

# APPENDIX F

## Scoping inputs from Specialists

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NAME	ORGANISATION	ROLE/STUDY TO BE UNDERTAKEN
Johann Lanz ( <i>Pr.Sci.Nat.</i> )	Private	Agriculture and Soils Compliance Statement
Dr Jayson Orton	ASHA Consulting (Pty) Ltd	Heritage Impact Assessment (Archaeology, Palaeontology and Cultural Landscape)
Dr John Almond ( <i>Candat</i> )	Natura Viva cc	
Chris van Rooyen, Albert Froneman ( <i>Pr.Sci.Nat.</i> )	Chris van Rooyen Consulting	Avifauna Impact Assessment
Ashlin Bodasing, Michael Brits, Mark Hodgson	ARCUS Consultancy Services South Africa Ltd	Bat Impact Assessment
Toni Belcher ( <i>Pr.Sci.Nat.</i> )	Private	Aquatic Biodiversity and Species Impact Assessment
Dr Noel van Rooyen ( <i>Pr.Sci.Nat.</i> )	Ekotrust cc	Terrestrial Biodiversity and Species Impact Assessment
Dr Brett Williams	Safetrain cc T/A Safetech	Noise Impact Assessment
Menno Klapwijk	Bapela Cave Klapwijk cc	Visual Impact Assessment
Iris Wink, Adrian Johnson	JG Afrika (Pty) Ltd	Traffic Impact Assessment
Sue Reuther	SRK Consulting (Pty) Ltd	Socio-Economic Impact Assessment
Lizande Kellerman ( <i>Pr.Sci.Nat.</i> )	CSIR	Civil Aviation Compliance Statement
Lizande Kellerman ( <i>Pr.Sci.Nat.</i> )	CSIR	Defence Site Sensitivity Verification

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.1

## Agriculture and Soils

## Appendix F.1: Site Sensitivity Verification

As required in terms of Part A of the Government Gazette 43110, GN 320 of 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. The details of the site sensitivity verification are noted below:

Date of Site Visit	Not applicable
Specialist Name	Johann Lanz
Professional Registration Number	Pr.Sci.Nat 400268/12
Specialist Affiliation / Company	Johann Lanz – Soil Scientist
Specialist Topic	Agriculture
Proposed WEF Project Name	Kwagga Wind Energy Facility 1 (Pty) Ltd

### 1 The screening tool sensitivity of the site

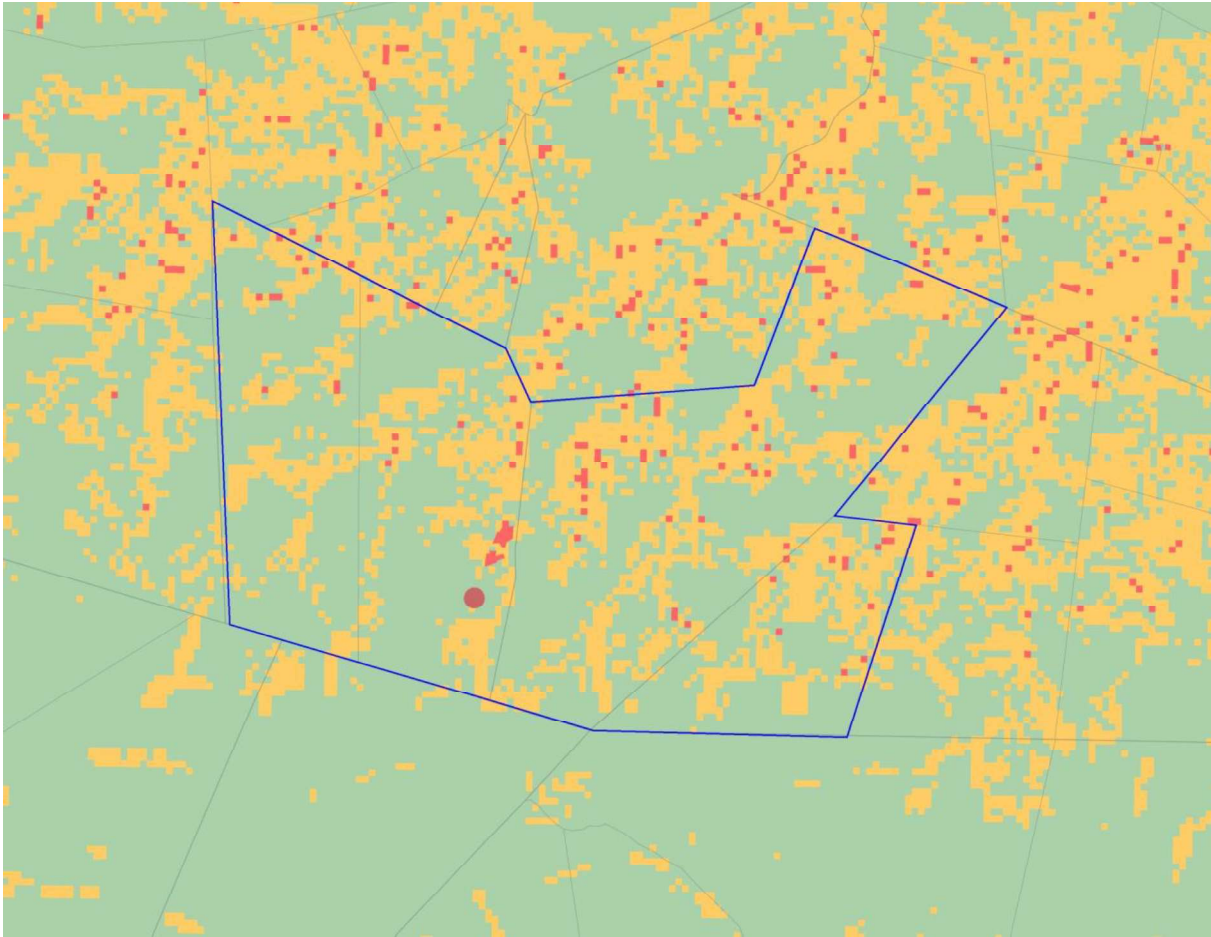
Agricultural sensitivity, in terms of environmental impact, is a direct function of the capability of the land for agricultural production. This is because a negative impact, or exclusion of agriculture, on land of higher agricultural capability is more detrimental to agriculture than the same impact on land of low agricultural capability.

The screening tool classifies agricultural sensitivity according to only two criteria – land capability and whether the land is cultivated or not. All cultivated land is classified as high sensitivity (or very high sensitivity). This is because there is a scarcity of arable production land in South Africa, in terms of how much is required for food security.

Uncultivated land is classified by the screening tool in terms of its land capability. Land capability is defined as the combination of soil, climate and terrain suitability factors for supporting rain fed agricultural production. It is an indication of what level and type of agricultural production can sustainably be achieved on any land. The higher land capability classes are suitable as arable land for the production of cultivated crops, while the lower suitability classes are only suitable as non-arable, grazing land, or at the lowest extreme, not even suitable for grazing. In 2017, DAFF released updated and refined land capability mapping across the whole of South Africa. This has greatly improved the accuracy of the land capability rating for any particular piece of land anywhere in the country. The new land capability mapping divides land capability into 15 different categories with 1 being the lowest and 15 being the highest. This land capability data is used by the screening tool.

The proposed site for the Kwagga Wind Energy Facility (WEF) 1 is identified by the screening tool

as being of predominantly low and medium sensitivity for agricultural resources, but it also includes small, mostly single pixel patches of high sensitivity. A map of the proposed development area for the Kwagga WEF 1 overlaid on the screening tool sensitivity is given in Figure 1, below.



**Figure 1.** The proposed development site overlaid on agricultural sensitivity, as given by the screening tool.

The basis for the agricultural sensitivity classification of land within the site is given in Table 1.

Table 1: Description of different agricultural sensitivity classes that occur in the Kwagga WEF 1 study area.

<b>Sensitivity category</b>	<b>Location</b>	<b>Reason for its sensitivity classification</b>
Very high	Circle in the southern centre of the site.	This appears to have been established as a centre pivot irrigated land between 2011 and 2015. It does not appear to have been cultivated since 2015.
High	Two areas immediately north of the circle above.	Cultivated lands associated with the farmstead, established between 2006 and 2011.
High	Small, mostly 'single pixel' patches of high sensitivity distributed across the northern parts of the site.	'Pixels' of land with a land capability value of 9, associated with land type Fc162. It is surprising that, in an arid climate with an annual rainfall of only 160 mm and an annual evaporation rate of 1,400 mm, land could be allocated a value as high as 9. It is even more surprising because the land type soil data for Fc162 shows the soils to be predominantly very shallow soils overlying rock. This high sensitivity rating is therefore an anomaly.
Medium and low	Distributed across the site.	Seemingly very similar land to the description provided above, but with land capability values that vary from 3 to 8, probably due to minor changes in terrain.

The differences in land capability across the project area are unlikely to be very significant and are probably more a function of how the land capability data is generated than of actual meaningful differences in agricultural potential on the ground.

The differences in agricultural sensitivity also have minimal influence on the layout constraints for a wind energy facility (see Section 5, below).

## 2 Method of site sensitivity verification

In terms of the gazetted agricultural protocol, a site sensitivity verification must be submitted that:

1. confirms or disputes the current use of the land and the environmental sensitivity as identified by the screening tool, such as new developments or infrastructure, the change in vegetation cover or status etc.;
2. contains a motivation and evidence (e.g. photographs) of either the verified or different use of the land and environmental sensitivity.

Although required for compliance purposes, an agricultural site sensitivity verification has little value or practical purpose, particularly in an area where climate is the predominant limiting factor

to agricultural potential. There are almost no conditions under which a sensitivity category different from that of the screening tool could possibly be arrived at.

As discussed above, agricultural sensitivity is rigidly defined according to only two criteria – land capability and whether the land is cultivated or not. It is practically impossible to contest the land capability of an area at a scale that is relevant to a wind farm development. The land capability data layer is a complex synthesis of climate, soil and terrain data sets that are based on many decades of investigation and records. It would be practically impossible, due to time and costs, to produce data, through a site assessment, that would match the level of accuracy, at the scale of a wind farm, of the existing data on which the land capability is based. And even if the time and costs were invested, the results would add very little value to an assessment of agricultural impact, so it would be a complete waste to do so. Therefore, land capability cannot be contested by data gathered in a site assessment.

The only possible way in which sensitivity could differ, and therefore need verification, is if new cultivated lands had recently been established on the site. This would increase the sensitivity category of those lands to high, if their land capability had defined them as medium or low. However, in an area where the climate and general soil conditions are known to be unsuitable for cultivation, this is highly unlikely.

In order to be sure however, satellite imagery from 2019 was investigated to identify any cultivated land that has been established since the field crop boundary data, that informs the screening tool, was collected. No newly cultivated lands were identified. It is extremely unlikely that any cultivated lands have been established since 2019.

### **3 Results of the site sensitivity verification**

The agricultural sensitivity, as identified by the screening tool, is confirmed by this assessment, but largely because it is practically impossible to dispute the land capability. It is however an anomaly that, in an arid climate with an annual rainfall of only 160 mm and an annual evaporation rate of 1,400 mm, land could be allocated a value as high as 9 (high agricultural sensitivity). It is even more so because the land type soil data shows the soils to be predominantly very shallow soils overlying rock.

The high and very high sensitivity of land as a result of its cultivation is also confirmed. Even if the land is no longer cultivated, and even if it very marginal for cultivation, the definition of cultivated land used to establish agricultural sensitivity by the screening tool is any land that is currently under cultivation or that has been cultivated within the past five years. These lands are likely to have been cultivated within the past five years.

As stated above, the differences in land capability across the proposed project area are unlikely to be very significant and are probably more a function of how the land capability data is generated than of actual meaningful differences in agricultural potential on the ground. The differences in agricultural sensitivity also have minimal influence on the layout constraints for a renewable energy facility.

While the sensitivity cannot be disputed because it is rigidly defined, what is of most importance for agricultural impact is that, despite the high sensitivity rating, the land is actually of very limited agricultural value. It is not viable arable land. At best it is very marginal arable land, that is not considered particularly preservation worthy as agricultural production land.

#### 4 Potential agricultural impacts

Two potential negative agricultural impacts have been identified, that are direct impacts:

1. **Loss of agricultural land use** - Agricultural land directly occupied by the development infrastructure will become unavailable for agricultural use. This impact is relevant only in the construction phase. No further loss of agricultural land use occurs in subsequent phases.
2. **Soil degradation** - Soil can be degraded by impacts in three different ways: erosion; topsoil loss; and contamination. Erosion can occur as a result of the alteration of the land surface run-off characteristics, which can be caused by construction related land surface disturbance, vegetation removal, and the establishment of hard surface areas including roads. Loss of topsoil can result from poor topsoil management during construction related excavations. Hydrocarbon spillages from construction activities can contaminate soil. Soil degradation will reduce the ability of the soil to support vegetation growth. This impact is relevant only during the construction and decommissioning phases.

One positive agricultural impact has been identified, that is an indirect impact:

1. **Increased financial security for farming operations** - Reliable income will be generated by the farming enterprises through the lease of the land to the wind energy facility. This is likely to increase their cash flow and financial security and thereby could improve farming operations.

The significance of all potential agricultural impacts is mitigated by two factors:

- the fact that the proposed site is on land of limited agricultural potential that is only viable

for low density grazing.

- The agricultural footprint of the wind farm (including all associated infrastructure and roads), that results in the exclusion of land from potential grazing, is very small in relation to the surface area of the affected farms. The wind farm infrastructure will only occupy approximately 2% of the surface area, according to the typical surface area requirements of wind farms in South Africa (DEA, 2015). Therefore, all agricultural impacts, including loss of agricultural land use, erosion and soil degradation will not be widespread and can at worst only affect a very limited proportion (2%) of the surface area. All agricultural activities will be able to continue unaffectedly on all parts of the farms other than the small development footprint for the duration of and after the project.

**All agricultural impacts, including cumulative impacts, are therefore likely to be of low significance.** The above three impacts will be assessed in the Agricultural Compliance Statement during the EIA Phase in order to conclude whether the agricultural impact of the development is acceptable or not.

#### **5 Implications of the site sensitivity for the layout options of the facility**

Even though the site includes some areas of high agricultural sensitivity, the sensitivity of the site will have minimal influence on the layout constraints for a wind energy facility. The nature of the latest NEMA requirements, that apply to agricultural impact, mean that there is no simple categorisation of the site into usable parts and no-go parts for development. Instead, the protocol imposes allowable development limits on different agricultural sensitivity categories of land. The allowable development footprint is the area of a particular sensitivity category of land that can be directly occupied by the physical footprint of a renewable energy development. Therefore, high sensitivity land can be utilised by the footprint of the wind energy facility, as long as it is within the allowable limits set by the protocol.

On this site earmarked for the proposed development of the Kwagga WEF 1 project, the area of high sensitivity land is so small that any wind farm layout will be within the limits and therefore the sensitivity will effectively impose no constraint on the layout of the facility footprint. Even though this is the case, it is still advisable to avoid those very limited areas on the site that are rated as high sensitivity as a result of their cultivation status. These are, however, associated with and in close proximity to the farmstead that is likely to be avoided by the footprint of the development, anyway.



## 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:  
Date Received:

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:

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Private Bag X447  
Pretoria  
0001

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Department of Environmental Affairs  
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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](mailto:EIAAdmin@environment.gov.za)

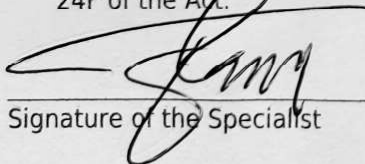
**1. SPECIALIST INFORMATION**

Specialist Company Name:	Johann Lanz – Soil Scientist		
B-BBEE	Contribution level (indicate 1 to 8 or non-compliant)	4	Percentage Procurement recognition
			100%
Specialist name:	Johann Lanz		
Specialist Qualifications:	M.Sc. (Environmental Geochemistry)		
Professional affiliation/registration:	Registered Professional Natural Scientist Member of the Soil Science Society of South Africa		
Physical address:	1a Wolfe Street, Wynberg, Cape Town, 7800		
Postal address:	1a Wolfe Street, Wynberg, Cape Town, 7800		
Postal code:	7800	Cell:	082 927 9018
Telephone:	082 927 9018	Fax:	Who still uses a fax? I don't
E-mail:	johann@johannlanz.co.za		

**2. DECLARATION BY THE SPECIALIST**

I, **Johann Lanz**, 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

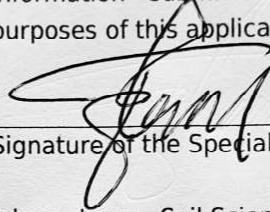
Johann Lanz - Soil Scientist (sole proprietor)

Name of Company:

Date 12/05/2021

**3. UNDERTAKING UNDER OATH/ AFFIRMATION**

I, **Johann Lanz**, 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

Johann Lanz - Soil Scientist (sole proprietor)

Name of Company

Date 12/05/2021

  
Signature of the Commissioner of Oaths

Date 2021-05-12



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.2

## Archaeology, Palaeontology and Cultural Heritage

## APPENDIX F.2 – Site Sensitivity Verification

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 are noted below:

<b>Date of Site Visit</b>	3, 4, 5, 6, 13 November 2020
<b>Specialist Name</b>	Dr Jayson Orton
<b>Professional Registration Number</b>	Association of Southern African Professional Archaeologists (ASAPA): 233 Association of Professional Heritage Practitioners (APHP): 043
<b>Specialist Affiliation / Company</b>	ASHA Consulting (Pty) Ltd
<b>Specialist Topic</b>	Heritage
<b>Proposed WEF Project Name</b>	Kwagga 1

### Method of the Site Sensitivity Verification

- Provide a description on how the site sensitivity verification was undertaken using the following means:

- (a) desktop analysis, using satellite imagery and spatial datasets;
- (b) preliminary on-site inspection (fieldwork); and
- (c) any other available and relevant information.

The study area was initially examined on aerial photography to determine whether any obvious heritage resources (such as buildings) could be seen. A number of such locations were noted and marked for checking on site. In the end, some turned out to be heritage resources, while others did not. No desktop study was carried out at this point, but the heritage specialist has extensive knowledge of the Karoo landscape and the types of heritage resources to be expected in the study area.

The field survey was carried out over three full days and parts of two more days. Any sites found were recorded by GPS and through field notes. The vast majority were also photographed. The survey never set out to study the area comprehensively, since that would take many weeks to accomplish. The aims were (1) to locate and record obvious heritage sites and (2) to walk as many transects as possible through the study area to verify the expected density and distribution of heritage resources.

