Malvaceae | <i>Radyera urens</i> | LC | | | | x |
| Meliantaceae | <i>Melianthus comosus</i> | LC | | | x | x |
| Molluginaceae | <i>Pharnaceum</i> sp. | - | | | x | |
| Papaveraceae | <i>Argemone achroleuca</i> | NE | | x | x | |
| Pedaliaceae | <i>Sesamum capense</i> | LC | | | x | |
| Plantaginaceae | <i>Plantago cafra</i> | LC | | | | x |
| Poaceae | <i>Aristida adscensionis</i> | LC | | | x | |
| Poaceae | <i>Aristida congesta</i> subsp. <i>congesta</i> | LC | | | x | x |
| Poaceae | <i>Aristida diffusa</i> | LC | | | x | |
| Poaceae | <i>Bromus pectinatus</i> | LC | | | x | x |
| Poaceae | <i>Cenchrus ciliaris</i> | LC | | | x | |
| Poaceae | <i>Chloris virgata</i> | LC | | | x | |
| Poaceae | <i>Cynodon incompletus</i> | LC | | | x | |
| Poaceae | <i>Digitaria argyrograpta</i> | LC | | | x | x |
| Poaceae | <i>Digitaria eriantha</i> | LC | | | x | |
| Poaceae | <i>Ehrharta</i> sp. | - | | | x | |
| Poaceae | <i>Enneapogon cenchrroides</i> | LC | | | x | |
| Poaceae | <i>Enneapogon desvauxii</i> | LC | | | x | x |
| Poaceae | <i>Eragrostis curvula</i> | LC | | | | x |

| | | | | |
|------------------|---|----|----|---|
| Poaceae | <i>Eragrostis homomalla</i> | LC | | x |
| Poaceae | <i>Eragrostis obtusa</i> | LC | | x |
| Poaceae | <i>Eragrostis procumbens</i> | LC | | x |
| Poaceae | <i>Eragrostis rotifer</i> | LC | | x |
| Poaceae | <i>Eragrostis</i> sp. | - | | x |
| Poaceae | <i>Fingerhuthia africana</i> | LC | | x |
| Poaceae | <i>Hordeum murinum</i> subsp. <i>leporinum</i> | NE | x | x |
| Poaceae | <i>Leptochloa fusca</i> | LC | | x |
| Poaceae | <i>Melica decumbens</i> | LC | | x |
| Poaceae | <i>Oropetium capense</i> | LC | | x |
| Poaceae | <i>Pentameris cf airoides</i> | LC | | x |
| Poaceae | <i>Polypogon monspeliensis</i> | NE | x | x |
| Poaceae | <i>Schismus barbatus</i> | LC | | x |
| Poaceae | <i>Setaria verticillata</i> | LC | | x |
| Poaceae | <i>Sporobolus fimbriatus</i> | LC | | x |
| Poaceae | <i>Sporobolus ioclados</i> | LC | | x |
| Poaceae | <i>Sporobolus</i> sp. | - | | x |
| Poaceae | <i>Stipagrostis ciliata</i> | LC | | x |
| Poaceae | <i>Stipagrostis namaquensis</i> | LC | | x |
| Poaceae | <i>Stipagrostis obtusa</i> | LC | | x |
| Poaceae | <i>Stipagrostis uniplumis</i> | LC | | x |
| Poaceae | <i>Tragus berteronianus</i> | LC | | x |
| Poaceae | <i>Tragus koelerioides</i> | LC | | x |
| Poaceae | <i>Tragus racemosus</i> | LC | | x |
| Polygalaceae | <i>Polygala myrtifolia</i> var. <i>myrtifolia</i> | LC | | x |
| Polygonaceae | <i>Emex australis</i> | LC | | x |
| Polygonaceae | <i>Persicaria lapathifolia</i> | LC | | x |
| Restionaceae | <i>Elegia filacea</i> | LC | | x |
| Restionaceae | <i>Thamnochortus cinereus</i> | LC | | x |
| Rosaceae | <i>Cliffortia</i> sp. | - | | x |
| Rubiaceae | <i>Kohautia cynanchica</i> | LC | | x |
| Rubiaceae | <i>Nenax microphylla</i> | LC | | x |
| Salicaceae | <i>Dovyalis caffra</i> | LC | | x |
| Santalaceae | <i>Thesium lacinulatum</i> | LC | | x |
| Santalaceae | <i>Viscum rotundifolium</i> | LC | | x |
| Scrophulariaceae | <i>Aptosimum indivisum</i> | LC | | x |
| Scrophulariaceae | <i>Chaenostoma archeri</i> | LC | | x |
| Scrophulariaceae | <i>Chaenostoma halimifolium</i> | LC | | x |
| Scrophulariaceae | <i>Diascia decipiens</i> | LC | | x |
| Scrophulariaceae | <i>Diascia runcinata</i> | LC | | x |
| Scrophulariaceae | <i>Jamesbrittenia atropurpurea</i> subsp. <i>atropurpurea</i> | LC | | x |
| Scrophulariaceae | <i>Jamesbrittenia</i> sp. | - | | x |
| Scrophulariaceae | <i>Jamesbrittenia tenuifolia</i> | LC | | x |
| Scrophulariaceae | <i>Jamesbrittenia tortuosa</i> | LC | | x |
| Scrophulariaceae | <i>Limosella africana</i> var. <i>africana</i> | LC | | x |
| Scrophulariaceae | <i>Lyperia tristis</i> | LC | | x |
| Scrophulariaceae | <i>Manulea chrysantha</i> | LC | | x |
| Scrophulariaceae | <i>Manulea</i> sp. | - | | x |
| Scrophulariaceae | <i>Nemesia linearis</i> | LC | | x |
| Scrophulariaceae | <i>Nemesia</i> sp. | - | | x |
| Scrophulariaceae | <i>Peliostomum leucorrhizum</i> | LC | | x |
| Scrophulariaceae | <i>Selago divaricata</i> | LC | | x |
| Scrophulariaceae | <i>Selago</i> sp. | - | | x |
| Scrophulariaceae | <i>Zaluzianskya venusta</i> | LC | | x |
| Solanaceae | <i>Datura ferox</i> | NE | 1b | x |
| Solanaceae | <i>Lycium cinereum</i> | LC | | x |
| Solanaceae | <i>Lycium horridum</i> | LC | | x |
| Solanaceae | <i>Lycium oxycarpum</i> | LC | | x |
| Solanaceae | <i>Lycium pumilum</i> | LC | | x |
| Solanaceae | <i>Solanum giftbergense</i> | LC | | x |
| Solanaceae | <i>Solanum</i> sp. | - | | x |
| Thesiaceae | <i>Lacomucinaea lineatum</i> | LC | | x |
| Thymelaeaceae | <i>Gnidia deserticola</i> | LC | | x |
| Thymelaeaceae | <i>Lasiosiphon deserticola</i> | LC | | x |
| Urticaceae | <i>Forsskaolea candida</i> | LC | | x |
| Zygophyllaceae | <i>Augea capensis</i> | LC | | x |
| Zygophyllaceae | <i>Roepora incrustata</i> | LC | | x |
| Zygophyllaceae | <i>Roepora lichtensteiniana</i> | LC | | x |
| Zygophyllaceae | <i>Roepora microphyllum</i> | LC | | x |
| Zygophyllaceae | <i>Roepora sessilifolia</i> | LC | | x |