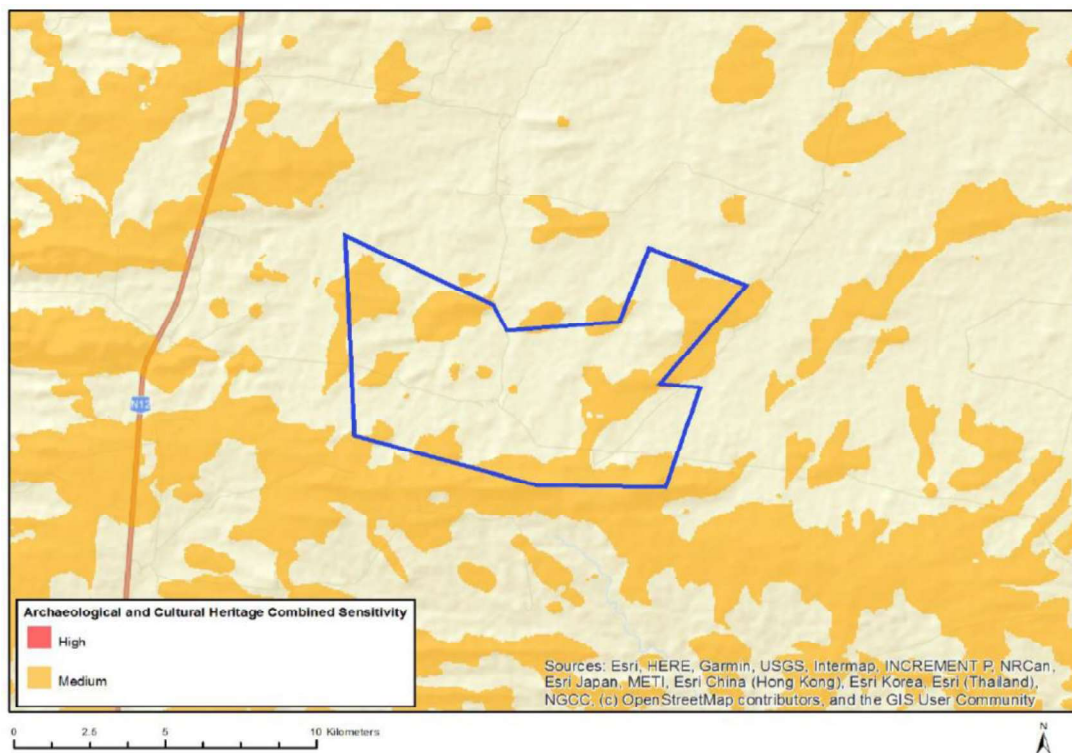
### Outcomes

- Provide a description of the outcome of the site sensitivity verification in order to:

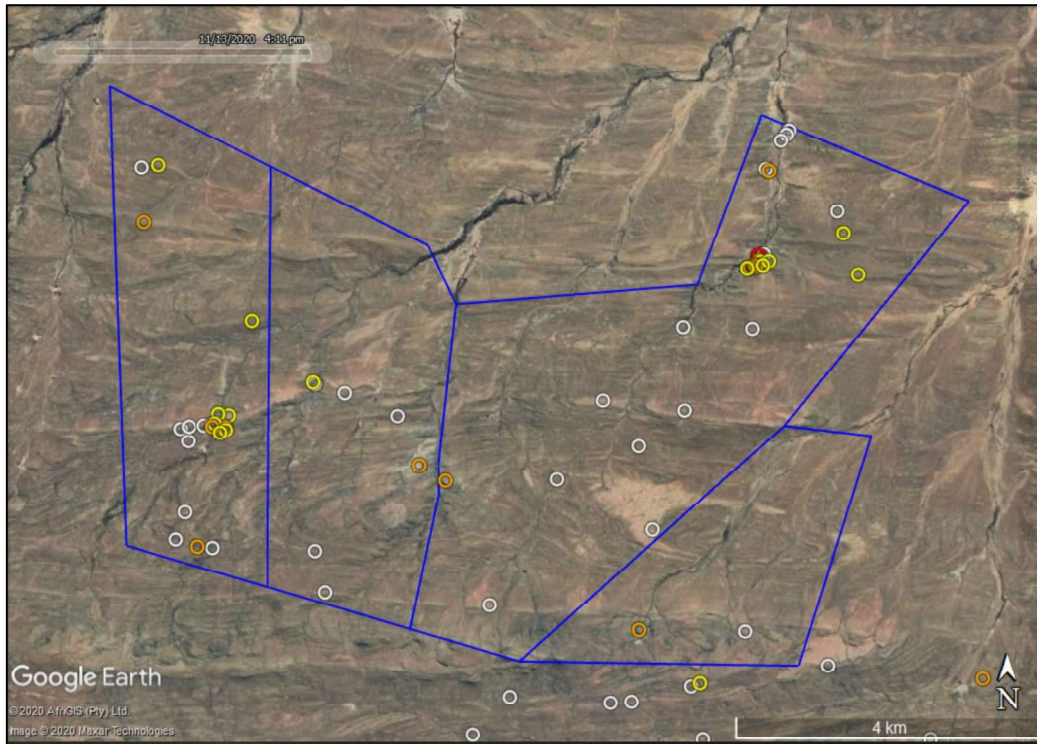
- (a) confirm or dispute the current use of the land and the environmental sensitivity as identified by the screening tool, such as new developments or infrastructure, the change in vegetation cover or status etc.;

- (b) include a motivation and evidence (e.g. photographs) of either the verified or different use of the land and environmental sensitivity (i.e. environmental sensitivity map);
- (c) describe the high-level impacts that may occur due to the proposed development of the WEF project;
- (d) provide review input on the preferred infrastructure locations i.e. wind turbines, construction platforms, construction compounds, laydown areas, on-site substation, etc. following the sensitivity analysis; and
- (e) include a description of the potential direct, indirect and cumulative impacts that will require further assessment in the EIA Phase.

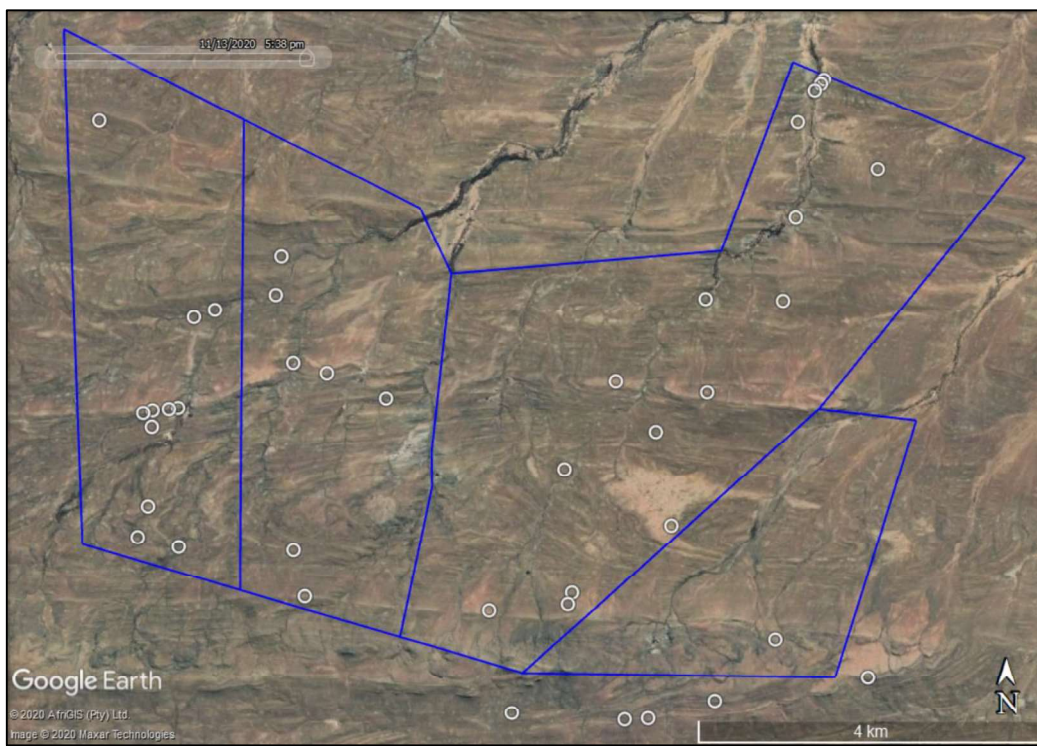
The DFFE Screening Tool sensitivity map was found to be incorrect (Figure 1). It is unknown how the sensitivity rating in the Screening Tool was devised – the medium sensitivity rating appears not to relate to either high ground, low ground or rivers. The site survey revealed that, as expected, land adjacent to rivers is by far the most sensitive. Even so, most individual heritage sites were found to be of very low cultural significance (heritage grade NCW) and thus of low sensitivity. They would not require consideration in the planning of the proposed WEF. Many other sites were found to be of low cultural significance (heritage grade IIIC) which is still low sensitivity but limited mitigation work would be required prior to destruction if they cannot be avoided. Smaller numbers of medium (heritage grade IIIB) and high (heritage grade IIIA) cultural significance sites were found. These are of medium and high environmental sensitivity and are best avoided. Mitigation would generally be acceptable for grade IIIB sites but would either be unacceptable or too difficult to effect in the case of grade IIIA sites. Figures 2 to 6 show the distribution of heritage resources, while Figure 7 shows the heritage sensitivity map compiled by the HIA specialist following the site sensitivity verification.



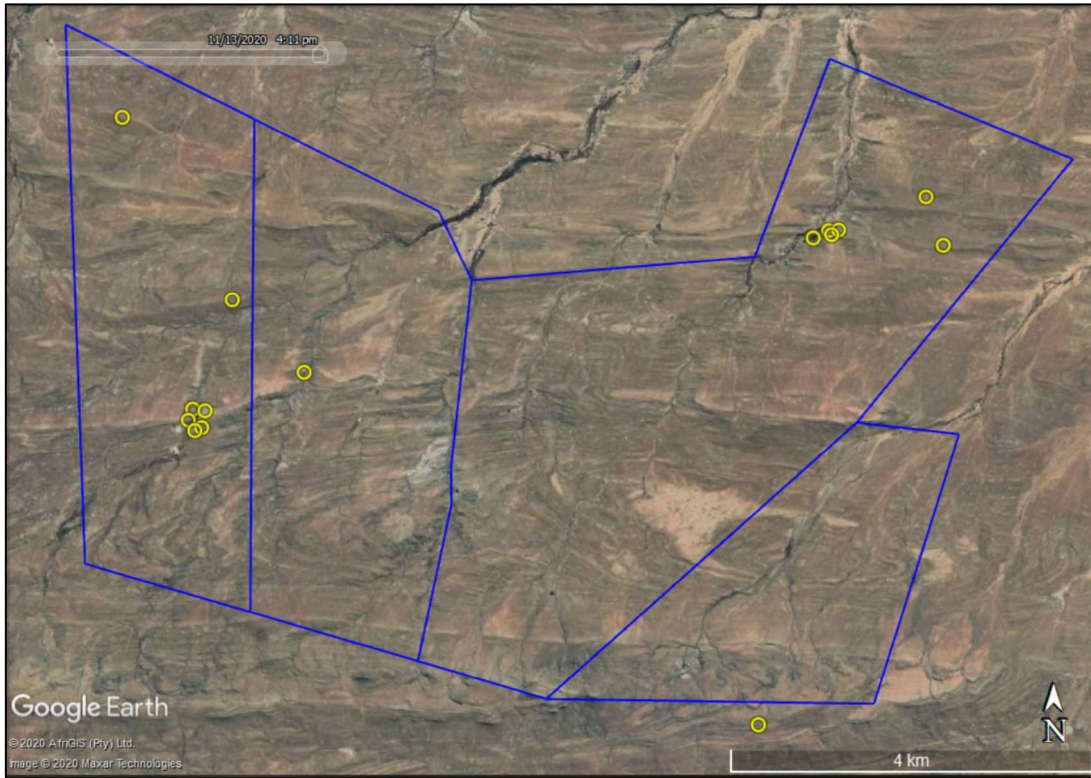
**Figure 1:** Screening Tool map provided for the archaeology and cultural heritage theme.



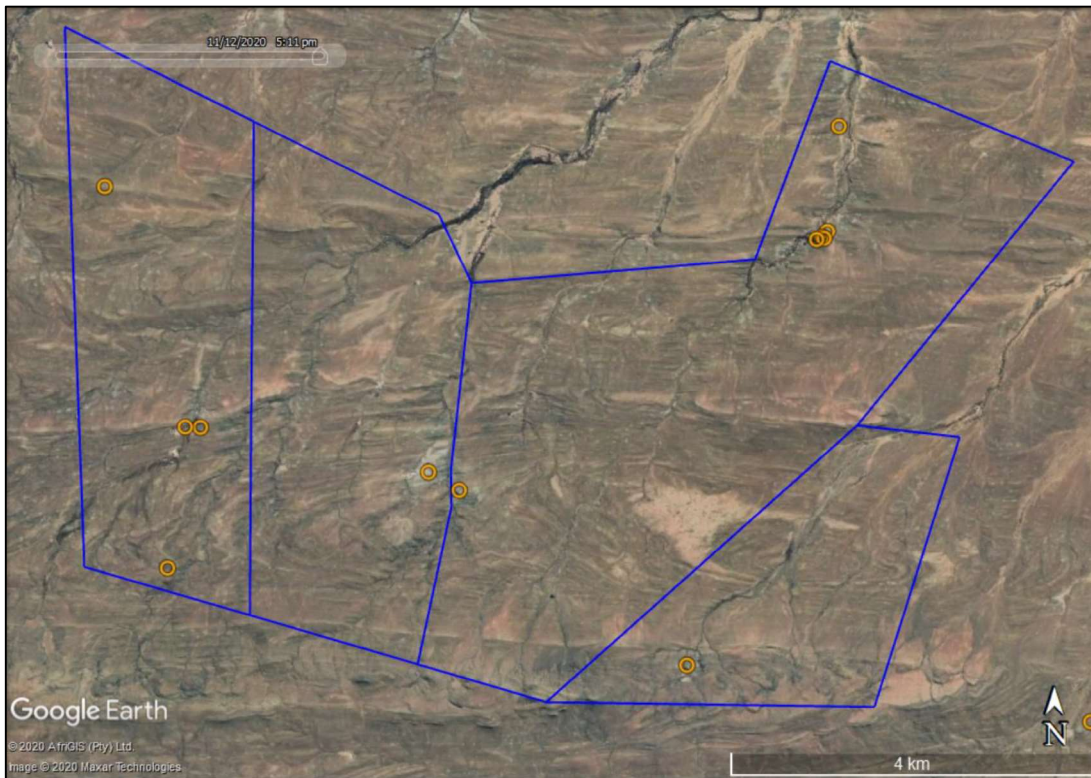
**Figure 2:** Map of all heritage resources recorded during the survey on the Kwagga 1 WEF study area. Red = Grade IIIA, orange = Grade IIIB, yellow = Grade IIIC, white = NCW.



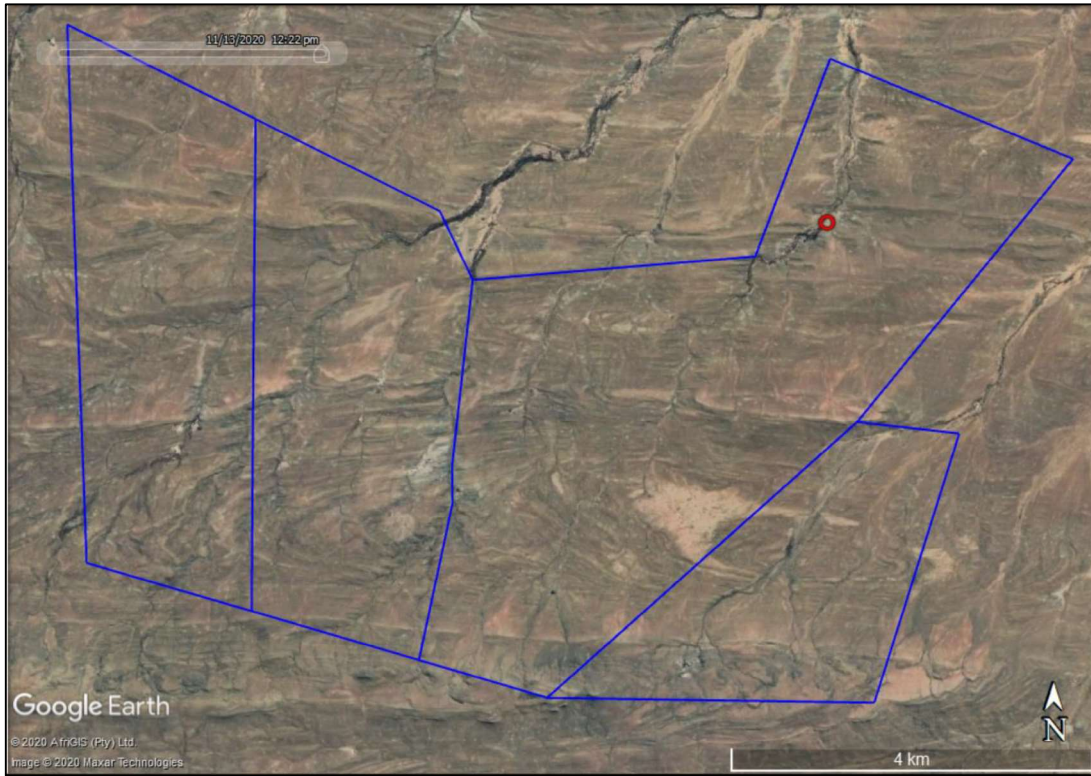
**Figure 3:** Map of grade NCW heritage resource locations on the Kwagga 1 WEF study area.