| | | | | |
|----------------|----------------------------------|----|---|---|
| Zygophyllaceae | <i>Tetraena chrysopteron</i> | LC | x | x |
| Zygophyllaceae | <i>Tetraena lichtensteiniana</i> | LC | x | |
| Zygophyllaceae | <i>Tetraena rigida</i> | LC | x | |

APPENDIX C

ANIMAL SPECIES CHECKLISTS (ADU
DATABASE)

Database: 3222 CB, CD, DA, DB, DC, DD; 3322 AB, BA, BB

IUCN red list category

Western Cape Nature and Environmental Conservation Ordinance (WCNECO)

CITES

NEMBA (ToPS) - Threatened or Protected Species

| Family | Scientific name | Common name | IUCN RSA | WCNCO Sch2 | CITES WELVIDA (ToPS) |
|---|---------------------------------|----------------------------|----------|------------|----------------------|
| MAMMALS | | | | | |
| ORDER: ARTIODACTYLA | | | | | |
| Bovidae | <i>Antidorcas marsupialis</i> | Springbok | LC | x | |
| Bovidae | <i>Kobus ellipsiprymnus</i> | Waterbuck | LC | x | |
| Bovidae | <i>Oreotragus oreotragus</i> | Klipspringer | LC | x | |
| Bovidae | <i>Raphicerus campestris</i> | Steenbok | LC | x | |
| Bovidae | <i>Raphicerus melanotis</i> | Cape grysbok | LC | x | |
| Bovidae | <i>Taurotragus oryx</i> | Cape eland | LC | x | |
| ORDER: CARNIVORA (CARNIVORES) | | | | | |
| Canidae | <i>Vulpes chama</i> | Cape fox | LC | x | x |
| Hyaenidae | <i>Proteles cristata</i> | Aardwolf | LC | x | |
| Viverridae | <i>Genetta genetta</i> | Small-spotted genet | LC | | |
| ORDER: PRIMATES | | | | | |
| Cercopithecidae | <i>Papio ursinus</i> | Chacma baboon | LC | | |
| ORDER: RODENTIA (RODENTS) | | | | | |
| Hystricidae | <i>Hystrix africaeaustralis</i> | Cape porcupine | LC | | |
| Muridae | <i>Desmodillus auricularis</i> | Cape short-tailed gerbil | LC | | |
| Muridae | <i>Otomys unisulcatus</i> | Karoo bush rat | LC | | |
| Muridae | <i>Parotomys brantsii</i> | Brants's whistling rat | LC | | |
| Muridae | <i>Parotomys littledalei</i> | Littledale's whistling rat | NT | | |
| ORDER: TUBULIDENTATA | | | | | |
| Orycteropodidae | <i>Orycteropus afer</i> | Aardvark | LC | x | |
| ORDER: HYRACOIDEA (HYRAXES) | | | | | |
| Procaviidae | <i>Procavia capensis</i> | Rock hyrax | LC | | |
| ORDER: LAGOMORPHA (HARES AND RABBITS) | | | | | |
| Leporidae | <i>Lepus saxatilis</i> | Scrub hare | LC | | |
| ORDER: MACROSCHELIDAE (ELEPHANT SHREWS) | | | | | |
| Macroscelididae | <i>Elephantulus edwardii</i> | Cape elephant shrew | LC | | |

| | | | | | |
|---------------------------------|--|-------------------------------------|----|---|--------|
| ORDER: EULIPTYPHIA (SHREWS) | | | | | |
| Soricidae | <i>Myosorex varius</i> | Forest shrew | LC | | |
| REPTILES | | | | | |
| ORDER: SQUAMATA | | | | | |
| SUB-ORDER: LACERTILIA (LIZARDS) | | | | | |
| Agamidae | <i>Agama aculeata aculeata</i> | Common ground agama | LC | x | |
| Agamidae | <i>Agama atra</i> | Southern rock agama | LC | x | |
| Chamaeleonidae | <i>Chamaeleo namaquensis</i> | Namaqua chameleon | LC | x | |
| Cordylidae | <i>Cordylus aridus</i> | Eastern dwarf girdled lizard | LC | x | |
| Cordylidae | <i>Karusasaurus polyzonus</i> | Karoo girdled lizard | LC | x | |
| Gekkonidae | <i>Chondrodactylus angulifer angulifer</i> | Common giant ground gecko | LC | x | |
| Gekkonidae | <i>Chondrodactylus bibronii</i> | Bibron's gecko | LC | x | |
| Gekkonidae | <i>Pachydactylus capensis</i> | Cape gecko | LC | x | |
| Gekkonidae | <i>Pachydactylus geitje</i> | Ocellated gecko | LC | x | |
| Gekkonidae | <i>Pachydactylus maculatus</i> | Spotted gecko | LC | x | |
| Gekkonidae | <i>Pachydactylus mariquensis</i> | Marico gecko | LC | x | |
| Gekkonidae | <i>Pachydactylus purcelli</i> | Purcell's gecko | LC | x | |
| Gekkonidae | <i>Ptenopus garrulus maculatus</i> | Spotted barking gecko | LC | x | |
| Lacertidae | <i>Meroles suborbitalis</i> | Spotted desert lizard | LC | x | |
| Lacertidae | <i>Nucras livida</i> | Karoo sandveld lizard | LC | x | |
| Lacertidae | <i>Pedioplanis laticeps</i> | Karoo sand lizard | LC | x | |
| Lacertidae | <i>Pedioplanis lineoocellata pulchella</i> | Common sand lizard | LC | x | |
| Lacertidae | <i>Pedioplanis namaquensis</i> | Namaqua sand lizard | LC | x | |
| Scincidae | <i>Trachylepis capensis</i> | Cape skink | LC | x | |
| Scincidae | <i>Trachylepis occidentalis</i> | Western three-striped skink | LC | x | |
| Scincidae | <i>Trachylepis sulcata sulcata</i> | Western rock skink | LC | x | |
| Scincidae | <i>Trachylepis variegata</i> | Variiegated skink | LC | x | |
| SUB-ORDER: SERPENTES (SNAKES) | | | | | |
| Elapidae | <i>Aspidelaps lubricus lubricus</i> | Coral shield cobra | LC | | |
| Elapidae | <i>Naja nivea</i> | Cape cobra | LC | | |
| Lamprophiidae | <i>Psammophis notostictus</i> | Karoo sand snake | LC | | |
| Viperidae | <i>Bitis arietans arietans</i> | Puff adder | LC | | |
| ORDER: TESTUDINATA (CHELONIANS) | | | | | |
| Testudinidae | <i>Chersina angulata</i> | Angulate tortoise | LC | x | App II |
| Testudinidae | <i>Chersobius boulengeri</i> | Karoo padloper/Karoo dwarf tortoise | EN | x | App II |
| Testudinidae | <i>Psammobates tentorius tentorius</i> | Karoo tent tortoise | - | x | App II |
| Testudinidae | <i>Psammobates tentorius verroxii</i> | Verrox's tent tortoise | - | x | App II |
| Testudinidae | <i>Stigmochelys pardalis</i> | Leopard tortoise | LC | x | App II |
| Pelomedusidae | <i>Pelomedusa galeata</i> | SA helmeted terrapin | NE | | |
| Frogs | | | | | |
| Bufonidae | <i>Vandijkophrynus garipeensis</i> | Karoo toad | LC | x | |
| Pipidae | <i>Xenopus laevis</i> | Common platanna | LC | x | |
| Pyxicephalidae | <i>Amietia fuscigula</i> | Cape river frog | LC | x | |
| Pyxicephalidae | <i>Cacosternum boettgeri</i> | Common caco | LC | x | |
| Pyxicephalidae | <i>Pyxicephalus adspersus</i> | Giant bull frog | NT | x | x |
| Pyxicephalidae | <i>Tomopterna delalandii</i> | Cape sand frog | LC | x | |
| Dung beetles | | | | | |
| Scarabaeidae | <i>Digitonthophagus gazella</i> | | | | |
| Scarabaeidae | <i>Epirinus aeneus</i> | | | | |
| Scarabaeidae | <i>Epirinus striatus</i> | | | | |
| Scarabaeidae | <i>Euonthophagus vicarius</i> | | | | |
| Scarabaeidae | <i>Gymnopleurus humanus</i> | | | | |
| Scarabaeidae | <i>Onthophagus albipennis</i> | | | | |
| Scarabaeidae | <i>Onthophagus cameloides</i> | | | | |
| Scarabaeidae | <i>Onthophagus peringueyi</i> | | | | |
| Scarabaeidae | <i>Phalops rufosignatus</i> | | | | |
| Scarabaeidae | <i>Scarabaeus sp.</i> | | | | |
| Scarabaeidae | <i>Scarabaeus (Sceliages) gagates</i> | | | | |
| Scarabaeidae | <i>Scarabaeus bohemani</i> | | | | |
| Scarabaeidae | <i>Scarabaeus kalaharicus</i> | | | | |
| Scarabaeidae | <i>Scarabaeus karrooensis</i> | | | | |
| Scarabaeidae | <i>Scarabaeus megaparvulus</i> | | | | |
| Scarabaeidae | <i>Scarabaeus satyrus</i> | | | | |

| | | | |
|--------------------|---|-------------------------------|----|
| Scarabaeidae | <i>Scarabaeus viator</i> | | |
| Lepidoptera | | | |
| Geometridae | <i>Acanthovalva focularia</i> | | LC |
| Hesperiidae | <i>Spialia asterodia</i> | Star sandman | LC |
| Hesperiidae | <i>Spialia nanus</i> | Dwarf sandman | LC |
| Hesperiidae | <i>Tsitana tulbagha kaplani</i> | Tulbagh sylph | LC |
| Lycaenidae | <i>Aloeides damarensis damarensis</i> | Damara russet | LC |
| Lycaenidae | <i>Aloeides depicta</i> | Depicta russet | LC |
| Lycaenidae | <i>Aloeides pierus</i> | Veined russet | LC |
| Lycaenidae | <i>Aloeides vansoni</i> | Roggeveld russet | LC |
| Lycaenidae | <i>Anthene definita definita</i> | Steel-blue-ciliate blue | LC |
| Lycaenidae | <i>Argyraspodes argyraspis</i> | Warrior silver-spotted copper | LC |
| Lycaenidae | <i>Azanus ubaldus</i> | Velvet-spotted babul blue | LC |
| Lycaenidae | <i>Brephidium metophis</i> | Tinktinkie pygmy blue | LC |
| Lycaenidae | <i>Cacyreus dicksoni</i> | Karoo geranium bronze | LC |
| Lycaenidae | <i>Chrysoritis chrysaor</i> | Burnished opal | LC |
| Lycaenidae | <i>Chrysoritis midas</i> | Midas opal | LC |
| Lycaenidae | <i>Chrysoritis pan lysander</i> | Lysander opal | LC |
| Lycaenidae | <i>Chrysoritis turneri turneri</i> | Karoo opal | LC |
| Lycaenidae | <i>Crudaria leroma</i> | Silver-spotted grey | LC |
| Lycaenidae | <i>lolaus mimosae mimosae</i> | Mimosa sapphire | LC |
| Lycaenidae | <i>Lepidochrysops australis</i> | Southern giant cupid | LC |
| Lycaenidae | <i>Lepidochrysops ketsi ketsi</i> | Ketsi giant cupid | LC |
| Lycaenidae | <i>Lepidochrysops ortygia</i> | Koppie giant cupid | LC |
| Lycaenidae | <i>Lepidochrysops robertsoni</i> | Robertson's giant cupid | LC |
| Lycaenidae | <i>Leptomyrina lara</i> | Cape black-eye | LC |
| Lycaenidae | <i>Leptotes brevidentatus</i> | Short-toothed zebra blue | LC |
| Lycaenidae | <i>Phasis clavum clavum</i> | Namaqua arrowhead | LC |
| Lycaenidae | <i>Stugeta bowkeri bowkeri</i> | Bowker's marbled sapphire | LC |
| Lycaenidae | <i>Thestor brachycerus dukei</i> | Duke's skolly | LC |
| Lycaenidae | <i>Trimenia argyroplaga argyroplaga</i> | Large silver-spotted copper | LC |
| Lycaenidae | <i>Tylopaedia sardonix sardonix</i> | King copper | LC |
| Noctuidae | <i>Helicoverpa armigera</i> | | |
| Nymphalidae | <i>Charaxes pelias</i> | Protea charaxes | LC |
| Nymphalidae | <i>Danaus chrysippus orientis</i> | African plain tiger | LC |
| Nymphalidae | <i>Pseudonympha trimenii trimenii</i> | White-netted brown | LC |
| Nymphalidae | <i>Stygionympha irrorata</i> | Karoo hillside brown | LC |
| Nymphalidae | <i>Tarsocera fulvina</i> | Karoo spring widow | LC |
| Nymphalidae | <i>Vanessa cardui</i> | Painted lady | LC |
| Pieridae | <i>Belenois aurota</i> | Pioneer caper white | LC |
| Pieridae | <i>Pontia helice helice</i> | Southern meadow white | LC |
| Saturnidae | <i>Imbrasia tyrreha</i> | | |
| Spingidae | <i>Agrilus convolvuli</i> | | |
| Odonata | | | |
| Libellulidae | <i>Sympetrum fonscolombii</i> | Red-veined Darter or Nomad | LC |
| Scorpions | | | |
| Buthidae | <i>Parabuthus schlechteri</i> | | |
| Buthidae | <i>Uroplectes gracillior</i> | | |
| Hormuridae | <i>Hadogenes trichiurus</i> | | |
| Scorpionidae | <i>Opisthophthalmus karrooensis</i> | | |
| Spiders | | | |
| Theraphosidae | <i>Harpactira namaquensis</i> | Baboon spider | |