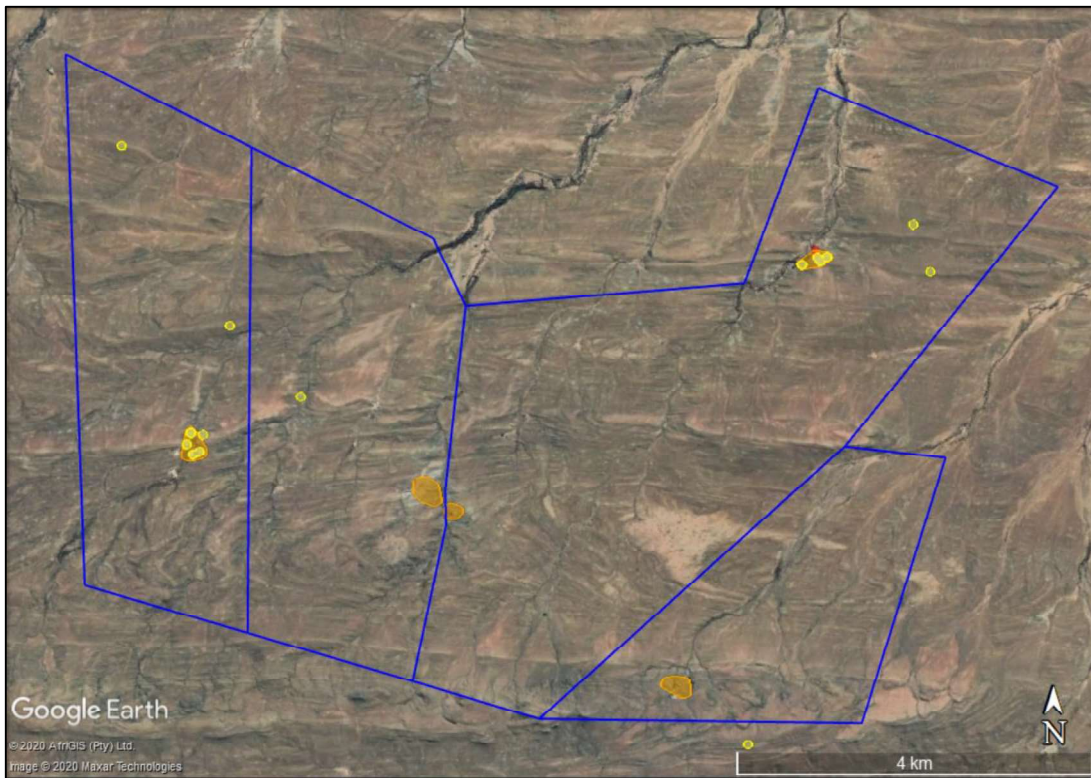
**Figure 4:** Map of grade IIIC heritage resource locations on the Kwagga 1 WEF study area.



**Figure 5:** Map of grade IIIB heritage resource locations on the Kwagga 1 WEF study area.



**Figure 6:** Map of grade IIIA heritage resource locations on the Kwagga 1 WEF study area.



**Figure 7:** Map of combined heritage sensitivity on the Kwagga 1 WEF study area.

It is evident that only small areas of low, medium and high sensitivity have been located and that the remainder of the study area is of very low sensitivity. This does not mean that no heritage resources will be present in these areas but the probability of resources of high cultural significance being found there are considered to be very low. **The heritage specialist thus disputes the screening tool sensitivity.**

The sensitive sites identified include ruined and standing structures (Figures 8 & 9), graves (Figure 10), Stone Age archaeological sites (Figures 11 & 12), historical artefact scatters (Figure 13) and historical packed stone structures and ruins (Figure 14).



**Figure 8:** Example of a heritage resource of medium sensitivity (heritage grade IIIB). Although appearing in reasonable condition from the outside, the inside of this 19<sup>th</sup> century house is in very poor shape due to its missing roof (waypoint 292).



**Figure 9:** Example of a heritage resource of medium sensitivity (heritage grade IIIB). Although in reasonable condition, the house is likely early 20<sup>th</sup> century in age (waypoint 327).



**Figure 10:** A grave at waypoint 314 considered to be of high sensitivity (heritage grade IIIA).



**Figure 11:** The surface of the unusually dense Later Stone Age site at waypoint 293 (heritage grade IIIB). Scale = 10 cm.



**Figure 12:** Stone artefacts on tuff and cryptocrystalline silica from the Later Stone Age site at waypoint 293. Scale = 10 cm.



**Figure 13:** Historical glass and ceramic artefacts from waypoint 296 (heritage grade IIIC). Scale = 10 cm.



**Figure 14:** Stone kraal at waypoint 310 (heritage grade IIIB).

Turbines and other infrastructure should avoid all grade IIIA and IIIB sites and their 50 m buffers. It is always preferred that all heritage resources be avoided but those considered NCW have very little to no cultural significance and are in practice of no further concern. Resources graded IIIC do have some cultural significance and, although best avoided, they can easily be mitigated through excavation and/or collection of archaeological materials. Infrastructure such as substations, offices, laydown areas, etc. are best located away from public view. The locations of these aspects will be best advised by the visual specialist.

Direct impacts to heritage resources take the form of damage and/or destruction of the resources during construction or visual intrusion for those heritage resources deemed to be visually sensitive. Most resources fall into the former category with only the built environment resources and the cultural landscape being visually sensitive. Structures are

generally given larger buffers of 500 m or more for reasons other than heritage and significant visual impacts to these resources are thus not expected. Impacts to the cultural landscape will be assessed by the visual specialists who would suggest appropriate buffers and no-go areas. If the grade IIIA and IIIB sites are avoided then direct impacts are expected to be of low significance if grade IIIC sites are either avoided or mitigated. It is very likely that further sites are present but the probability of significant sites and hence significant impacts occurring is considered to be low. If the site is managed appropriately and impacts are kept to within the authorised areas then indirect impacts are not expected. For the same reason, new impacts during the operation and decommissioning phases are not expected. Similarly, cumulative impacts would be of very little concern because the nature and low cultural significance of those sites that do end up being impacted will mean that significant wider impacts will not occur.

Recommendation from the specialist:

Following the Heritage Western Cape NID response, a full Heritage Impact Assessment (HIA) is required during the EIA Phase. It is recommended that this HIA will need to assess impacts to archaeology, palaeontology (separate specialist), graves, built environment (although the probability of impacts is extremely low) and the cultural landscape. The Visual Impact Assessment would be used to guide the assessment of impacts to the landscape and must be included as an appendix to the HIA for the purposes of submission to HWC.

## **APPENDIX 1 – Specialist Declaration**



## 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:

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#### Departmental Details

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Attention: Chief Director: Integrated Environmental Authorisations  
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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](mailto:EIAAdmin@environment.gov.za)

**1. SPECIALIST INFORMATION**

Specialist Company Name:	ASHA Consulting (Pty) Ltd		
B-BBEE	Contribution level (indicate 1 to 8 or non-compliant)	4	Percentage Procurement recognition
Specialist name:	Dr Jayson Orton		
Specialist Qualifications:	D.Phil (Archaeology, Oxford, UK) MA (Archaeology, UCT)		
Professional affiliation/registration:	ASAPA CRM member No. 233 APHP member No. 043		
Physical address:	23 Dover Road, Muizenberg, 7945		
Postal address:	23 Dover Road, Muizenberg		
Postal code:	7945	Cell:	083 272 3225
Telephone:	021 788 1025	Fax:	n/a
E-mail:	jayson@asha-consulting.co.za		

**2. DECLARATION BY THE SPECIALIST**

I, JAYSON ORTON, 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

ASHA CONSULTING (PTY) LTD

Name of Company:

26 MAY 2021

Date

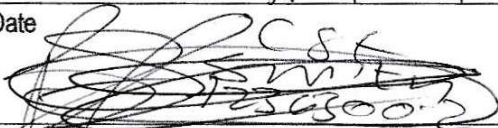
3. UNDERTAKING UNDER OATH/ AFFIRMATION

I, JAYSON ORTON, 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 

ASHA CONSULTING (PTY) LTD  
Name of Company

26 MAY 2021  
Date

  
Signature of the Commissioner of Oaths

Date 

SOUTH AFRICAN POLICE SERVICE
KIRSTENHOF SAPS
2021-05-26
CSC

**PALAEONTOLOGICAL HERITAGE: COMBINED DESKTOP & FIELD-BASED SCREENING STUDY & SITE SENSITIVITY VERIFICATION**

**Proposed Development of the Kwagga 1 Wind Energy Facility near Beaufort West in the Central Karoo District, Western Cape**

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**January 2021**

**1. Summary**

The Kwagga 1 Wind Energy Facility (WEF) project area, situated on the southern margins of the Great Karoo some 60 km south of Beaufort West, is underlain by (1) continental sediments of the Lower Beaufort Group (Abrahamskraal and Teekloof Formations) of Permian age as well as (2) extensive, largely unconsolidated Late Caenozoic superficial sediments such as colluvium, alluvium and surface gravels. The fossil record of the Abrahamskraal – Teekloof contact zone, extensively represented within the combined Kwagga 1-3 WEF project area, is of special scientific interest because of its record of environmental and palaeobiological events related to the major Middle Permian Mass Extinction Event of 262-260 million years ago. Since vertebrate fossils are generally rare within this interval, any new records of well-preserved, identifiable material are of considerable scientific value.

Seventeen new fossil sites or subsites (probable scattered bones of the same individual) were recorded within the Kwagga 1 WEF project area during the recent field survey from some 80 potentially fossiliferous sedimentary exposures examined. Most specimens can only be accurately identified following laboratory preparation, while some are unidentifiable (e.g. poorly preserved postcranial remains). The new palaeontological finds are all from the Lower Beaufort Group (Abrahamskraal and Teekloof Formations) and include small dicynodonts (the most numerous category), large pareiasaur reptiles, unidentified large herbivores (probably dinocephalians), lungfish and invertebrate burrows, poorly-preserved petrified wood and reedy plant compressions. No fossil sites were recorded within the Late Caenozoic superficial deposits within the Kwagga 1 WEF project area.

On the basis of the recent field survey of the Kwagga 1 WEF project area, in the context of additional palaeontological fieldwork in adjoining WEF project areas, the Very High Sensitivity assigned to the great majority of the area by the ~~DEFF-DFFE~~ Screening Tool is *disputed*. Since comparatively few fossils of scientific and conservation value are recorded over a large area here, even in areas of good bedrock exposure, it is concluded that in practice *the palaeosensitivity of the site is generally LOW but with sparse, small and largely unpredictable sites of HIGH to VERY HIGH sensitivity*. No areas (as opposed to sites) of High Palaeosensitivity or No-Go Areas are identified here.

None of the new fossil finds falls directly within the provisional Kwagga 1 WEF project footprint (*N.B.* the access road network - which may have a significant impact on surface fossils - has not yet been taken into consideration). Many of the new fossil sites here are assigned a Proposed Field Rating IIIB and would require mitigation should they fall within or very close to (within 10 m of) the final project footprint. Since all the known fossil sites recorded can be effectively mitigated in

**John E. Almond (2021)**

**Natura Viva cc**

this way, and there are no known fossil sites which must be conserved *in situ*, *there are currently no palaeontological heritage constraints on the layout of the Kwagga 1 WEF. There are no preferences on palaeontological grounds for any specific layout design.*

Once the final WEF layout is approved, and *before* construction commences, the footprint should be cross-checked by a professional palaeontologist against the known palaeontological database for the project area. Potentially-sensitive sectors of the footprint, such as areas of extensive mudrock exposure along rivers and bedrock ridges, might require a focussed specialist palaeontological walk-down in the Preconstruction Phase. Known fossil sites within 10 m of the approved footprint should be mitigated in the Preconstruction Phase through professional palaeontological recording and collection of fossil material and associated geological data. The collected fossil material must be curated in an approved repository (museum / university collection). Standards for palaeontological reporting and mitigation have been established by Heritage Western Cape (2016) and SAHRA (2013).

During the Construction Phase, a standard Chance Fossil Finds Protocol will apply, to be implemented by the Environmental Control Officer (ECO) and, where necessary, a palaeontological specialist.

<b>Date of Site Visit</b>	12-14, 19 November 2020
<b>Specialist Name</b>	Dr John Edward Almond
<b>Professional Registration Number</b>	Member of Palaeontological Society of Southern African Palaeontologists (PSSA) & Association of Professional Heritage Practitioners (APHP)
<b>Specialist Affiliation / Company</b>	<i>Natura Viva</i> cc, Cape Town, RSA
<b>Specialist Topic</b>	Palaeontological Heritage
<b>Proposed WEF Project Name</b>	Kwagga 1 WEF

## 2. Methodology of the Screening Study & Site Sensitivity Verification

### 2.1. Information sources

The combined desktop and field-based palaeontological heritage Screening and Site Sensitivity Verification Study of the Kwagga 1 WEF was based on the following information resources:

- 1, A brief project outline, kmz files, screening report and maps provided by CSIR - Environmental Management Services;
2. A desktop review of (a) the relevant 1:50 000 and 1:250 000 scale topographic maps, (b) Google Earth© satellite imagery, (c) published geological and palaeontological literature, including 1:250 000 geological maps (3222 Beaufort West, 3322 Oudtshoorn) and relevant sheet explanations (Johnson & Keyser 1979, Toerien 1979) as well as (d) several previous and on-going fossil heritage (PIA) assessments in the Great Karoo region to the south of Beaufort West by the author (*e.g.* Almond 2018, 2020a, 2020b *plus* various earlier studies listed in the References);
3. The author's field experience with the formations concerned and their palaeontological heritage (*cf* Almond & Pether 2008 and PIA reports listed in the References); and
4. A four-day field assessment of the WEF project area, including all land parcels involved, by the author and two experienced field assistants (Madelon Tusenius and Hedi Stummer), during the period 12 to 19 November 2020. The season in which the site visit took place has no bearing on the study.

## 2.2. Study approach

In preparing a palaeontological desktop study the potentially fossiliferous rock units (groups, formations, members *etc.*) represented within the study area are determined from geological maps and satellite images. The known fossil heritage within each rock unit is inventoried from the published scientific literature, previous palaeontological impact studies in the same region, and the author's field experience (consultation with professional colleagues as well as examination of institutional fossil collections may play a role here, or later following scoping during the compilation of the final report). This data is then used to assess the palaeontological sensitivity of each rock unit to development (provisional tabulations of palaeontological sensitivity of all formations in the Western Cape have already been compiled by J. Almond and colleagues; *e.g.* Almond & Pether 2008) and are shown on the palaeosensitivity map on the SAHRIS (South African Heritage Resources Information System) website. The likely impact of the development on local fossil heritage is then determined on the basis of (1) the palaeontological sensitivity of the rock units concerned and (2) the nature and scale of the development itself, most notably the extent of fresh bedrock excavation and ground clearance envisaged. When rock units of moderate to high palaeontological sensitivity are present within the development footprint, a field assessment study by a professional palaeontologist is usually warranted.

The focus of palaeontological field assessment is *not* simply to survey the development footprint or even the development area as a whole (*e.g.* farms or other parcels of land concerned in the development). Rather, the palaeontologist seeks to assess or predict the diversity, density and distribution of fossils within and beneath the study area, as well as their heritage or scientific interest. This is primarily achieved through a careful field examination of one or more representative exposures of all the sedimentary rock units present (*N.B.* Metamorphic and igneous rocks rarely contain fossils). The best rock exposures are generally those that are easily accessible, extensive, fresh (*i.e.* unweathered) and include a large fraction of the stratigraphic unit concerned (*e.g.* formation). These exposures may be natural or artificial and include, for example, rocky outcrops in stream or river banks, cliffs, quarries, dams, dongas, open building excavations or road and railway cuttings. Consolidated as well as uncemented superficial deposits, such as alluvium, scree or wind-blown sands, may occasionally contain fossils and should also be included in the field study where they are well-represented in the study area. It is normal practice for impact palaeontologists to collect representative, well-localised (*e.g.* GPS and stratigraphic data) samples of fossil material during field assessment studies. In order to do so, a fossil collection permit from Heritage Western Cape (HWC) is required and all fossil material collected must be properly curated within an approved repository (usually a museum or university collection).

Note that while fossil localities recorded during field work within the study area itself are obviously highly relevant, most fossil heritage here is embedded within rocks beneath the land surface or obscured by surface deposits (soil, alluvium, *etc.*) and by vegetation cover. In many cases where levels of fresh (*i.e.* unweathered) bedrock exposure are low, the hidden fossil resources have to be *inferred* from palaeontological observations made from better exposures of the same formations elsewhere in the region but outside the immediate study area. Therefore a palaeontologist might reasonably spend far *more* time examining road cuts and borrow pits close to, but outside, the study area / project footprint than within the study area / project footprint itself. Field data from localities even further afield (*e.g.* an adjacent province) may also be adduced to build up a realistic picture of the likely fossil heritage within the study area.

Given 1) the large project areas concerned with the Kwagga WEF projects and (2) the limited bedrock exposure in this region of the Great Karoo, the Palaeontological Screening and Site Sensitivity Verification field study largely entailed the examination of potentially fossiliferous sites with good Beaufort Group mudrock exposure – especially along drainage lines as well as steeper hillslopes and erosion gullies. Since previous field experience shows that in the lower part of the Beaufort Group outcrop area important fossil sites may also occur in association with crevasse splay and channel sandstones, a representative selection of such sites as well as good sections through Late Cenozoic alluvial deposits were also examined. It is emphasised that it is simply not

practicable to record all, or even a major portion, of fossil sites within the course of a few days, and that the occurrence of fossils at surface has a large element of unpredictability. Several fossil sites were discovered simply by chance, while one important, previously recorded site was pointed out by the local landowner and would otherwise have been missed.

### 3. Geological context

The geology of the combined Kwagga 1-3 WEF project area Beaufort West area is covered by 1: 250 000 geology sheets 3222 Beaufort West and 3322 Oudtshoorn (Council for Geoscience, Pretoria; Johnson & Keyser 1979, Toerien 1979) (Fig. 1). The majority of the lower-lying terrain within the WEF project area is underlain by Middle Permian continental sediments of the **Abrahamskraal Formation** (Lower Beaufort Group / Adelaide Subgroup, Karoo Supergroup) (Pa, pale green in Fig. 1) (Johnson & Keyser 1979, Johnson *et al.* 2006). It is likely that the majority of the bedrocks here can be largely or entirely assigned to the sandstone package of the **Moordenaars Member** and the following mudrock-dominated **Karelskraal Member** towards the top of the very thick Abrahamskraal Formation succession but lower members are represented in the far south. Three low, west-east trending ridges crossing the southern central and northern sectors of the Kwaggas 1 WEF project area are built of the conformably overlying, sandstone-rich **Poortjie Member** at the base of the **Teekloof Formation** (Adelaide Subgroup) (Pt, dark green in Fig. 1).

The sedimentology of the Abrahamskraal – Teekloof transition has been addressed recently by Paiva (2015). Early Jurassic intrusions of the Karoo Dolerite Suite are not mapped within the project area but do occur closer to Beaufort West. The project area lies within the northern margins of the Cape Fold Belt where levels of tectonic deformation in the project area vary from low to moderately high. Large-scale folding of the Beaufort Group bedrocks along west-east axes as well as common northerly-directed thrust faulting is shown on the geological map. Both mudrock and sandstone facies commonly develop a pervasive west-east, closely-spaced fracturing or cleavage.

The Palaeozoic bedrocks in the study area, which lies on the SW periphery of the Aberdeen *vlaktes* - possibly a relict of a Miocene African Land Surface (Partridge & Maud 1987) - are, for the most part, poorly exposed away from the more important drainage lines and occasional steeper hillslopes. Topographic relief is generally low so that on gentler hillslopes, beneath the extensive gravelly to sandy *vlaktes* (*i.e.* plains) as well as along many water courses the bedrocks are mantled by various **Late Caenozoic superficial sediments**. For the most part these comprise downwasted surface gravels, rubbly colluvium, silty, sandy and gravelly alluvium (pale yellow areas in Fig. 1) and skeletal soils with local development of spring deposits such as calcrete. Most of the superficial deposits are unconsolidated and probably of Late Pleistocene to Holocene age (*i.e.* last 2.5 million years) but some alluvium is well-calcretised and might be somewhat older. High Level gravel terraces are not well-developed in the region, implying low levels of stream incision.

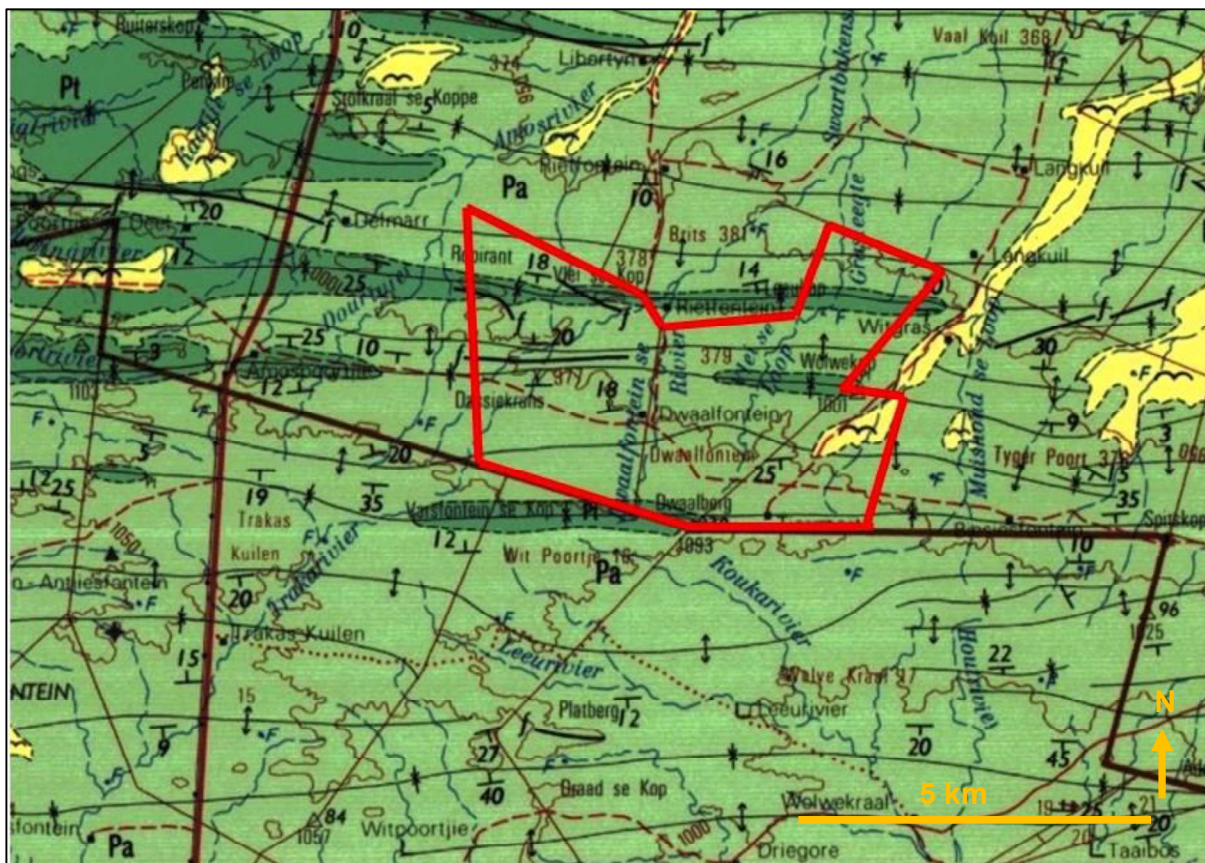


Figure 1: Extract from 1: 250 000 geology sheet 3222 Beaufort West showing the boundaries of the Kwagga 1 WEF project area to the south of Beaufort West (red polygon). Note numerous W-E trending fold axes in the region which falls within the northern margins of the Cape Fold Belt. Pa (pale green) = Abrahamskraal Formation (Adelaide Subgroup, Lower Beaufort Group). Pt (dark green) = Teekloof Formation (Adelaide Subgroup, Lower Beaufort Group). Yellow = Late Caenozoic / Quaternary superficial sediments, including alluvium, sheet wash, colluvium, soils, locally cemented by pedocretes such as calcrete. To the west of the N12 and *outside* the WEF project area diamond symbols indicate fossil localities within the *Tapinocephalus* Assemblage Zone. Triangles indicate fossils within the *Pristerognathus* Assemblage Zone (*N.B.* This fossil biozone data is now outdated).

#### 4. Palaeontological heritage context

Fossil heritage resources in the combined Kwagga 1-3 WEF project area on the southern margins of the Great Karoo are associated not only with the palaeontologically well-studied bedrocks of the Lower Beaufort Group (Karoo Supergroup) of Permo-Triassic age but also with the less well-known Late Caenozoic superficial deposits.

##### 4.1. Lower Beaufort Group fossils

The fossil record of the Abrahamskraal – Teekloof contact zone, extensively represented within the combined Kwagga 1-3 WEF project area, is of special scientific interest because of its record of environmental and palaeobiological events related to the major **Middle Permian Mass Extinction Event** of 262-260 million years ago (= Capitanian or Guadalupian Mass Extinction Event) (Day *et al.* 2015b). Since vertebrate fossils are generally rare within this interval, any new records of well-preserved, identifiable material here are of considerable scientific value (*cf* ongoing research

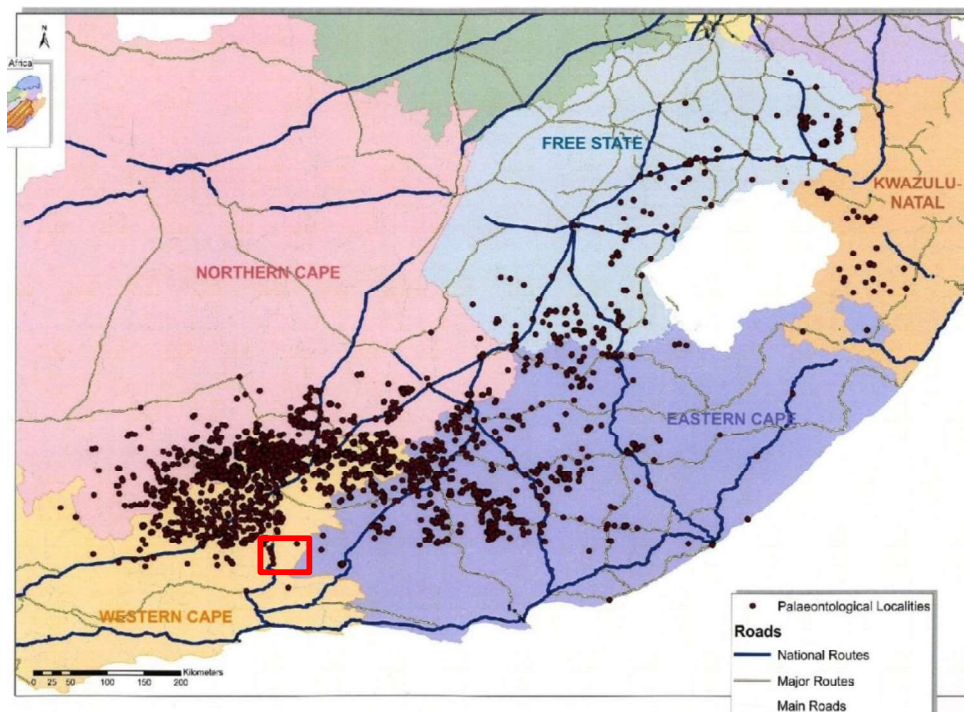
project on this extinction event conducted by Professor Bruce Rubidge of Wits University and colleagues elsewhere).

Continental (terrestrial / lacustrine / fluvial) fossil biotas within the upper part of the Abrahamskraal Formation (Moordenaars and Karelskraal Members) as well as within the lowermost portion of the Poortjie Member of the Teekloof Formation are now assigned to the ***Diictodon – Styraucocephalus* Subzone** of the revised ***Tapinocephalus* Assemblage Zone** (AZ) that is of Late Capitanian age (c. 262-260 Ma) (Day & Rubidge 2020). The highly impoverished, post-extinction vertebrate fauna represented in the uppermost part of the *Diictodon – Styraucocephalus* Subzone (lowermost Poortjie Member) includes – or is inferred to include – only a few representatives of several tetrapod subgroups. These include amphibians, parareptiles (pareiasaurs, *Eunotosaurus*), dinocephalians (e.g. *Criocephalosaurus*, perhaps also *Styraucocephalus*), dicynodonts (e.g. *Diictodon*), therocephalians (e.g. *Pristerognathus*) and gorgonopsians (Retallack *et al.* 2006, Smith *et al.* 2012, Day *et al.* 2015a, 2015b, Day & Rubidge 2020, Marchetti *et al.* 2020).

Fossil locality distribution maps for the Lower Beaufort Group in the southern sector of the Main Karoo Basin in the region to the south of Beaufort West show very few records of vertebrate fossils in this area. This is apparent on early palaeontological maps of Kitching (1977) and Keyser & Smith (1977-1978) as well as from the published 1: 250 000 geological sheet 3222 Beaufort West (Johnson & Keyser 1979). This last shows just a few fossil sites of the *Tapinocephalus* and *Pristerognathus* Assemblage Zones, as previously defined, to the west of the N12 and *outside* the combined Kwagga 1-3 WEF project area (Fig. 1). The more recent fossil site map of Nicolas (2007) features a few sites just to the west of the N12 and one site further east, *possibly* located within or close to the Kwagga 3 WEF project area (Fig. 2). A few additional vertebrate fossil sites – mostly small-bodied dicynodonts *plus* poorly preserved postcranial remains of large herbivorous tetrapods (pareiasaurs or dinocephalians) - were recently recorded by Almond (2018) within the combined project area for the Trakas and Beaufort West 140 MW Wind Farms which adjoins the Kwagga 1-3 WEF project area to the south.

#### 4.2. Late Cenozoic fossils

The diverse Late Cenozoic superficial deposits within the South African interior have been comparatively neglected in palaeontological terms. However, sediments associated with ancient drainage systems, springs and pans in particular may occasionally contain important fossil biotas, notably the bones, teeth and horn cores of mammals as well as remains of reptiles like tortoises (e.g. Skead 1980, Klein 1984b, Brink, J.S. 1987, Bousman *et al.* 1988, Bender & Brink 1992, Brink *et al.* 1995, MacRae 1999, Meadows & Watkeys 1999, Churchill *et al.* 2000, Partridge & Scott 2000, Brink & Rossouw 2000, Rossouw 2006, De Ruiter *et al.* 2010, Backwell *et al.* 2017). Other late Cenozoic fossil biotas that may occur within these superficial deposits include non-marine molluscs (bivalves, gastropods), ostrich egg shells, trace fossils (e.g. calcretised termitaria, coprolites, invertebrate burrows, rhizocretions), and plant material such as peats or palynomorphs (pollens) in organic-rich alluvial horizons (Scott 2000) and diatoms in pan sediments. In Quaternary deposits, fossil remains may be associated with human artefacts such as stone tools and are also of archaeological interest (e.g. Smith 1999 and refs. therein). Ancient solution hollows within extensive calcrete hardpans may have acted as animal traps in the past. As with coastal and interior limestones, they might occasionally contain mammalian bones and teeth (perhaps associated with *hyaena dens*) or invertebrate remains such as snail shells.



**Figure 2: Distribution of recorded vertebrate fossil sites within the within the Lower Beaufort Group of the Main Karoo Basin (modified from Nicolas 2007). The *approximate* location of the combined Kwagga 1-3 WEF project area to the south of Beaufort West is approximately indicated by the small red rectangle. The very low density of recorded fossil sites here, to the east of the N12 and on the SW periphery of the Aberdeen *vlaktes*, is notable.**

## 5. Outcome: Site Sensitivity Verification of the Kwagga 1 project area

### 5.1. New palaeontological heritage data within the Kwagga 1 WEF project area

Over the course of in total some three weeks' worth of palaeontological field reconnaissance on the southern margins of the Karoo Basin due south of Beaufort West, covering the project areas of the adjoining Trakas, Beaufort West, Heuweltjies, Kraaltjies and Kwagga 1-3 WEFs, the author and colleagues have recorded a modest number (c. 40-50) of new vertebrate fossil sites (Almond 2018, Almond 2020, work in progress). The major fossil groups found here include: large-bodied dinocephalian therapsids and pareiasaur reptiles, wolf- to dog-sized gorgonopsian and therocephalian predators, small-bodied dicynodont herbivores, disarticulated palaeoniscoid fish remains (scales, tiny bones), lungfish aestivation burrows, small invertebrate burrows, poorly-preserved silicified wood from petrified logs as well as compressions of reedy plants (probably sphenophyte ferns). Some of the material is well-preserved and of considerable palaeontological importance, given (1) the lack of previous fossil records in the region as well as (2) the scientific interest in the late Middle Permian Mass Extinction Event (See Section 4.1 above).

Despite these valuable new palaeontological finds it is nevertheless clear, given the very large area covered (albeit at a superficial reconnaissance level), that vertebrate fossil remains are indeed *rare* within the Abrahamskraal – Teekloof Formation contact zone in this part of the Main Karoo Basin. The paucity of fossil records here does not only reflect (1) palaeontological neglect in the past, (2) moderate to high levels of tectonic deformation (folding / faulting / cleavage development) as well as (3) the generally low levels of bedrock exposure. The last is attributed to generally low levels of topographic relief and extensive cover by Late Caenozoic superficial deposits (colluvium, alluvium, soils, gravels) that may be related to an inferred relict patch of the

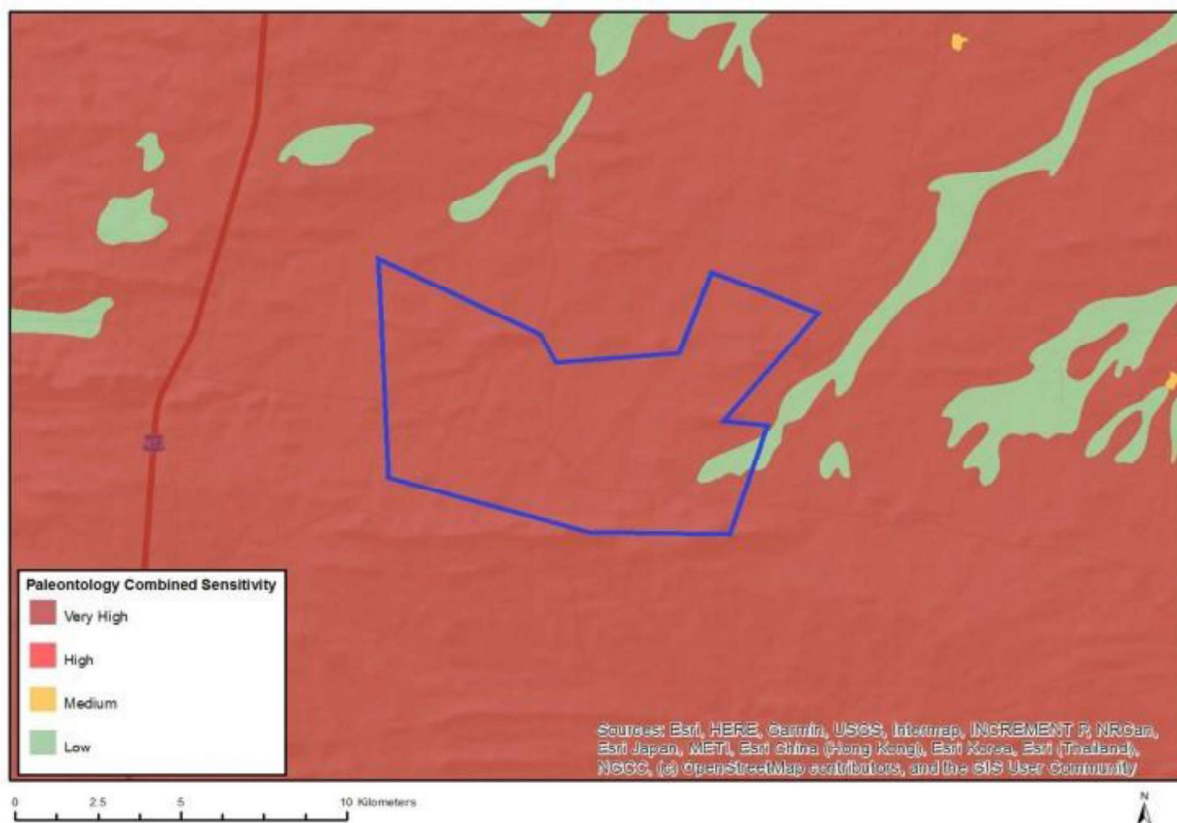
Miocene African Land Surface in the Aberdeen *vlaktes* (Partridge & Maud 1987, Watkeys 1999). Even where bedrock exposure is locally good and extensive (e.g. some riverine and hillslope sections), fossil occurrence is very sporadic indeed and to a considerable extent unpredictable. Fossils in this part of the Lower Beaufort succession may occur in a wide range of sedimentary settings, including both mudrock and sandstone facies. While a high proportion of fossil finds are related to pedogenic calcrete (palaeosol) horizons, many are not. It should be noted that skeletal material is often very hard to spot in this terrain while many fossils (e.g. small skulls) have inevitably been missed because they are largely or entirely enclosed within pedocrete concretions. Several of the fossil finds were made by chance, and in one case pointed out by a knowledgeable local landowner.

Locality data and a brief field description of the 17 new fossil sites recorded within the Kwagga 1 WEF project area, from some 80 potentially fossiliferous sedimentary exposures examined, are tabulated in Table 1 and mapped on a Google Earth© satellite image in Figure 4 below (*N.B.* This data is *not* for public release on palaeontological conservation grounds and obviously does *not* include all fossil sites within the WEF project area). Some of these data points are in practice subsites of one original site, for example when fossil bones have become dispersed following natural exposure of a single skeleton. Most specimens can only be accurately identified following laboratory preparation, while some are unidentifiable (e.g. poorly preserved postcranial remains). The new palaeontological finds are all from the Lower Beaufort Group (Abrahamskraal and Teekloof Formations) and include small dicynodonts (the most numerous category), large pareiasaur reptiles, unidentified large herbivores (probably dinocephalians), lungfish and invertebrate burrows, petrified wood and reedy plant compressions. No fossil sites were recorded within the Late Caenozoic superficial deposits within the Kwagga 1 WEF project area (*N.B.* A fossil or subfossil mammalian bone was recorded from alluvium within the combined Kwagga 1-2 WEF project area by Jayson Orton, pers. comm., Nov. 2020).