APPENDIX D

Curriculum vitae: DR NOEL VAN ROOYEN

1. Biographical information

| | |
|---------------------------|---|
| Surname | Van Rooyen |
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| e-mail | noel@ekotrust.co.za |
| Current position | Member of Ekotrust cc |
| Professional registration | Botanical Scientist : Pr.Sci.Nat; Reg no. 401430/83 |

Academic qualifications include BSc (Agric), BSc (Honours), MSc (1978) and DSc degrees (1984) in Plant Ecology at the University of Pretoria, South Africa. Until 1999 I was Professor in Plant Ecology at the University of Pretoria and at present I am a member of Ekotrust cc.

2. Publications

I am the author/co-author of 128 peer reviewed research publications in national and international scientific journals and was supervisor or co-supervisor of 9 PhD and 33 MSc students. More than 350 projects were undertaken by Ekotrust cc as consultant over a period of more than 40 years.

Books

VAN ROOYEN, N. 2001. *Flowering plants of the Kalahari dunes*. Ekotrust CC, Pretoria. (In collaboration with H. Bezuidenhout & E. de Kock).

VAN ROOYEN, N. & VAN ROOYEN, M.W. 2019. *Flowering plants of the southern Kalahari*. Somerset West.

Author / co-author of various chapters on the Savanna and Grassland Biomes in:

LOW, B. & REBELO, A.R. 1996. *Vegetation types of South Africa, Lesotho and Swaziland*, Department of Environmental Affairs and Tourism, Pretoria.

KNOBEL, J. (Ed.) 1999, 2006. *The Magnificent Natural Heritage of South Africa*. (Chapters on the Kalahari and Lowveld).

VAN DER WALT, P.T. 2010. *Bushveld*. Briza, Pretoria. (Chapter on Sour Bushveld).

Contributed to chapters on vegetation, habitat evaluation and veld management in the book:

BOTHMA, J. du P. & DU TOIT, J.G. (Eds). 2016. *Game Ranch Management*. 5th edition. Van Schaik, Pretoria.

Co-editor of the book:

BOTHMA, J. du P. & VAN ROOYEN, N. (eds). 2005. *Intensive wildlife production in southern Africa*. Van Schaik, Pretoria.

3. Ekotrust CC: Core Services

Ekotrust CC specializes in vegetation surveys, classification and mapping, wildlife management, wildlife production and economic assessments, vegetation ecology, veld condition assessment, carrying capacity, biodiversity assessments, rare species assessments, carbon pool assessments and alien plant management.

4. Examples of projects previously undertaken

Numerous vegetation surveys and vegetation impact assessments for Baseline, Scoping and Environmental Impact Assessments (BAs & EIA's) were made both locally and internationally.

Numerous projects have been undertaken in game ranches and conservation areas covering aspects such as vegetation surveys, range condition assessments and wildlife management. Of note is the Kgalagadi Transfrontier Park; iSimangaliso Wetland Park, Ithala Game Reserve, Phinda Private Game Reserve, Mabula Game Reserve, Tswalu Kalahari Desert Reserve, Maremani Nature Reserve and Associate Private Nature Reserve (previously Timbavati, Klaserie & Umbabat Private Game Reserve).

Involvement in various research programmes: vegetation of the northern Kruger National Park, Savanna Ecosystem Project at Nylsvley, Limpopo; Kuiseb River Project (Namibia); Grassland Biome Project; Namaqualand and Kruger Park Rivers Ecosystem research programme.