## 5.2. Inferred palaeosensitivity of the Kwagga 1 WEF project area

The Lower Beaufort Group outcrop area in the Main Karoo Basin as a whole is provisionally designated as Very High Sensitivity in palaeontological heritage terms on the basis of its rich fossil record of continental (fluvial / lacustrine / terrestrial) vertebrates of Middle to Late Permian age. A Very High Palaeosensitivity for almost the entire combined Kwagga 1-3 WEF project area is indicated on the SAHRIS palaeosensitivity map, with the exception of small riverine areas with thick alluvial deposits. Likewise a **Very High Sensitivity** is indicated for the great majority of the Kwagga 1 WEF project area, with the exception of a small Low Sensitivity alluvial area on the eastern margin, based on the ~~DEFF-DFFE~~ Screening Tool (Fig. 3). Paradoxically, the draft Phase 2 Heritage Scoping Report for the Aberdeen and Beaufort West REDZ5 area by Van der Walt (2019) only asserts that “Small sections in the focus area are of medium palaeontological sensitivity” and assigns an overall Medium Sensitivity to this REDZ (This assessment is currently being challenged, however).

On the basis of the recent field survey of the Kwagga 1 WEF project area, in the context of additional palaeontological fieldwork in adjoining WEF project areas, the Very High Sensitivity assigned to the majority of the project area by the ~~DEFF-DFFE~~ Screening Tool (Fig. 3) is *disputed*. Since comparatively few fossils of scientific and conservation value are recorded over a large area here, even in areas of good bedrock exposure, *it is concluded that in practice the palaeosensitivity of the site is generally LOW but with sparse, small and largely unpredictable sites of HIGH to VERY HIGH sensitivity*. The LOW palaeosensitivity of small areas with thick alluvial deposits (green in Fig. 3) is uncontested. No areas (as opposed to sites) of High Palaeosensitivity or No-Go Areas are identified here.



**Figure 3: Palaeontological sensitivity mapping of the Kwagga 1 WEF project area (blue polygon) based on the DEFF Screening Tool (Image abstracted from Site Sensitivity Report produced by the CSIR). The Very High Sensitivity assigned to the majority of the WEF project area is disputed here.**

## 6. Implications for WEF layout design

Potential palaeontological heritage impacts of concern involve the disturbance, damage or destruction of scientifically important and legally protected fossil material preserved at or beneath the ground surface during the construction phase of the WEF. Such impacts are largely the consequence of ground clearance and bedrock excavations during the Construction Phase of the WEF, for example for wind turbine foundations, underground cables, laydown areas, access roads, substation and building foundations. These direct impacts will need to be formally assessed in the EIA Phase. Since a number of other WEF developments have been approved or proposed in the vicinity, potential cumulative impacts on regional palaeontological heritage will also need to be assessed.

Many of the known fossil sites within the Kwagga 1 project area occur along riverine and stream-gullied areas where bedrock exposure is locally good; these sites will be largely protected within the riverine buffer zone (32 m) established on ecological grounds. A disproportionate number of the sites are associated with east-west topographic ridges that reflect more resistant-weathering sandstones of the Poortjie Member (Teekloof Formation). It is unclear whether this distribution reflects biostratigraphic controls or, rather, improved bedrock exposure in more dissected, higher ground. WEF infrastructure such as wind turbines and their access roads are likely to focus on these higher-lying areas.

None of the new fossil finds falls directly within the provisional WEF project footprint (Fig. 4) (*N.B.* the access road network - which may have a significant impact on surface fossils, given the large

area affected - has not yet been taken into consideration). As indicated in Table 1, many of the new fossil sites are assigned a Proposed Field Rating IIIB and would require mitigation should they fall within or very close to (within 10 m of) the final project footprint (See Section 4.4, below). Since all the known fossil sites recorded can be effectively mitigated in this way, and there are no known fossil sites which must be conserved *in situ*, *there are currently no palaeontological heritage constraints on the layout of the Kwagga 1 WEF. There are also no preferences on palaeontological grounds for any specific layout design.*

## 7. Palaeontological heritage mitigation

Once the final WEF layout is approved, and *before* construction commences, the footprint should be cross-checked by a professional palaeontologist against the known palaeontological database for the project area. Potentially-sensitive sectors of the footprint, such as areas of extensive mudrock exposure along rivers and bedrock ridges, might require a focussed specialist palaeontological walkdown in the Preconstruction Phase. Known fossil sites within 10 m of the approved footprint should be mitigated in the Preconstruction Phase through professional palaeontological recording and collection of fossil material and associated geological data. The collected fossil material must be curated in an approved repository (museum / university collection). Standards for palaeontological reporting and mitigation have been established by Heritage Western Cape (2016) and SAHRA (2013).

During the Construction Phase of the WEF a standard Chance Fossil Finds Protocol will apply, to be implemented by the ECO and, where necessary, a palaeontological specialist.

## 8. Key references

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## 9. Acknowledgements

Ms Lizande Kellerman of the CSIR and Mr Rob Invernizzi of ABO Wind Renewable Energies (Pty) Ltd are both thanked for commissioning this study and for providing the necessary background information. I am very grateful to Ms Hedi Stummer (retired, formerly of Iziko Museums, Cape Town) and Ms Madelon Tusenius (*Natura Viva* cc) for assistance with the palaeontological fieldwork, for logistical back-up as well as for companionship in the Karoo *veld*. The landowners within the Kwagga 1-3 WEF project areas are all thanked for allowing access to their properties, especially Mnr Ghaties Snyman (Muis Kraal 373) for pointing out an important fossil locality on his farm and Mnr Dirk Lamprecht (Wolwe Kraal No. 17) for generous hospitality during our site visit.

## 10. Qualifications & experience of the author

Dr John Almond has an Honours Degree in Natural Sciences (Zoology) as well as a PhD in Palaeontology from the University of Cambridge, UK. He has been awarded post-doctoral research fellowships at Cambridge University and in Germany, and has carried out palaeontological research in Europe, North America, the Middle East as well as North and South Africa. For eight years he was a scientific officer (palaeontologist) for the Geological Survey / Council for Geoscience in the RSA. His current palaeontological research focuses on fossil record of the Precambrian - Cambrian boundary and the Cape Supergroup of South Africa. He has recently written palaeontological reviews for several 1: 250 000 geological maps published by the Council for Geoscience and has contributed educational material on fossils and evolution for new school textbooks in the RSA.

Since 2002 Dr Almond has also carried out palaeontological impact assessments for developments and conservation areas in the Western, Eastern and Northern Cape, Limpopo, Northwest Province, Mupumalanga, Gauteng, KwaZulu-Natal and the Free State under the aegis of his Cape Town-based company *Natura Viva* cc. He has served as a long-standing member of the Archaeology, Palaeontology and Meteorites Committee for Heritage Western Cape (HWC) and an advisor on palaeontological conservation and management issues for the Palaeontological Society of South Africa (PSSA), HWC and SAHRA. He is currently compiling technical reports on the provincial palaeontological heritage of Western, Northern and Eastern Cape for SAHRA and HWC. Dr Almond is an accredited member of PSSA and APHP (Association of Professional Heritage Practitioners – Western Cape).

**Declaration of Independence**

I, John E. Almond, declare that I am an independent consultant and have no business, financial, personal or other interest in the proposed development, application or appeal in respect of which I was appointed other than fair remuneration for work performed in connection with the activity, application or appeal. There are no circumstances that compromise the objectivity of my performing such work.



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**Palaeontologist**  
**Natura Viva cc**

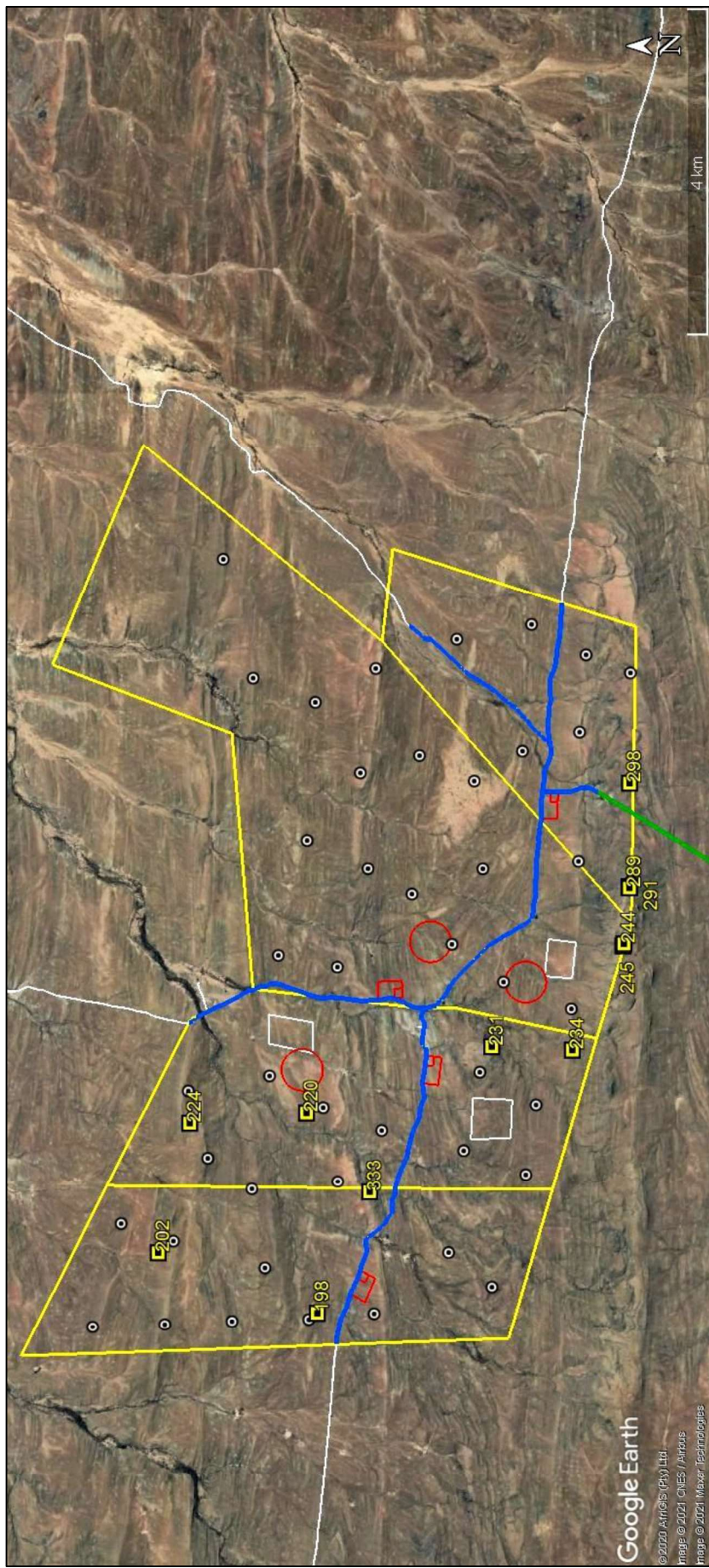
**Table 1: Data table for new fossil sites recorded within the Kwagga 1 WEF project area [NOT for public release]**

All GPS readings were taken in the field using a hand-held Garmin GPSmap 64s instrument. The datum used is WGS 84. Note that:

- Locality data for South African fossil sites in *not* for public release due to conservation concerns.
- The table does *not* represent all potential fossil sites within the project area.
- The stratigraphic data for each site has yet to be confirmed.

Loc	GPS data	Comments
198	S32° 53' 40.1" E22° 36' 50.0"	Dwaalfontein Wes 1/377. Skull of medium-sized tetrapod within palaeocalcrete nodule, <i>in situ</i> within well-developed pedogenic calcrete palaeosol. Proposed Field Rating IIIB – specialist recording and collection necessary if threatened by WEF development.
202	S32° 52' 37.3" E22° 37' 17.9"	Dwaalfontein Wes 1/377. Concentration of several angular to subrounded blocks of poorly-preserved petrified wood among surface gravels dominated by orange tuffite clasts. Presumed to be weathering out of the nearby Poortjie Member sandstones. Proposed Field Rating IIIC – no mitigation necessary.
220	S32° 53' 35.8" E22° 38' 23.8"	Dwaalfontein Wes R/377. Partial skull with articulated upper and lower jaws, teeth of a large-bodied pareiasaur reptile (probably <i>Bradysaurus</i> ) together with cluster of weathered postcranial bones exposed at surface near farm track. Possibly same individual as Loc. 222. Proposed Field Rating IIIB – specialist recording and collection necessary if threatened by WEF development.
222	S32° 53' 35.9" E22° 38' 22.6"	Dwaalfontein Wes. Postcrania, including articulated vertebral column, of large-bodied tetrapod. Possibly same pareiasaur individual as Loc. 220. Proposed Field Rating IIIB – specialist recording and collection necessary if threatened by WEF development.
224	S32° 52' 49.8" E22° 38' 19.0"	Dwaalfontein Wes R/377. Small-scale invertebrate burrows preserved in crevasse sandstone bed top. Proposed Field Rating IIIC – no mitigation necessary.
231	S32° 54' 48.8" E22° 38' 54.9"	Dwaalfontein Wes R/377. Several subcylindrical, vertical sandstone casts of lungfish burrows (round to oval cross-section, up to 7 cm max. diameter) <i>in situ</i> within overbank mudrocks beneath crevasse-splay sandstone. Abundant gypsum pseudomorphs and loading of sandstones suggest plastic lacustrine muds. Proposed Field Rating IIIC – no mitigation necessary.
234	S32° 55' 20.4" E22° 38' 53.4"	Dwaalfontein Wes R/377. Pedogenic palaeocalcrete concretion in float containing a small tetrapod skull (probably small-bodied dicynodont). Proposed Field Rating IIIB – specialist recording and collection necessary if threatened by WEF development.
244	S32° 55' 40.4" E22° 39' 43.4"	Dwaalfontein 379. Small tetrapod skull (probably dicynodont) embedded within silty overbank mudrocks. Proposed Field Rating IIIB – specialist recording and collection necessary if threatened by WEF development.
245	S32° 55' 40.0" E22° 39' 42.4"	Dwaalfontein 379. Small dicynodont skull embedded within pedogenic palaeocalcrete concretion, weathered-out in float. Proposed Field Rating IIIB – specialist recording and collection necessary if threatened by WEF development.
289	S32° 55' 42.6" E22° 40' 09.5"	Tyger Poort Portion 3 of Farm 376. Small block of bone weathered out into erosion gully gravels. Proposed Field Rating IIIC – no mitigation necessary.
290	S32° 55' 42.6" E22° 40' 09.8"	Tyger Poort Portion 3 of Farm 376. Bone (probably large tetrapod) embedded within overbank siltstones. Proposed Field Rating IIIB – specialist recording and collection necessary if threatened by WEF development.

<b>291</b>	S32° 55' 42.6" E22° 40' 09.9"	Tyger Poort Portion 3 of Farm 376. Cluster of postcranial skeletal remains of large tetrapod within surface float. Probably belong to <i>in situ</i> individual at Loc. 293. Proposed Field Rating IIIB – specialist recording and collection necessary if threatened by WEF development.
<b>292</b>	S32° 55' 42.6" E22° 40' 10.0"	Tyger Poort Portion 3 of Farm 376. Cluster of postcranial skeletal remains of large tetrapod within surface float. Probably belong to <i>in situ</i> individual at Loc. 293. Proposed Field Rating IIIB – specialist recording and collection necessary if threatened by WEF development.
<b>293</b>	S32° 55' 42.5" E22° 40' 10.2"	Tyger Poort Portion 3 of Farm 376. <i>In situ</i> postcrania of large tetrapod embedded within overbank siltstones. Probable source of weathered-out bone material at Locs. 291 & 292. Proposed Field Rating IIIB – specialist recording and collection necessary if threatened by WEF development.
<b>294</b>	S32° 55' 42.6" E22° 40' 10.2"	Tyger Poort Portion 3 of Farm 376. Highly-weathered, crumbling bone of large tetrapod, possibly <i>in situ</i> . Proposed Field Rating IIIC – no mitigation necessary.
<b>298</b>	S32° 55' 42.8" E22° 40' 58.6"	Tyger Poort Portion 3 of Farm 376. Cleaved, dark blue-grey to purplish mudrocks (possibly lacustrine) with compressed moulds of longitudinally striated plant stems (probably sphenophyte ferns). Proposed Field Rating IIIC – no mitigation necessary.
<b>333</b>	S32° 54' 00.7" E22° 37' 46.7"	Dwaalfontein Wes 1/377. Small dicynodont skull (lower jaw and palate) embedded within sandstone. Proposed Field Rating IIIB – specialist recording and collection necessary if threatened by WEF development.



**Figure 4: Google Earth© satellite image of the Kwagga 1 WEF project area (yellow polygon) located c. 60 km south of Beaufort West and 5.5 to 16 km to the east of the N12, Western Cape. Numbered new fossil sites (yellow squares – see Table 1) are shown in relation to the provisional layout for wind turbines (white squares), substition site options (white circles), and laydown / compound areas (red rectangles). Important existing roads are shown in blue with the connecting road between Kwagga 1 and 2 in green. The internal access road network is *not* shown here. Note that none of the known fossil sites lies within the provisional development footprint, as currently defined. No areas of High Palaeosensitivity or No-Go Areas are identified here. Please note that this map does *not* show all potential fossil sites within the study area.**

John E. Almond (2021)

Natura Viva cc

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.3

## Avifauna

# Kwagga 1 – 3 Wind Energy Facilities: Avifaunal Reconnaissance Report

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January 2021



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Chris has 22 years' experience in the management of wildlife interactions with electricity infrastructure. He was head of the Eskom-Endangered Wildlife Trust (EWT) Strategic Partnership from 1996 to 2007, which has received international acclaim as a model of co-operative management between industry and natural resource conservation. He is an acknowledged global expert in this field and has worked in South Africa, Namibia, Botswana, Lesotho, New Zealand, Texas, New Mexico and Florida. Chris also has extensive project management experience and has received several management awards from Eskom for his work in the Eskom-EWT Strategic Partnership. He is the author of 15 academic papers (some with co-authors), co-author of two book chapters and several research reports. He has been involved as ornithological consultant in numerous power line and wind generation projects. Chris is also co-author of the Best Practice for Avian Monitoring and Impact Mitigation at Wind Development Areas in Southern Africa, which is currently accepted as the industry standard. Chris also works outside the electricity industry and had done a wide range of bird impact assessment studies associated with various residential and industrial developments.

**Albert Froneman**

Albert has an M. Sc. in Conservation Biology from the University of Cape Town and started his career in the natural sciences as a Geographic Information Systems (GIS) specialist at the Council for Scientific and Industrial Research (CSIR). In 1998, he joined the Endangered Wildlife Trust where he headed up the Airports Company South Africa – EWT Strategic Partnership, a position he held until he resigned in 2008 to work as a private ornithological consultant. Albert's specialist field is the management of wildlife, especially bird related hazards at airports. His expertise is recognized internationally; in 2005 he was elected as Vice Chairman of the International Bird Strike Committee. Since 2010, Albert has worked closely with Chris van Rooyen in developing a protocol for pre-construction monitoring at wind energy facilities, and he is currently jointly coordinating pre-construction and operational monitoring programmes at several wind farm facilities. Albert also works outside the electricity industry and had done a wide range of bird impact assessment studies associated with various residential and industrial developments.



# Summary of findings

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## 1. Introduction

ABO Wind Renewable Energies (Pty) Ltd (“the Developer”) is proposing to develop three Wind Energy Facilities (WEFs) and associated infrastructure approximately 60km south of 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 each have a total installed capacity of 279 MW (Kwagga 1), 341 MW (Kwagga 2) and 204.6 MW (Kwagga 3), respectively.

This report presents the findings of a pre-construction avifaunal monitoring programme which was implemented at the proposed Kwagga Wind Energy Facilities (WEFs) in the course of 2019 and 2020. The programme was implemented prior to the promulgation of the prescribed protocol for assessment and minimum criteria for reporting on the impacts of wind energy facilities on avifauna.<sup>1</sup> However, the protocol followed is in alignment with the published avifaunal protocol, and this report therefore serves as the prescribed reconnaissance study for all three the proposed developments.

With an overall recorded species count of 91, of which 12 species are priority species, the area where the proposed development and control areas are located supports a moderate diversity of avifauna, which is to be expected from an extremely arid area. Nonetheless, the transect survey data indicates that the development area is suitable for a number of priority species at low densities, especially members of the *Otididae* family (bustards and korhaans), and *Accipitridae* (raptors).

### 1.1 Displacement

- **Karoo Korhaan**

This southern African endemic is classified as locally Near Threatened (Taylor *et al.* 2015). The Kwagga development areas (239 km<sup>2</sup>) are estimated to hold around 47 pairs. It is not expected that the species will be entirely displaced by the wind farm, as the proposed direct habitat loss due to the turbines and associated infrastructure is usually only around 5% - 10% (Strickland *et al.* 2011). Temporary displacement is likely during the construction phase, but re-colonisation is likely once the construction activities are over, although post-construction densities might be lower. The biggest potential impact (if any) is likely to be habitat fragmentation by the road network, rather than the actual physical habitat destruction (Strickland *et al.* 2011).

- **Southern Pale Chanting Goshawk**

The habitat at the development areas is highly suitable for the species, with a mixture of open ground (for prey visibility) and hunting perches (shrubs), with an estimated 27 pairs or family groups potentially resident in the development area. Being a raptor, permanent displacement is highly unlikely, even during the construction phase (Madders and Whitfield 2006; Hötter *et al.* 2006; Gove *et al.* 2013).

- **Ludwig’s Bustard**

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<sup>1</sup> GN 320 published on 20 March 2020.

This southern African near-endemic is classified as both locally and globally Endangered (Taylor *et al.* 2015). It is not possible to make an estimate of the population in the development areas, as it is likely to vary widely depending on the availability of food resources. Temporary displacement is likely during the construction phase, but re-colonisation is likely once the construction activities are over, although post-construction densities might be lower. The biggest potential impact (if any) is likely to be habitat fragmentation by the road network, rather than the actual physical habitat destruction (Strickland *et al.* 2011).

- **Kori Bustard and Booted Eagle**

The only other priority species that were recorded during transects counts in the development areas were the near Threatened Kori Bustard (Taylor *et al.* 2015) and Booted Eagle, which is not regarded as threatened. Both species were recorded in very low numbers. In the case of Kori Bustard, the situation is likely to be the same as with Ludwig's Bustard. i.e. temporary displacement is likely during the construction phase, but re-colonisation is likely once the construction activities are over, although post-construction densities might be lower. The biggest potential impact (if any) is likely to be habitat fragmentation by the road network, rather than the actual physical habitat destruction (Strickland *et al.* 2011). In the case of Booted Eagle, an intra-African and Palearctic summer migrant, it can be reasonably assumed that the birds that were recorded were moving through the development areas to breeding grounds further to the south, in the Swartberg Mountains. Being a raptor, permanent displacement is highly unlikely, even during the construction phase (Madders and Whitfield 2006; Hötter *et al.* 2006; Gove *et al.* 2013).

## 1.2 Collisions

The passage rate of 0.11 birds/hour for priority species recorded over the four surveys during the 12-months pre-construction, is low<sup>2</sup>.

- **Verreaux's Eagle**

The locally Vulnerable Verreaux's Eagle (Taylor *et al.* 2015) emerged as the species with the highest site-specific collision risk rating at 0.41, which is 4.5 times higher than the average rating for priority species recorded flight activity. This is a surprise finding, as the habitat is not suitable for Verreaux's Eagles at all. It is difficult to speculate why the bird found itself so far from suitable habitat, as there is definitely not suitable breeding or foraging habitat in the development areas for this cliff-nesting and specialised Rock Hyrax *Procavia capensis* hunter. The most probable explanation is that the bird was a floater, i.e. a non-breeding individual without a territory, which may have wandered into the area for a short while. Because these birds are not tied to breeding territories, they sometimes wander widely. The risk of turbine collisions for the species is regarded as low, notwithstanding the collision risk rating in this instance, as it is extremely unlikely that the species will occur regularly in the development areas.

- **Lanner Falcon**

The locally Vulnerable Lanner Falcon (Taylor *et al.* 2015) emerged with the second highest site-specific collision risk rating at 0.15, which is 1.6 times higher than the average rating for priority species recorded flight activity. The national population is estimated at <5000 breeding individuals (Taylor *et al.* 2015). The development areas have limited suitable breeding habitat for the species in the form of Eucalyptus trees and disused windmills where they might attempt to breed in a crow nest. No breeding was recorded, and it is estimated that the development areas are suitable for 3 - 4 pairs of birds at most due to limited nesting opportunities. Occasional mortalities of especially juvenile birds can be expected, but not beyond the critical threshold of 12% of breeding adults in the regional population (Tack *et al.* 2017), which could lead to a gradual decline in the population.

- **Booted Eagle**

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<sup>2</sup> The passage rate is the sixth lowest out of 51 potential and operational wind farm areas which were surveyed by the authors countrywide, and the third lowest out of 29 areas located within the Nama and Succulent Karoo biomes (Van Rooyen unpubl. data).

The species is an intra-African and Palearctic summer migrant. The species is regarded as locally fairly common (Hockey *et al.* 2005). The species emerged with the third highest collision risk rating, which at 0.11 is 1.2 times higher than the average risk rating of 0.09 for priority species at the development areas. The species have been killed at wind farms in South Africa (van Rooyen unpubl. data) (Ralston-Patton *et al.* 2017, Perold *et al.* 2018, Ralston - Patton & Camagu 2019), therefore sporadic mortality could be expected. The local population is regarded as "locally fairly common" with an estimated breeding population of >700 pairs in the former Cape Province (Hockey *et al.* 2005), therefore the impact of the occasional mortality is not expected to push the annual background mortality beyond the critical threshold of 12% of breeding adults in the regional population (Tack *et al.* 2017), which could lead to a gradual decline in the population.

- **Kori Bustard**

Some flight activity at medium altitude was also recorded for the Near Threatened Kori Bustard (Taylor *et al.* 2015), albeit less than the average for priority species. A single bird was recorded for one minute in March 2019, flying at medium altitude. The species has not yet been recorded as a turbine collision victim in South Africa (Ralston-Patton *et al.* 2017, Perold *et al.* 2018, Ralston - Patton & Camagu 2019). Indications are that bustards, which are highly vulnerable to power line collisions, are not prone to wind turbine collisions.

- **Southern Pale Chanting Goshawk**

The flight activity was very low with a total of only 6 minutes and 30 seconds of flight activity recorded for the species over the total period of observations. Although the species is the commonest raptor in the area, it is not a very aerial species and it seldom soars. All of the flight activity was recorded below rotor height. The impact of the occasional mortality is not expected to push the annual background mortality beyond the critical threshold of 12% of breeding adults in the regional population (Tack *et al.* 2017), which could lead to a gradual decline in the population.

- **Black Harrier**

At an estimated global population of about 1000 mature individuals, Black Harriers are the scarcest endemic raptor in southern Africa (Taylor *et al.* 2015) and is classified as locally Endangered (Taylor *et al.* 2015). The Black Harrier received a collision risk rating of zero, because no flights within rotor height were recorded. Given the extreme aridity of the proposed development areas, it is not expected that Black Harriers will regularly forage in the area, but they can occur sporadically, especially after good rains when the vegetation has recovered. An occasional mortality cannot be excluded, but it should not be a regular occurrence.

- **Ludwig's Bustard**

Ludwig's Bustard emerged with a collision risk rating of zero, because no medium altitude flights were recorded. Ludwig's Bustard is classified as Endangered, both globally (IUCN 2020) and regionally (Taylor *et al.* 2015). As stated earlier, indications are that bustards, which are highly vulnerable to power line collisions, are not prone to wind turbine collisions (see 6.2.4).

- **Karoo Korhaan**

Karoo Korhaan flights constituted the vast majority of recorded flight activity for all priority species at the site but all of it was at low altitude. Karoo Korhaan does not fly easily and when it does fly, it tends to fly at low altitudes for a short distance (pers. observation). So far, there have been no published reports of Karoo Korhaan fatalities at wind farms in South Africa (Ralston-Patton *et al.* 2017, Perold *et al.* 2018, Ralston - Patton & Camagu 2019).

## 2. Sensitive areas

The following high sensitivity areas were identified (see Figure 14), which are all linked to the presence of surface water, which is a huge attractant for most birds, especially in very arid areas, such is the case with the development areas.

Within these 400m buffer areas, no turbines should be constructed, to prevent displacement of birds during the construction phase, and to reduce the collision risk during the operational phase.

### 3. Conclusions

The avifaunal pre-construction monitoring, conducted over a 12-months period in 2019 and 2020, has not revealed any fatal flaws which stand in the way of the development of the proposed wind energy facilities. However, this conclusion is subject to the implementation of the recommendations listed in Section 9.

## 4. Recommendations

### 4.1 Displacement

- Construction activity should be restricted to the immediate footprint of the infrastructure, and in particular to the proposed road network. Access to the remainder of the area should be strictly controlled to prevent unnecessary disturbance of priority species.
- Removal of vegetation must be restricted to a minimum and must be rehabilitated to its former state where possible after construction.
- Construction of new roads should only be considered if existing roads cannot be upgraded.
- Once operational, vehicle and pedestrian access to the area should be controlled and restricted to access roads to prevent unnecessary disturbance of priority species.
- Formal live-bird monitoring should be implemented in the operational phase, as per the most recent edition of the Best Practice Guidelines at the time (Jenkins *et al.* 2015). The purpose of this would be to establish if displacement of priority species has occurred and to what extent. The exact time when operational monitoring should commence, will depend on the construction schedule, and should commence when the first turbines starts to turn.
- No turbines should be constructed in the buffer zones as indicated in the sensitivity map in Section 4. These buffer zones are all linked to surface water, which could attract many birds, including some threatened raptors species such as the Martial Eagle.

### 4.2 Collisions

- The results of the pre-construction monitoring must guide the lay-out of the turbines, especially as far as proposed no-turbine zones are concerned. No turbines must be constructed in the buffer zones which were identified based on the results of the pre-construction monitoring, with a specific view to limiting the risk of collisions to a variety of birds, including several Red Data species.
- Formal live-bird monitoring should be in the operational phase, as per the most recent edition of the Best Practice Guidelines at the time (Jenkins *et al.* 2015) to assess collision rates.
- If collision rates indicate unacceptable mortality levels of priority species, i.e. in excess of 12% of the adult breeding populations which could potentially be directly impacted by the wind farm, additional measures will have to be implemented which could include shut down on demand or other measures.

### 4.3 Operational monitoring

- The Best Practice Guidelines require that, as an absolute minimum, operational monitoring should be undertaken for the first two (preferably three) years of operation, and then repeated again in year 5, and again every five years thereafter for the operational life-time of the facility. The exact scope and nature of the post-construction monitoring will be determined on an ongoing basis by the result of the monitoring through a process of adaptive management.

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List of Abbreviations

CSIR	The Council for Scientific and Industrial Research
VP	Vantage point
FP	Focal point
MW	Megawatt
IKA	Index of Kilometric Abundance
WEF	Wind Energy Facility
IUCN	International Union for Conservation of Nature

# 1. Introduction

ABO Wind Renewable Energies (Pty) Ltd (“the Developer”) is proposing to develop three Wind Energy Facilities (WEFs) and associated infrastructure approximately 60km south of 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 proposed wind energy facilities (WEFs) will each have a total installed capacity of 279 MW (Kwagga 1), 341 MW (Kwagga 2) and 204.6 MW (Kwagga 3), respectively.

This report presents the findings of a pre-construction avifaunal monitoring programme which was implemented at the proposed Kwagga WEFs in the course of 2019 and 2020. The programme was implemented prior to the promulgation of the prescribed protocol for assessment and minimum criteria for reporting on the impacts of wind energy facilities on avifauna<sup>3</sup>. However, the protocol followed is in alignment with the published avifaunal protocol, and this report therefore serves as the prescribed reconnaissance study for all three the proposed developments.

With an overall recorded species count of 91, of which 12 species are priority species, the area where the proposed development and control areas are located supports a moderate diversity of avifauna, which is to be expected from an extremely arid area. Nonetheless, the transect survey data indicates that the development area is suitable for a number of priority species at low densities, especially members of the Otididae family (bustards and korhaans), and Accipitridae (raptors).

The pre-construction monitoring protocol was designed in accordance with the latest version (2015) of the “*Best practice guidelines for avian monitoring and impact mitigation at proposed wind energy development areas in southern Africa*” (Jenkins *et al.* 2011) (the Best Practice Guidelines).

## 2. Terms of reference

The terms of reference for the avifaunal pre-construction monitoring programme were as follows:

- To establish which species regularly occur in the development areas;
- To gather baseline data on the diversity of avifauna and specifically abundance of priority species in the development areas to measure potential **displacement** due to the construction and operation of the wind farm. This is primarily done through transect surveys (see 4.1 below).
- To record flight behaviour of priority species to assess the risk of potential mortality due to **collision** with the turbines. This is primarily done through vantage point counts (see 4.2 below).

## 3. Assumptions and limitations

The basic assumption is that the sources of information used are reliable enough to allow for meaningful interpretation. However, it must be noted that there are certain limitations:

- It is inevitable that observations at vantage points are biased towards those species that are more visible (i.e. larger species), and flights that are closer to the observer (one observer per VP). It must therefore be accepted that both the accuracy and frequency of observations decrease with the distance from the observer.

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<sup>3</sup> GN 320 published on 20 March 2020.

- The best practice guidelines state that “monitoring data also should be collected over at least a 12-month period (at both WEF and control areas) and include sample counts representative of the full spectrum of prevailing environmental conditions likely to occur on each area in a year. Whereas the sampling periods in this study aim to be broadly representative of seasonal environmental conditions which prevailed during the monitoring period, it must be borne in mind that environmental conditions may vary significantly on an annual basis. Furthermore, it is not always practically possible to schedule monitoring to coincide with the full spectrum of environmental conditions.
- In circumstances where there is uncertainty and the precautionary principle may be relevant, evidence, expert opinion, best practice guidance and professional judgment was applied.
- For purposes of monitoring, priority species were defined as species included on the latest (2014) list of priority species of the Avian Wind Farm Sensitivity Map of South Africa (Retief *et al.* 2012).

## 4. Methods

Data was gathered through sampling surveys at the development areas and a control area, during the following periods:

Autumn:	10 – 18 March 2019 and 5 – 10 May 2020
Winter:	17 – 26 July and 6-8 August 2019
Spring:	12 - 28 September 2019
Summer:	16 – 20 January 2020 and 3 – 4 March 2020

### 4.1 Transects and point counts

Monitoring was conducted in the following manner:

- Three drive transects were identified totalling 40.33km on the development areas and one drive transect in the control area with a total length of 9.52km.
- Two monitors travelling slowly ( $\pm 10$ km/h) in a vehicle recorded all birds on both sides of the transect. The observers stopped at regular intervals (every 500m) to scan the environment with binoculars. Drive transects were counted three times per sampling session.
- In addition, 13 walk transects of 1km each were identified at the development areas, and one at the control area, and counted 8 times per sampling season. All birds were recorded during walk transects.
- The following variables were recorded:
  - Species;
  - Number of birds;
  - Date;
  - Start time and end time;
  - Estimated distance from transect;
  - Wind direction;
  - Wind strength (estimated Beaufort scale);
  - Weather (sunny; cloudy; partly cloudy; rain; mist);
  - Temperature (cold; mild; warm; hot);
  - Behaviour (flushed; flying-display; perched; perched-calling; perched-hunting; flying-foraging; flying-commute; foraging on the ground); and
  - Co-ordinates (priority species only).

The aim with drive transects was primarily to record large priority species (i.e. raptors and large terrestrial species), while walk transects are primarily aimed at recording small passerines. The objective of the transect monitoring was to gather baseline data on the use of the areas by birds in order to measure potential displacement by the wind farm activities.

See Figure 1 for the location of the drive and walk transects at the development and control areas.

## 4.2 Vantage point observations

Monitoring was conducted in the following manner:

- 13 vantage points (VPs) were identified from which the majority of the proposed development areas could be observed, to record the flight altitude and patterns of priority species. One VP was also identified on the control area. The following variables were recorded for each flight:
  - Species;
  - Number of birds;
  - Date;
  - Start time and end time;
  - Wind direction;
  - Wind strength (estimated Beaufort scale 1-7);
  - Weather (sunny; cloudy; partly cloudy; rain; mist);
  - Temperature (cold; mild; warm; hot);
  - Flight altitude (high i.e. >220m; medium i.e. 30m – 220m; low i.e. <30m);
  - Flight mode (soar; flap; glide; kite; hover); and
  - Flight time (in 15 second intervals).

The objective of vantage point counts was to measure the potential collision risk with the turbines. Priority species were identified using the latest (November 2014) BirdLife SA (BLSA) list of priority species for wind farms.

See Figure 1 for the location of the vantage points at the development and control areas.