5. Selected references of other projects done by Ekotrust CC

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- VAN ROOYEN, N, VAN ROOYEN, M.W. & GROBLER, A. 2004. Habitat evaluation and stocking rates for wildlife and livestock - PAN TRUST Ranch, Ghanzi, Botswana.
- VAN ROOYEN, N. 2004. Vegetation and wildlife of the Greater St Lucia Wetland Park, KZN.
- VAN ROOYEN, N. & VAN ROOYEN, M.W. 2008. Vegetation classification, habitat evaluation and wildlife management of the proposed Royal Big Six Nsubane-Pongola Transfrontier Park, Swaziland. Ekotrust cc.
- VAN ROOYEN, N., VAN DER MERWE, H. & Van Rooyen, M.W. 2011. The vegetation of the NECSA Vaalputs site. Report to NECSA.
- VAN ROOYEN, N. & VAN ROOYEN, M.W. 2014. Ecological evaluation and wildlife management on Ndzalama Nature Reserve and adjacent farms, Gravelotte, Limpopo province.
- VAN ROOYEN, N. & VAN ROOYEN, M.W. 2016. Ecological evaluation of the farm Springbokoog in the Van Wyksvlei region of Northern Cape, including a habitat assessment for the introduction of black rhinoceros. Ekotrust.
- VAN ROOYEN, M.W. & VAN ROOYEN, N. & VAN DEN BERG, H. 2016. Kathu Bushveld study: Research offset for first development phase of Adams Solor Energy Facility. Project conducted for Department of Environment and Nature Conservation Northern Cape (DENC) and the Department of Agriculture, Forestry and Fisheries (DAFF).
- VAN ROOYEN, N. & VAN ROOYEN, M.W. 2018. Environmental screening study for the proposed essential oils and Moringa oil enterprise on Ferndale farm, Bathurst, Eastern Cape. Ekotrust cc, Somerset West.
- VAN ROOYEN, M.W., GAUGRIS, J.Y. & VAN ROOYEN, N. 2018. Dish Mountain gold project, Republic of Ethiopia: Natural resource use evaluation - baseline report. FFMES, Report to SRK Consulting.
- VAN ROOYEN, N. & VAN ROOYEN, M.W. 2018. Report on the terrestrial ecology (flora & fauna). Basic assessment report for the proposed development of the 325 MW Kudusberg Wind Energy Facility in the Northern and Western Cape. Ekotrust cc, Somerset West.
- VAN ROOYEN, N. & VAN ROOYEN, M.W. 2019. Proposed amendments to the Ishwati Emoyeni Wind Energy Facility (WEF) of Special Energy Project (PTY) LTD, a subsidiary of Windlab Systems (PTY) LTD. Ekotrust cc, Somerset West.

6. Selected peer-reviewed research publications

- VAN ROOYEN, N. 1978. A supplementary list of plant species for the Kruger National Park from the Pafuri area. *Koedoe* 21: 37 - 46.
- VAN ROOYEN, N., THERON, G.K. & GROBBELAAR, N. 1981. A floristic description and structural analysis of the plant communities of the Punda Milia - Pafuri - Wambiya area in the Kruger National Park, Republic of South Africa. 2. The sandveld communities. *Jl S. Afr. Bot.* 47: 405 - 449.
- VAN ROOYEN, N., THERON, G.K. & GROBBELAAR, N. 1986. The vegetation of the Roodeplaat Dam Nature Reserve. 4. Phenology and climate. *S. Afr. J. Bot.* 52: 159 - 166.
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Curriculum vitae: PROF GRETEL VAN ROOYEN

1. Biographical information

| | |
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| Academic qualifications | BSc; BSc (Hons), HNOD, MSc (Botany), PhD (Plant ecology) |

2. Publications

I am author / co-author of more than 100 peer reviewed research publications and have presented / co-presented more than 100 posters or papers at international and national conferences. Five PhD-students and 29 Masters students have completed their studies under my supervision / co-supervision. I have co-authored a book as part of a series on the Adaptations of Desert Organisms by Springer Verlag (Van Rhee de van Oudtshoorn, K. & Van Rooyen, M.W. 1999. *Dispersal biology of desert plants*. Springer Verlag, Berlin) and two wildflower guides (Van Rooyen, G., Steyn, H. & De Villiers, R. 1999. *Cederberg, Clanwilliam and Biedouw Valley*. Wild Flower Guide of South Africa no 10. Botanical Society of South Africa, Kirstenbosch, and Van der Merwe, H. & Van Rooyen, G. *Wild flowers of the Roggeveld and Tanqua*). I have also contributed to six chapters in the following books: (i) Dean, W.R.J. & Milton, S.J. (Eds) *The Karoo: Ecological patterns and processes*. Cambridge University Press, Cambridge. pp. 107-122; (ii) Knobel, J. (ed.) *The magnificent heritage of South Africa*. Sunbird Publishing, Llandudno. pp. 94-107; (iii) Hoffman, M.T., Schmedel, U., Jürgens, N. [Eds]: *Biodiversity in southern Africa. Vol. 3: Implications for land use and management*: pp. 109–150, Klaus Hess Publishers, Göttingen & Windhoek; (iv) Schmedel, U., Jürgens, N. [Eds]: *Biodiversity in southern Africa. Vol. 2: Patterns and processes at regional scale*: pp. 222-232, Klaus Hess Publishers, Göttingen & Windhoek; (v) Stoffberg, H., Hinds, C. & Muller, L. *South African Landscape Architecture: A Compendium and A Reader*. Chapter 10, pp. 129 – 140; and (vi) Stoffberg, H., Hinds, C. & Muller, L. *South African Landscape Architecture: A Compendium and A Reader*. Chapter 11, pp. 141 – 146.

3. Research interests

My primary research interests lie in population biology and vegetation dynamics. The main aim of the research is to gain an understanding of ecosystem dynamics and to use this understanding to develop strategies to conserve, manage, use sustainably or restore ecosystems. Geographically the focus of the studies has been primarily in Namaqualand (Northern Cape Province, South Africa; classified as Succulent Karoo) and the Kalahari although several studies were conducted in Maputaland (Northern KwaZulu-Natal) and Namibia.

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environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

DETAILS OF THE SPECIALIST, DECLARATION OF INTEREST AND UNDERTAKING UNDER OATH

| | |
|------------------------|-------------------------|
| File Reference Number: | (For official use only) |
| NEAS Reference Number: | DEA/EIA/ |
| Date Received: | |

Application for authorisation in terms of the National Environmental Management Act, Act No. 107 of 1998, as amended and the Environmental Impact Assessment (EIA) Regulations, 2014, as amended (the Regulations)

PROJECT TITLE

Scoping and Environmental Impact Assessment for the Proposed Development of the 279 MW Wind Energy Facility (i.e. Kwagga WEF 1), near Beaufort West, Western Cape

Kindly note the following:

1. This form must always be used for applications that must be subjected to Basic Assessment or Scoping & Environmental Impact Reporting where this Department is the Competent Authority.
2. This form is current as of 01 September 2018. It is the responsibility of the Applicant / Environmental Assessment Practitioner (EAP) to ascertain whether subsequent versions of the form have been published or produced by the Competent Authority. The latest available Departmental templates are available at <https://www.environment.gov.za/documents/forms>.
3. A copy of this form containing original signatures must be appended to all Draft and Final Reports submitted to the department for consideration.
4. All documentation delivered to the physical address contained in this form must be delivered during the official Departmental Officer Hours which is visible on the Departmental gate.
5. All EIA related documents (includes application forms, reports or any EIA related submissions) that are faxed; emailed; delivered to Security or placed in the Departmental Tender Box will not be accepted, only hardcopy submissions are accepted.

Departmental Details

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0001

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473 Steve Biko Road
Arcadia

Queries must be directed to the Directorate: Coordination, Strategic Planning and Support at:
Email: EIAAdmin@environment.gov.za


1. SPECIALIST INFORMATION

| | | | |
|--|---|-------|------------------------------------|
| Specialist Company Name: | EKOTRUST CC | | |
| B-BBEE | Contribution level (indicate 1 to 8 or non-compliant) | 4 | Percentage Procurement recognition |
| Specialist name: | NOEL VAN ROOYEN | | |
| Specialist Qualifications: | DSc | | |
| Professional affiliation/registration: | SACNASP Reg. no. 401430/83 | | |
| Physical address: | 7 ST GEORGE STREET, LIONDIHAM, SOMERSET WEST | | |
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| Postal code: | 7130 | Cell: | 082 882 0886 |
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| E-mail: | noel@ekotrust.co.za | | |

2. DECLARATION BY THE SPECIALIST

I, NOEL VAN ROOYEN, declare that -

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- all the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.



 Signature of the Specialist

EKOTRUST CC

 Name of Company:

26 MAY 2021

 Date

3. UNDERTAKING UNDER OATH/ AFFIRMATION

I, NOEL VAN ROOYEN, swear under oath / affirm that all the information submitted or to be submitted for the purposes of this application is true and correct.

M. Rooyen
Signature of the Specialist

EKOTRUST CC
Name of Company

26 MAY 2021
Date

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moantsi ost
Signature of the Commissioner of Oaths

201-05-26
Date



Scoping and Environmental Impact Assessment for the proposed development of the 279 MW Kwagga Wind Energy Facility 1 near Beaufort West, Western Cape



APPENDIX F.7

Noise

Site Sensitivity Verification Report

for the Kwagga Wind Energy Facility 1 (Pty) Ltd
Near Beaufort West, South Africa



Date of Site Visit: 9th – 11th October 2020
Specialist Name: Dr Brett Williams
Professional Registration Number: SAIOH 0962
Specialist Affiliation / Company: Safetech
Specialist Topic: Noise Impact Assessment
Proposed WEF Project Name: Kwagga Wind Energy Facility 1 (Pty) Ltd

31st October 2020

1. Introduction

ABO Wind Renewable Energies (Pty) Ltd proposes to develop a Wind Energy Farm (WEF) located to the south of Beaufort West in the Western Cape. Safetech has been appointed to conduct the noise impact assessment. The first stage in the assessment is to conduct a site sensitivity verification report as per the requirements of the Environmental Assessment Protocols of the NEMA EIA Regulations (2014, as amended), and the Protocol for the Specialist Assessment and Minimum Report Content Requirements for Noise Impacts (GG 43110 / GNR 320, 20 March 2020).

The potential noise impacts from the construction and operation of the proposed development of the Kwagga Wind Energy Facility 1 (Pty) Ltd will include the following:

- Construction equipment and vehicle noise;
- Mechanical and aerodynamic noise from the operation of the wind turbine components.

The noise emissions could have an impact on the local residents. Figure 1 below illustrates the noise sensitive areas identified by satellite imagery and during the site visit in October 2020.

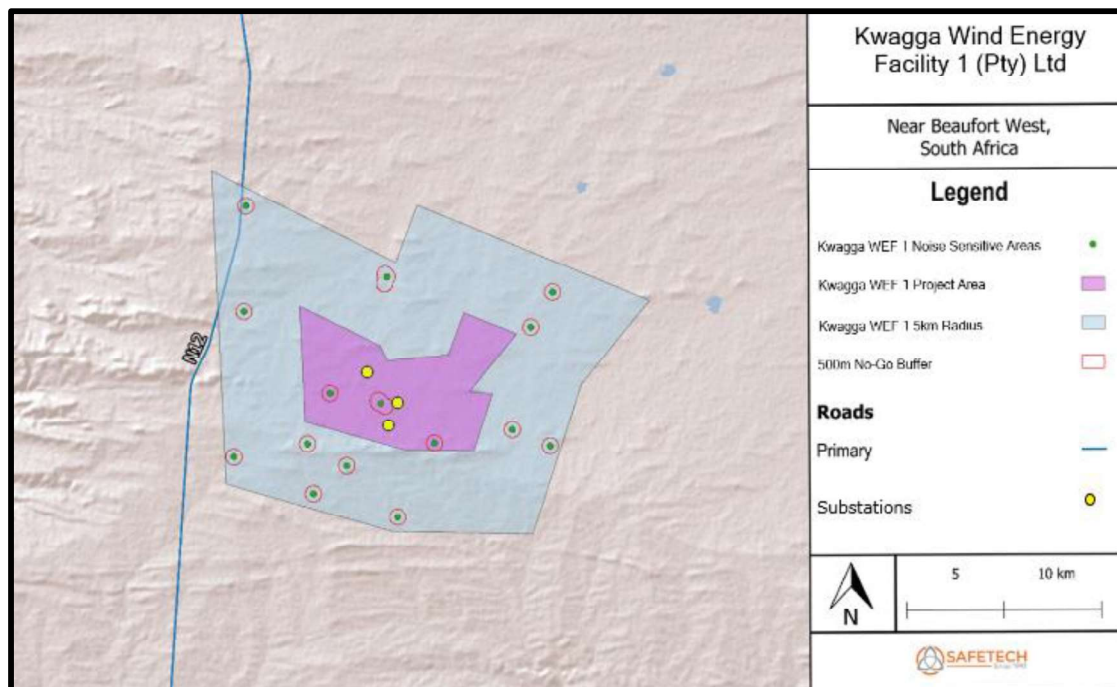


Figure 1: Kwagga WEF 1 Noise Sensitive Areas

In addition to the wind turbines, Kwagga WEF 1 will have 3 substations, as illustrated in Figure 1 above, these substations operate at low noise levels and will thus have no impact on the receptors from a noise perspective.

2. Field Study

The field study validated the classification of the study area as a rural district. Table 1 below shows the SANS 10103:2008 guidelines for day and night noise limits. National and provincial standards classify noise levels exceeding 7dB(A) above the ambient noise levels as a disturbing noise.