## 4.3 Focal point counts

A total of five potential focal points (FPs) of bird activity were identified and monitored. Four focal points were farm dams and one was a Martial Eagle nest on the Droërvier-Proteus 400 kV high voltage line within 10km of the western border of the development area, on Tower 108.

See Figure 1 for the location of the focal points at the turbine and control areas.

## 4.4 Habitat and climate

The development and control areas are located in Gamka Karoo, which is one of most arid vegetation units of the Nama Karoo biome. It consists of undulating plains covered with dwarf spiny shrubland dominated by Karoo dwarf shrubs, with sparse low trees. Dense stands of drought-resistant grasses cover broad sandy bottomlands, but only after abundant rains, which happens seldom (Mucina & Rutherford 2006). The development areas contain many ephemeral drainage lines which are characterised by sandy channels with *Vachellia karoo* shrubs and small trees growing on the edges. This region is in the rain shadow of the Cape Fold Belt mountains in the south, with mean annual precipitation ranging from 100 – 240mm, mostly between December and April. Mean maximum and minimum monthly temperatures in Beaufort West are 38.7°C and -3.2°C for January (summer) and July (winter) respectively (Mucina & Rutherford 2006). Strong north-westerly winds occur in winter (Mucina & Rutherford 2006). The only longer-term surface water in the development areas consists of a couple of earth dams and many boreholes with water troughs. Drainage lines flow only briefly after good rains. The only large trees that are found in the development area are exotics, mostly Eucalyptus, which are located at homesteads. The land is used mostly for sheep and game farming. The Droërvier - Proteus 400kV high voltage line runs to the west of the development areas, parallel to the N12 national road, which is located approximately 6km from the closest border of the development areas.

See Figures 2 - 4 for representative examples of habitat at the development areas.

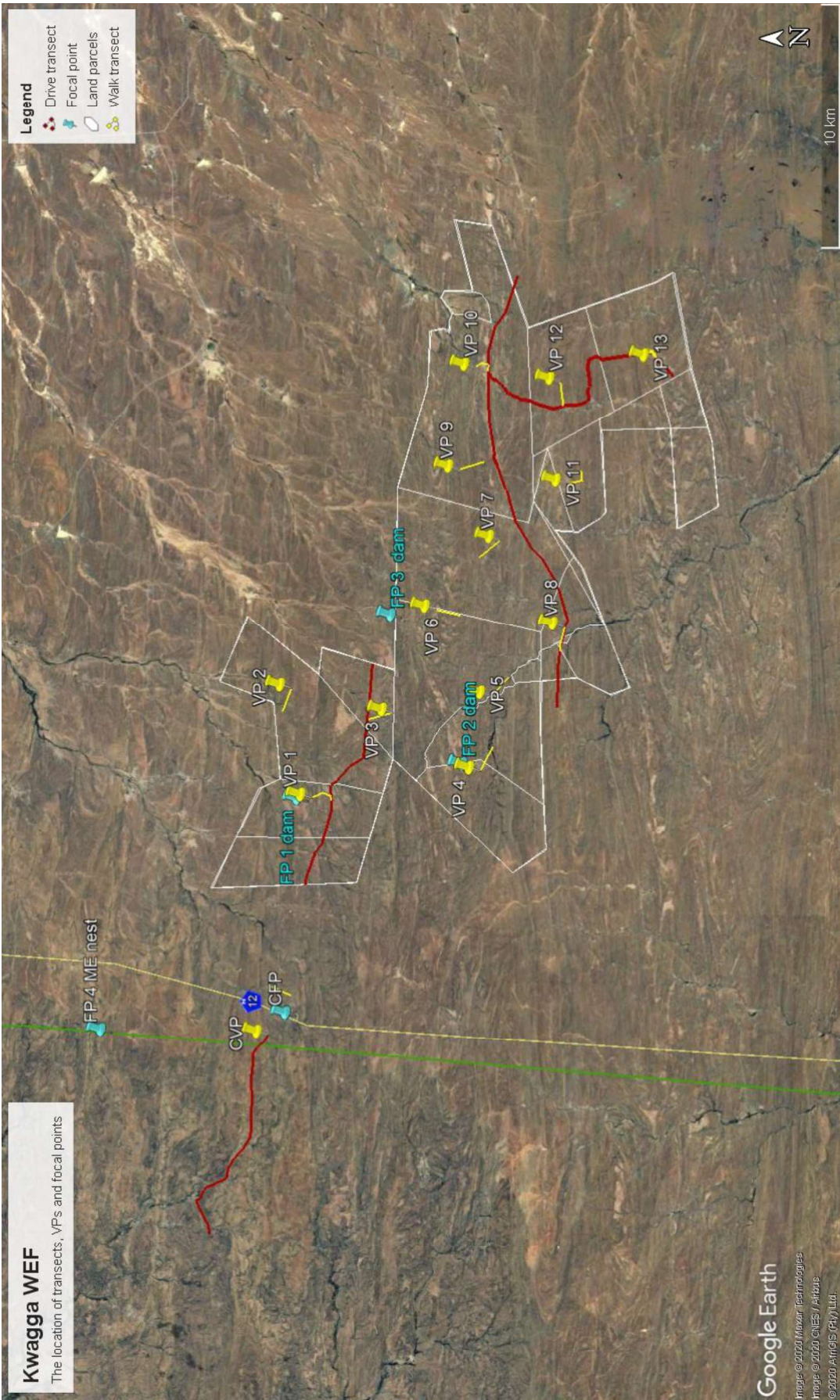


Figure 1: Transects, VPs and focal points used during the pre-construction monitoring. The control area is located to the west of the proposed WEFs.



Figure 2: Gamka Karoo is the dominant habitat in the development area. Note the absence of a grass layer, due to extended drought conditions.



Figure 3: Boreholes with water troughs are the only permanent surface water in the development area.



Figure 4: Ephemeral drainage lines only flow periodically after rains, and contain stunted trees, sometimes forming clumps of thicket.

## 5. Results

### 5.1 Transects, walk transects and focal point surveys

#### 5.1.1 Transects and point counts

The results of the transect counts are tabled in Tables 1 and 2.

Table 1: The results of the drive transects

	Total number of individuals - all species	Total number of individuals - priority species only	Total number of species (i.e. both non-priority and priority)	Total number of priority species only
Development areas	1 463	186	74	5
Control area	237	15	33	3

Table 2: The results of the walk transects:

	Total number of individuals - all species	Total number of individuals - priority species only	Total number of species (i.e. both non-priority and priority)	Total number of priority species only
Development areas	6 216	232	83	3
Control area	706	22	31	1

Eight priority species were recorded as incidental sightings (i.e. not during formal surveys) in and around the development areas and eight priority species during vantage point counts (see Table 3 for a consolidated list of species from all survey sources).

An Index of Kilometric Abundance (IKA = birds/km) was calculated for each priority species, and also for all priority species combined, which equates to 0.38 birds/km for the drive transects at the development area, and 0.43 birds/km for drive transects at the control area. For walk transects, the figure at the development area is 0.56 birds/km and 0.34 birds/km for the control area (see Figures 5 and 6 below).

Overall, the abundance of birds was low during the year of pre-construction monitoring.

#### 5.1.2 Focal points

Five potential avifaunal focal points were identified and were monitored during each of the surveys. The results of the surveys were as follows:

- FP 1 (earth dam): The dam was dry for the full period of the monitoring, except in autumn 2019, when the dam had a little bit of water. No birds were recorded during any of the surveys.
- FP 2 (earth dam): The dam was dry for the entire period of the monitoring. No birds were recorded.
- FP3 (earth dam): The dam was dry for the entire period of the monitoring. No birds were recorded.
- FP4 Martial Eagle nest: The nest on Tower 108 appeared to be active when it was inspected in June 2019, based on fresh whitewash around the nest tower. Two adult birds were recorded at the nest in May 2020.
- Control FP (earth dam): Non-priority bird species were recorded at the dam in March 2020, namely Red-billed Teal, Cape Shoveler, South Africa Shelduck, Pied Avocet, Egyptian Goose, African Spoonbill, Blacksmith Lapwing and Three-banded Plover. No priority species were recorded.

Table 3: Consolidated list of species recorded at the development and control area from all data sources, with regional status (Taylor *et al.* 2015). The conservation status is indicated in brackets behind the species name in the first column. See Appendix 1 for photographs of the priority species.

Priority Species		Transects turbine	Transects control	VP	VP control	Incidental
Black Harrier (Endangered)	<i>Circus maurus</i>			*		
Blue Crane (Near threatened)	<i>Anthropoides paradiseus</i>					*
Booted Eagle	<i>Aquila pennatus</i>	*		*		
Greater Kestrel	<i>Falco rupicoloides</i>					*
Karoo Korhaan (Near threatened)	<i>Eupodotis vigorsii</i>	*	*	*	*	*
Kori Bustard (Near threatened)	<i>Ardeotis kori</i>	*		*		*
Lanner Falcon (Vulnerable)	<i>Falco biarmicus</i>			*		
Ludwig's Bustard (Endangered)	<i>Neotis ludwigii</i>	*	*	*		*
Martial Eagle (Endangered)	<i>Polemaetus bellicosus</i>					*
Southern Pale Chanting Goshawk	<i>Melierax canorus</i>	*	*	*		*
Spotted Eagle-Owl	<i>Bubo africanus</i>					*
Verreaux's Eagle (Vulnerable)	<i>Aquila verreauxii</i>			*	*	
12		5	3	8	2	8
Non-Priority Species		Transects turbine	Transects control			
Acacia Pied Barbet	<i>Tricholaema leucomelas</i>	*	*			
African Black Swift	<i>Apus barbatus</i>	*				
African Hoopoe	<i>Upupa africana</i>	*				
African Pipit	<i>Anthus cinnamomeus</i>	*				
African Red-eyed Bulbul	<i>Pycnonotus nigricans</i>	*	*			
Alpine Swift	<i>Tachymarptis melba</i>	*				
Anteater Chat	<i>Myrmecocichla formicivora</i>		*			
Barn Swallow	<i>Hirundo rustica</i>	*				
Black-eared Sparrowlark	<i>Eremopterix australis</i>	*				
Black-headed Canary	<i>Serinus alario</i>	*				
Blacksmith Lapwing	<i>Vanellus armatus</i>	*				
Black-throated Canary	<i>Crithagra atrogularis</i>	*				
Bokmakierie	<i>Telophorus zeylonus</i>	*	*			
Brown-throated Martin	<i>Riparia paludicola</i>	*				
Cape Bunting	<i>Emberiza capensis</i>	*	*			
Cape Crow	<i>Corvus capensis</i>	*	*			
Cape Penduline-Tit	<i>Anthoscopus minutus</i>	*				

		Transects turbine	Transects control
<b>Non-Priority Species cont.</b>			
Cape Robin-Chat	<i>Cossypha caffra</i>	*	
Cape Sparrow	<i>Passer melanurus</i>	*	*
Cape Turtle-Dove	<i>Streptopelia capicola</i>	*	*
Cape Wagtail	<i>Motacilla capensis</i>	*	
Cape White-eye	<i>Zosterops capensis</i>	*	
Chat Flycatcher	<i>Bradornis infuscatus</i>	*	*
Chestnut-vented Tit-Babbler	<i>Parisoma subcaeruleum</i>	*	*
Common Fiscal	<i>Lanius collaris</i>	*	*
Common Scimitarbill	<i>Rhinopomastus cyanomelas</i>	*	
Common Swift	<i>Apus apus</i>		*
Crowned Lapwing	<i>Vanellus coronatus</i>	*	
Double-banded Courser	<i>Rhinoptilus africanus</i>	*	*
Dusky Sunbird	<i>Cinnyris fuscus</i>	*	*
Egyptian Goose	<i>Alopochen aegyptiaca</i>	*	*
Fairy Flycatcher	<i>Stenostira scita</i>	*	*
Familiar Chat	<i>Cercomela familiaris</i>	*	*
Fiscal Flycatcher	<i>Sigelus silens</i>	*	*
Greater Striped Swallow	<i>Hirundo cucullata</i>	*	
Grey Tit	<i>Parus afer</i>	*	*
Grey-backed Cisticola	<i>Cisticola subruficapilla</i>	*	
Grey-backed Sparrowlark	<i>Eremopterix verticalis</i>	*	
Hadeda Ibis	<i>Bostrychia hagedash</i>	*	*
Helmeted Guineafowl	<i>Numida meleagris</i>	*	
House Sparrow	<i>Passer domesticus</i>	*	
Karoo Chat	<i>Cercomela schlegelii</i>	*	*
Karoo Eremomela	<i>Eremomela gregalis</i>	*	
Karoo Long-billed Lark	<i>Certhilauda subcoronata</i>	*	*
Karoo Prinia	<i>Prinia maculosa</i>	*	*
Karoo Scrub-Robin	<i>Cercotrichas coryphoeus</i>	*	*
Karoo Thrush	<i>Turdus smithi</i>		*
Kittlitz's Plover	<i>Charadrius pecuarius</i>	*	
Large-billed Lark	<i>Galerida magnirostris</i>	*	*
Lark-like Bunting	<i>Emberiza impetuani</i>	*	*
Laughing Dove	<i>Streptopelia senegalensis</i>	*	
Layard's Tit-Babbler	<i>Parisoma layardi</i>	*	*
Little Swift	<i>Apus affinis</i>	*	*
Long-billed Crombec	<i>Sylvietta rufescens</i>	*	
Long-billed Pipit	<i>Anthus similis</i>	*	
Malachite Sunbird	<i>Nectarinia famosa</i>	*	
Mountain Wheatear	<i>Oenanthe monticola</i>	*	*

		Transects turbine	Transects control
<b>Non-Priority Species cont.</b>			
Namaqua Dove	<i>Oena capensis</i>	*	*
Namaqua Sandgrouse	<i>Pterocles namaqua</i>	*	
Pale-winged Starling	<i>Onychognathus nabouroup</i>		*
Pearl-breasted Swallow	<i>Hirundo dimidiata</i>	*	
Pied Crow	<i>Corvus albus</i>	*	*
Pied Starling	<i>Spreo bicolor</i>	*	*
Plain-backed Pipit	<i>Anthus leucophrys</i>	*	
Pirit Batis	<i>Batis pririt</i>	*	
Red-capped Lark	<i>Calandrella cinerea</i>	*	
Red-faced Mousebird	<i>Urocolius indicus</i>	*	*
Red-headed Finch	<i>Amadina erythrocephala</i>	*	
Red-knobbed Coot	<i>Fulica cristata</i>	*	
Red-winged Starling	<i>Onychognathus morio</i>	*	
Rock Kestrel	<i>Falco rupicolus</i>		*
Rock Martin	<i>Hirundo fuligula</i>	*	
Rufous-eared Warbler	<i>Malcorus pectoralis</i>	*	*
Sabota Lark	<i>Calendulauda sabota</i>	*	
Sickle-winged Chat	<i>Cercomela sinuata</i>	*	
South African Shelduck	<i>Tadorna cana</i>	*	*
Southern Double-collared Sunbird	<i>Cinnyris chalybeus</i>	*	
Southern Grey-headed Sparrow	<i>Passer diffusus</i>	*	
Southern Masked-Weaver	<i>Ploceus velatus</i>	*	
Southern Red Bishop	<i>Euplectes orix</i>	*	
Speckled Mousebird	<i>Colius striatus</i>	*	
Speckled Pigeon	<i>Columba guinea</i>	*	*
Spike-heeled Lark	<i>Chersomanes albofasciata</i>	*	*
Spotted Thick-knee	<i>Burhinus capensis</i>	*	
Three-banded Plover	<i>Charadrius tricollaris</i>	*	
White-backed Mousebird	<i>Colius colius</i>	*	*
White-necked Raven	<i>Corvus albicollis</i>		*
White-rumped Swift	<i>Apus caffer</i>	*	
White-throated Canary	<i>Crithagra albogularis</i>	*	*
Yellow Canary	<i>Crithagra flaviventris</i>	*	*
Yellow-bellied Eremomela	<i>Eremomela icteropygialis</i>	*	*
91		85	45
		<b>90</b>	<b>48</b>

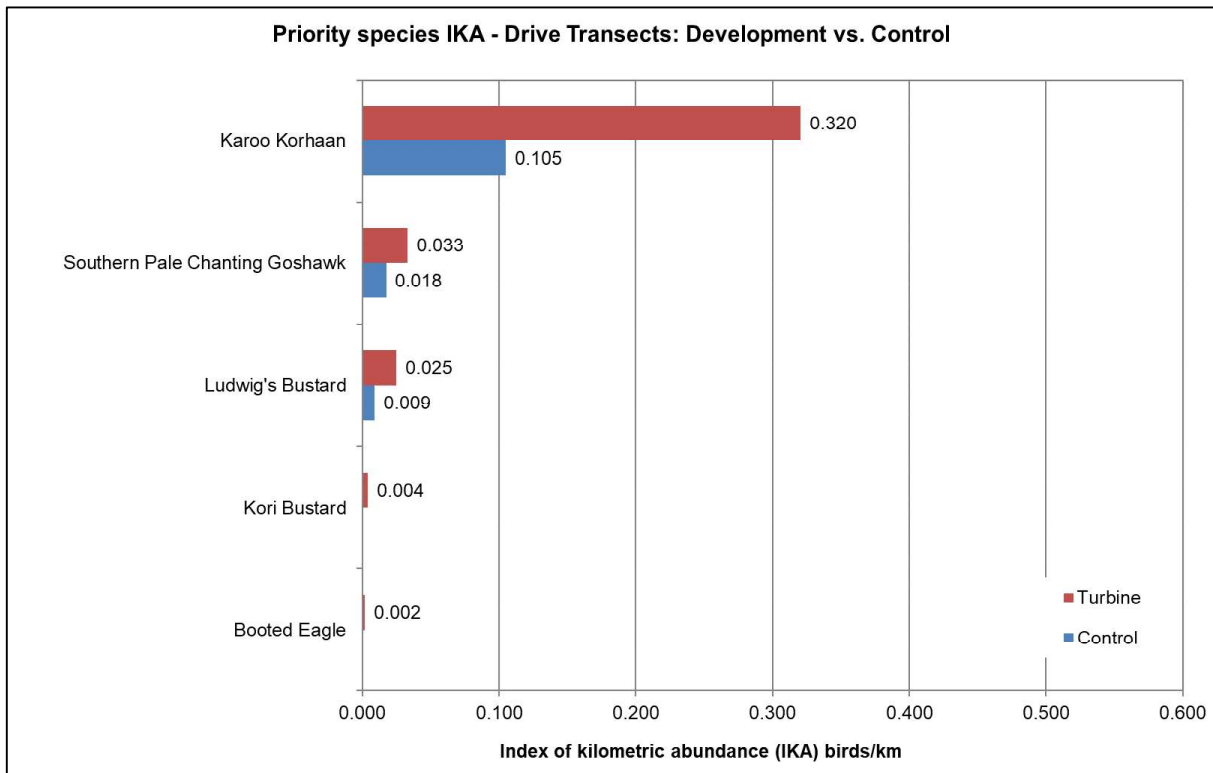


Figure 5: Index of kilometric abundance of priority species recorded at the development and control areas through drive transect surveys.