Table 1: Noise limits for rural districts

| Type of District | Equivalent Continuous Rating Level, LReq.T for Noise | | | | | |
|------------------|--|---------|------------|------------------------------------|---------|------------|
| | Outdoors (dB(A)) | | | Indoors, with open windows (dB(A)) | | |
| | Day-night | Daytime | Night-time | Day-night | Daytime | Night-time |
| Rural Districts | 45 | 45 | 35 | 35 | 35 | 25 |

The field study was conducted from the 9th of October 2020 to the 11th of October 2020 in accordance with SANS 10103:2008. The guidelines to determine the ambient noise levels of the area are described in the methodology below:

A long-term measurement was taken by placing a noise meter on a tripod and ensuring that it was placed at least 1.2 m from floor level and 3.5 m from any large flat reflecting surface. The 36-hour measurement time encompassed one “day” period (06:00-22:00) and two “night” periods (22:00-06:00). The noise meter was calibrated before and after the survey. At no time was the difference more than one decibel (dB) (Note: If the difference between measurements at the same point under the same conditions is more than 1 dB, then this is an indication that the noise meter is not properly calibrated). The weighting used was on the A scale and the meter was placed on “fast”, which is the preferred method as per SANS 10103:2008, the measurement and rating of environmental noise. The meter was fitted with a windscreen, which is supplied by the manufacturer. The windscreen is designed so as to reduce wind noise around the microphone and not bias the measurements.

The results of the ambient monitoring are illustrated in Figure 2 below. The low values represent periods of low temperature whereby the measuring equipment is outside of its design parameters. The results below 20dB(A) do however still give a good indication of the low ambient noise levels when the windspeed is low. As the windspeed data was measured at 60m on the mast, the windspeed at ground level was most likely calm.

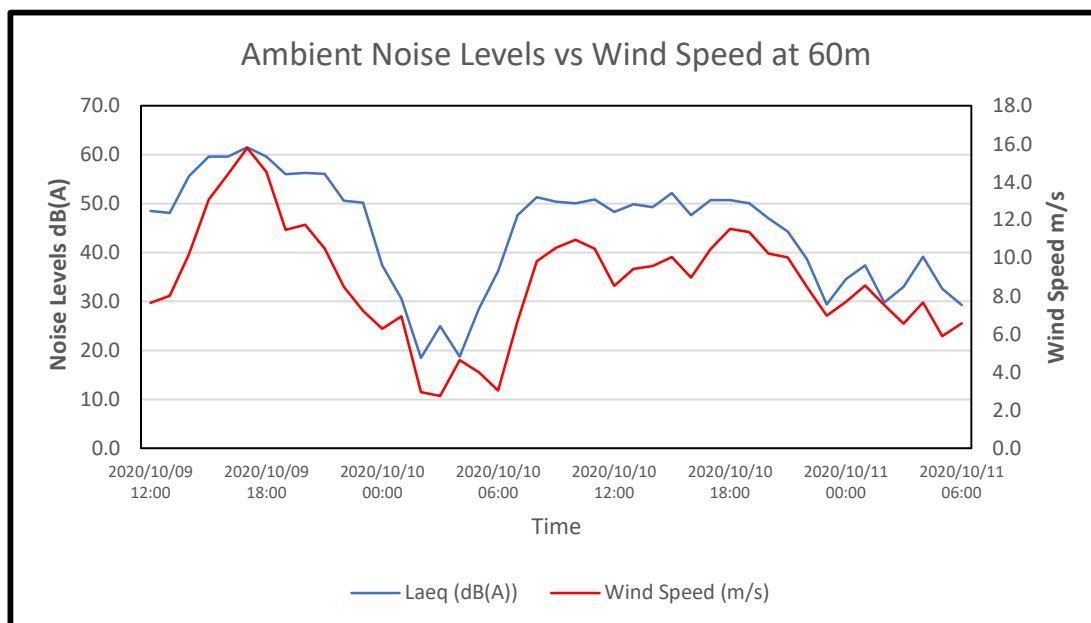


Figure 2: Ambient Noise Levels vs Weather Conditions

The weather data for the monitoring period was supplied by the client from a weather station located at 32° 54' 32.3" S; 22° 38' 09.6" E, which is approximately 1 750m away from the monitoring point. The wind data is taken at 60m above ground level which is the lowest monitoring point.

3. Cumulative Impact Study

The cumulative noise impacts of surrounding developments should also be considered. Figure 3 below shows projects that are within a 50km radius of Kwagga WEF 1 that may contribute to the overall noise levels experienced by the identified receptors. Due to the close proximity to the NSAs identified in this study, it is expected that Kwagga WEF 2 (K2), Kwagga WEF 3 (K3) and the proposed development directly to the south-west of Kwagga WEF 1 (A1) may have an impact on the NSAs from a noise perspective.

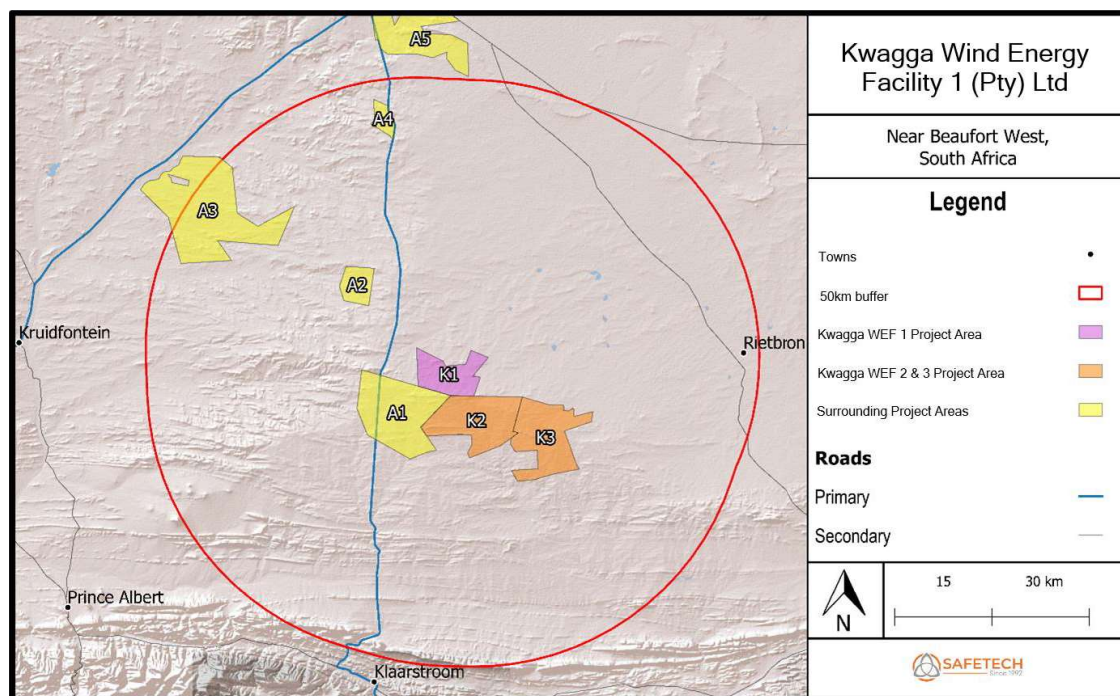


Figure 3: Developments within a 50km radius of Kwagga WEF 1.

4. Legal Requirements

Relevant noise related legislation will be identified. Where applicable the following standards will also be consulted:

- South Africa - GNR.154 of January 1992: Noise control regulations in terms of section 25 of the Environment Conservation Act (ECA), 1989 (Act No. 73 of 1989).
- South Africa - GNR.155 of 10 January 1992: Application of noise control regulations made under section 25 of the Environment Conservation Act, 1989 (Act No. 73 of 1989).
- South Africa – GNR. 320 of 20 March 2020: Procedures for the Assessment and Minimum Criteria for Reporting on identified Environmental Themes under Sections 24(5)(a) and (h) of the National Environmental Management Act, 1998 (Act no. 107 of 1998).
- Province of the Western Cape: Provincial Gazette Extraordinary 7141 – Western Cape Noise Control Regulations - PN 200/2013 (20th June 2013).

- SANS 10103:2008 Version 6 - The measurement and rating of environmental noise with respect to annoyance and to speech communication.
- SANS 10357:2004 Version 2.1 - The calculation of sound propagation by the Concawe method.
- International Finance Corporation – 2007 General EHS Guidelines: Environmental Noise.

5. Conclusion

The following is concluded and verified:

- The project site is situated in a rural district where the main activity is agriculture, specifically sheep farming. Several homesteads were identified containing both permanent and temporary occupants.
- The project could impact on several noise sensitive areas.
- The noise impacts from the construction and operation of the substations will be negligible.
- It is recommended that a 500m buffer be placed around all noise sensitive receptors for planning purposes. No wind turbines should be placed within the 500m buffer.
- The cumulative impacts of other windfarms in the area should be assessed.

It is recommended that a full noise impact assessment that includes emission modelling be conducted. A comprehensive report will be provided that will include noise mitigation measures to be included in the environmental management plan as well as predicted noise levels during the construction and operation phase.



Dr Brett Williams



environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

DETAILS OF THE SPECIALIST, DECLARATION OF INTEREST AND UNDERTAKING UNDER OATH

| | |
|------------------------|-------------------------|
| | (For official use only) |
| File Reference Number: | |
| NEAS Reference Number: | DEA/EIA/ |
| Date Received: | |

Application for authorisation in terms of the National Environmental Management Act, Act No. 107 of 1998, as amended and the Environmental Impact Assessment (EIA) Regulations, 2014, as amended (the Regulations)

PROJECT TITLE

Scoping and Environmental Impact Assessment for the Proposed Development of the 279 MW Wind Energy Facility (i.e. Kwagga WEF 1), near Beaufort West, Western Cape

Kindly note the following:

1. This form must always be used for applications that must be subjected to Basic Assessment or Scoping & Environmental Impact Reporting where this Department is the Competent Authority.
2. This form is current as of 01 September 2018. It is the responsibility of the Applicant / Environmental Assessment Practitioner (EAP) to ascertain whether subsequent versions of the form have been published or produced by the Competent Authority. The latest available Departmental templates are available at <https://www.environment.gov.za/documents/forms>.
3. A copy of this form containing original signatures must be appended to all Draft and Final Reports submitted to the department for consideration.
4. All documentation delivered to the physical address contained in this form must be delivered during the official Departmental Officer Hours which is visible on the Departmental gate.
5. All EIA related documents (includes application forms, reports or any EIA related submissions) that are faxed; emailed; delivered to Security or placed in the Departmental Tender Box will not be accepted, only hardcopy submissions are accepted.

Departmental Details

Postal address:

Department of Environmental Affairs
Attention: Chief Director: Integrated Environmental Authorisations
Private Bag X447
Pretoria
0001

Physical address:

Department of Environmental Affairs
Attention: Chief Director: Integrated Environmental Authorisations
Environment House
473 Steve Biko Road
Arcadia

Queries must be directed to the Directorate: Coordination, Strategic Planning and Support at:
Email: EIAAdmin@environment.gov.za


1. SPECIALIST INFORMATION

| | | | |
|--|---|---------------|------------------------------------|
| Specialist Company Name: | SAFETECH | | |
| B-BBEE | Contribution level (indicate 1 to 8 or non-compliant) | NON-COMPLIANT | Percentage Procurement recognition |
| Specialist name: | DR BRETT WILLIAMS | | |
| Specialist Qualifications: | PHD ENVIRONMENTAL MANAGEMENT – OCCUPATIONAL HYGIENIST | | |
| Professional affiliation/registration: | MEMBER SA INSTITUTE OF OCCUPATIONAL HYGIENISTS | | |
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| Postal code: | 6057 | Cell: | 0825502137 |
| Telephone: | 041-3656846 | Fax: | 041-3652123 |
| E-mail: | Brett.williams@safetech.co.za | | |

2. DECLARATION BY THE SPECIALIST

I, Brett Williams, declare that –

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- all the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.


Signature of the Specialist

Safetech

Name of Company:

25th May 2021

Date

Details of Specialist, Declaration and Undertaking Under Oath

3. UNDERTAKING UNDER OATH/ AFFIRMATION

I, Brett Williams, swear under oath / affirm that all the information submitted or to be submitted for the purposes of this application is true and correct.




Signature of the Specialist

Safetech

Name of Company

25th May 2021

Date



Signature of the Commissioner of Oaths

25 May 2021

Date

Roger Charles Hannington
Commissioner of Oaths
Practising Attorney - Hannington @ Law
43 Wychwood Avenue Port Elizabeth
South Africa