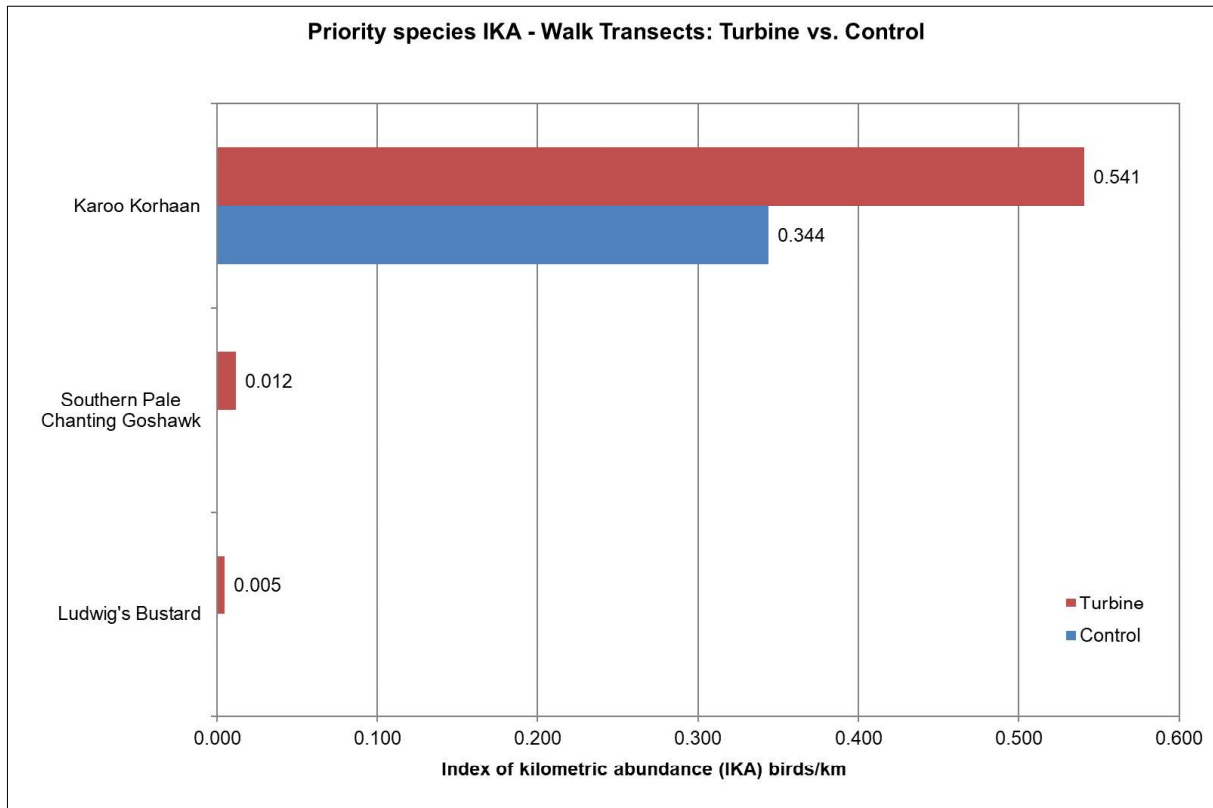


Figure 6: Index of kilometric abundance of priority species recorded at the development and control areas through walk transect surveys.

The spatial distribution of priority species recorded during the transects counts, and as incidental observations, is depicted in Figure 7 below.

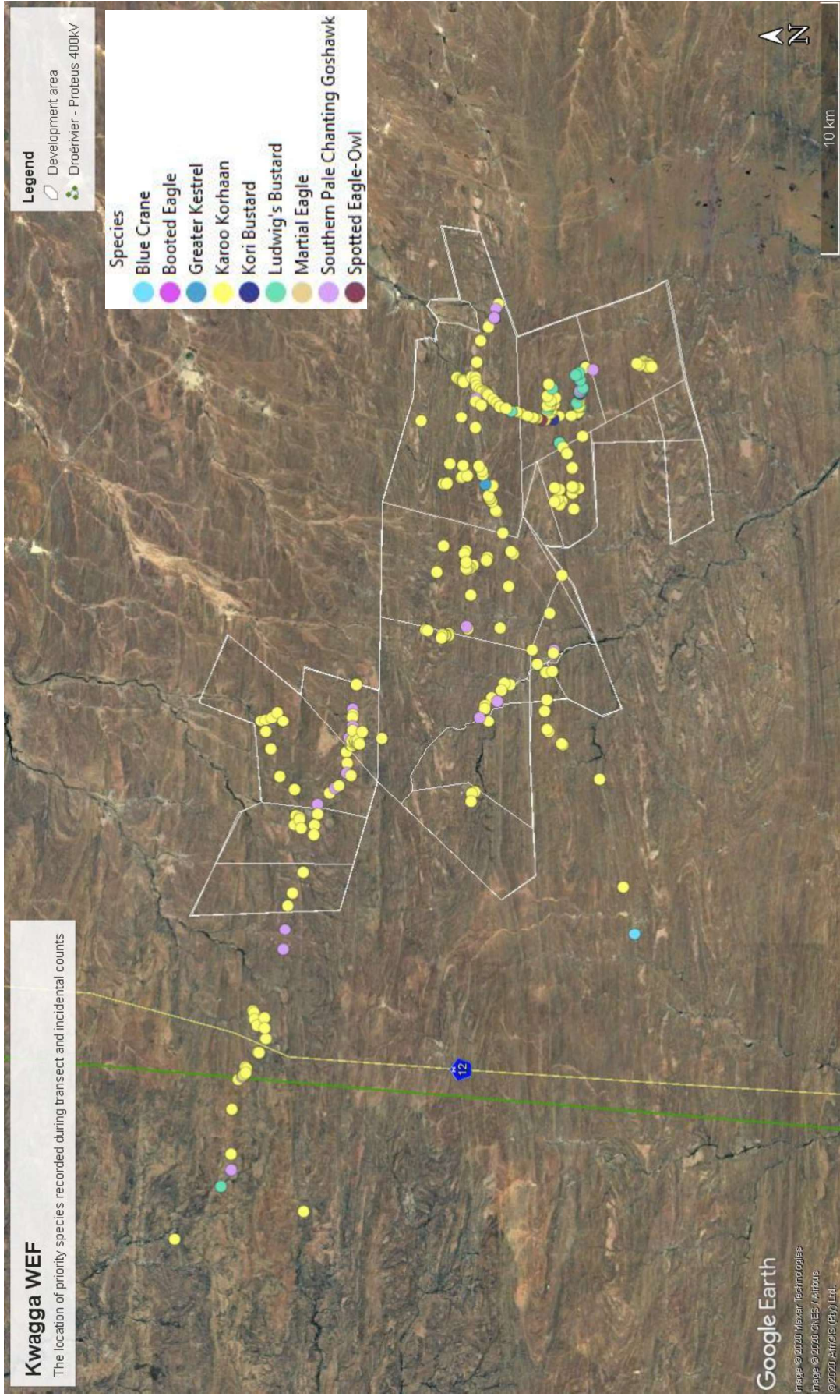


Figure 7: Spatial distribution of recorded sightings of priority species at the development areas during the course of the sampling surveys (transect surveys and incidental sightings).

## 5.2 Vantage point observations

### 5.2.1 Duration of priority species flight activity

A total of 624 hours of vantage point watches (12 hours per vantage point per season) were completed at the development areas in order to record flight patterns of priority species. In the sampling periods, priority species were recorded flying over the development areas for a total of 1 hour 2 minutes and 45 seconds. A total of 76 individual flights were recorded. Of these, 65 (90.2%) of flights were at low altitude (<30m), 9 (12.5%) were at medium altitude (i.e. between 30m and 220m) and 2 (2.7%) were at high altitude (>220m). The passage rate for priority species recorded at the development areas (all flight altitudes) was 0.11 birds/hour<sup>4</sup>. The passage rate for medium altitude flights only was approximately 0.01 birds/hour.

See Figure 8 below for the duration of recorded flights for each species, at each altitude class <sup>5</sup>.

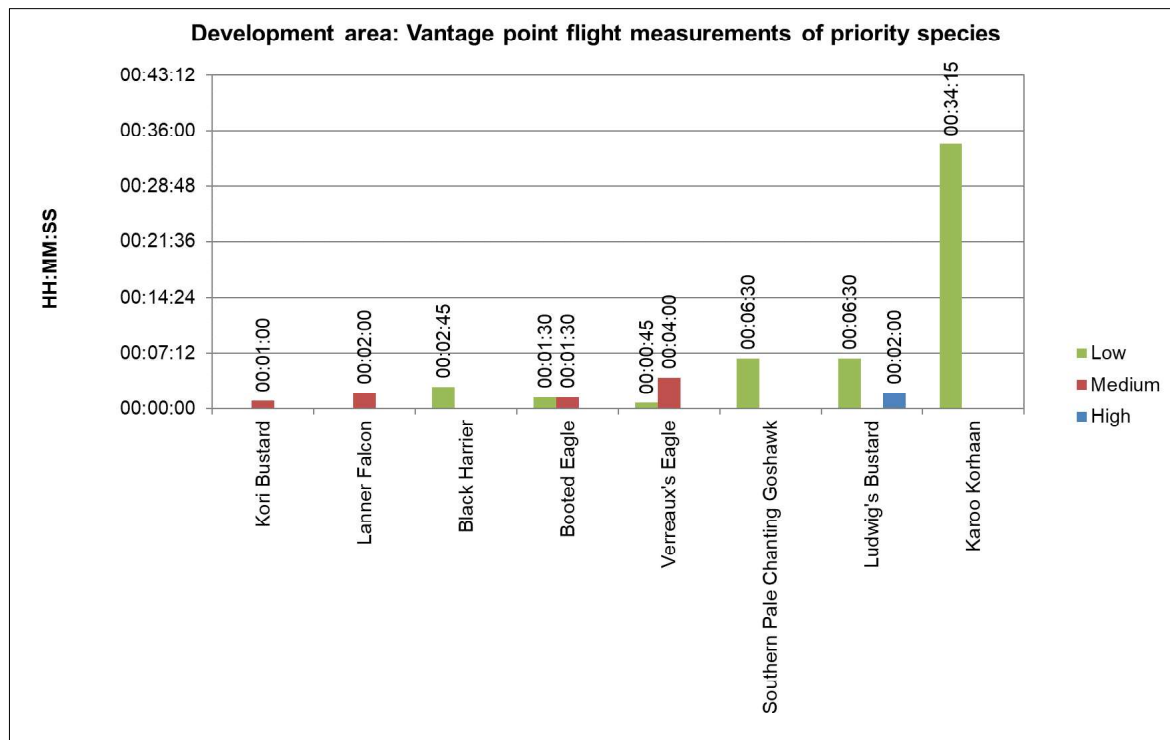


Figure 8: Flight times and altitudes recorded for priority species at the development areas (Y axis = hours: minutes: seconds)

### 5.2.1 Area specific collision risk rating

An area-specific collisions risk rating for each priority species recorded during VP watches was calculated to give an indication of the likelihood of an individual of the specific species to collide with the turbines in the development areas. This was calculated taking into account the following factors:

- The duration of medium altitude flights;

<sup>4</sup> A distinction was drawn between passages and flights. A passage may consist of several flights e.g. every time an individual bird changes height or mode of flight, this was recorded as an individual flight, although it still forms part of the same passage.

<sup>5</sup> Flight duration was calculated by multiplying the flight time with the number of individuals in the flight e.g. if the flight time was 30 seconds and it contained two individuals, the flight duration was 30 seconds x 2 = 60 seconds.

- the susceptibility to collisions, based on morphology (size) and behaviour (soaring, predatory, ranging behaviour, flocking behaviour, night flying, aerial display and habitat preference) using the ratings for priority species in the Avian Wind Farm Sensitivity Map of South Africa (Retief *et al.* 2012); and
- the number of planned turbines.

This was done in order to gain some understanding of which species are likely to be most at risk of collision. The formula used is as follows<sup>6</sup>:

*Duration of medium altitude flights x collision susceptibility calculated as the sum of morphology and behaviour ratings x number of planned turbines ÷ 100.*

The results are presented in Table 4 and Figure 9 below.

Table 4: Area specific collision risk rating, assuming a total of 128 turbines across four facilities

Species	Duration of medium altitude flights (hr)	Avian Wind Farm Sensitivity Map collision susceptibility rating	Area specific collision risk rating
Southern Pale Chanting Goshawk	0	70	0.00
Karoo Korhaan	0	65	0.00
Black Harrier	0	90	0.00
Ludwig's Bustard	0	85	0.00
Kori Bustard	0.001	75	0.07
Booted Eagle	0.001	85	0.11
Lanner Falcon	0.001	85	0.15
Verreaux's Eagle	0.003	115	0.41
<b>Average</b>	<b>0.001</b>	<b>83.75</b>	<b>0.09</b>

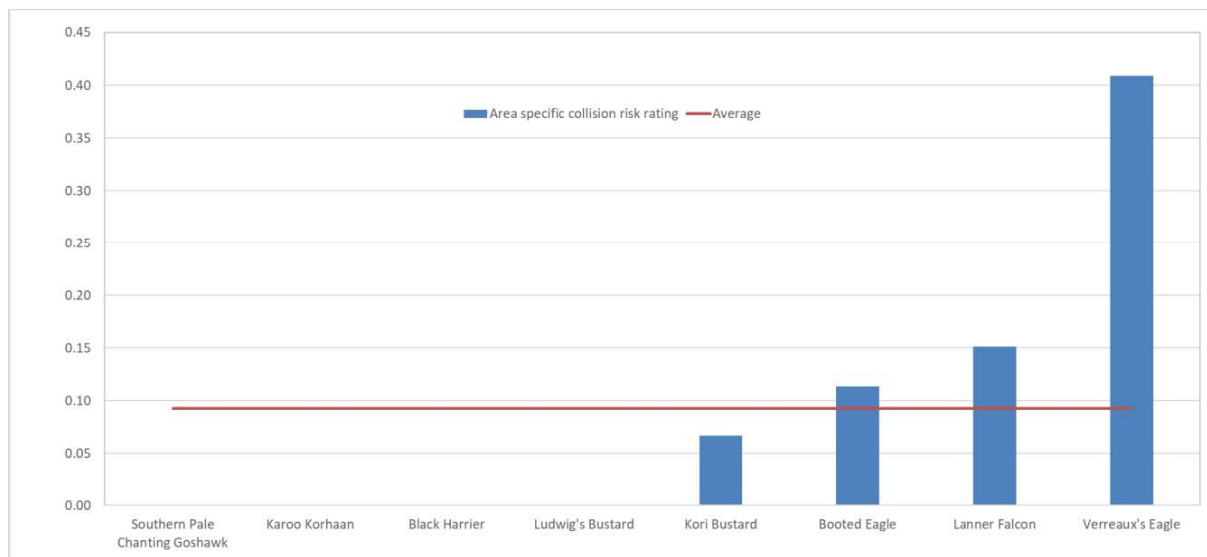


Figure 9: Area specific collision risk rating for priority species

<sup>6</sup> It is important to note that the formula does not incorporate avoidance behaviour. This may differ between species and may have a significant impact on the size of the risk associated with a specific species. It is generally assumed that 95-98% of birds will successfully avoid the turbines (SNH 2010).

## 5.3 Spatial distribution of flights over the development areas

Flight maps were prepared for the three species with higher than zero collision risk indices (Verreaux's Eagle, Lanner Falcon and Booted Eagle), indicating the spatial distribution of all flights observed from the various vantage points (see Figures 10-13 below). This was done by overlaying a 100m x 100m grid over the survey area. Each grid cell was then given a weighting score (Very High; High; Medium; Low) taking into account the duration and distance of individual flight lines through a grid cell and the number of individual birds associated with each flight crossing the grid cell, in order to give an indication where the observed flight activity was most concentrated. It is important to interpret these maps bearing in mind the difference in flight duration for each species i.e. the "High" category on the map for Verreaux's Eagle is not equivalent to the "High" category on the map for Booted Eagle, as the flight duration for former is much higher than the flight duration for the latter (see Figure 10 for the flight lines recorded for all the species, and Figures 11 - 13 for the flight intensity map for Verreaux's Eagle, Lanner Falcon and Booted Eagle).

## 6. Discussion

### 6.1 Displacement

With an overall recorded species count of 91, of which 12 species are priority species, the area where the development and control areas are located supports a moderate diversity of avifauna, which is to be expected from an extremely arid area. Nonetheless, the transect survey data indicates that the development areas are suitable for a number of priority species at low densities, especially members of the *Otididae* family (bustards and korhaans), and *Accipitridae* (raptors).

#### 6.1.1 Karoo Korhaan

This southern African endemic is classified as locally Near Threatened (Taylor *et al.* 2015). The regional population of Karoo Korhaan is suspected to have undergone a population decline approaching 30% over the last 10 years. The cause of this reduction is not perfectly understood. The species is assessed as regional Near Threatened pending further population trend data (Taylor *et al.* 2015). It was the highest recorded priority species during both the walk and drive transect surveys at the development areas, as well as incidental counts. The habitat is very well suited for the species – in the Nama Karoo the species is usually found in shrubby areas, in flat to undulating areas, with vegetation 10 – 50cm tall. It prefers 30 – 60% plant cover, with a wide variety of perennial shrubs and annuals, but usually with little grass (Hockey *et al.* 2005). The global population is estimated to run into the hundreds of thousands. The territory size is estimated to be 0.45 – 5.00km<sup>2</sup>, with the largest territories found in the most arid parts of its range. It is highly sedentary (Hockey *et al.* 2005). The Kwagga development areas (239 km<sup>2</sup>) is estimated to hold around 47 pairs. It is not expected that the species will be entirely displaced by the wind farms, as the proposed direct habitat loss due to the turbines and associated infrastructure is usually only around 5% - 10% (Strickland *et al.* 2011). Temporary displacement is likely during the construction phase, but re-colonisation is likely once the construction activities are over, although post-construction densities might be lower. The biggest potential impact (if any) is likely to be habitat fragmentation by the road network, rather than the actual physical habitat destruction (Strickland *et al.* 2011).

#### 6.1.2 Southern Pale Chanting Goshawk

This common near endemic was the second most recorded priority species during the transect counts, and the third most recorded priority species during incidental counts. The habitat at the development areas is highly suitable for the species, with a mixture of open ground (for prey visibility) and hunting perches (shrubs). Territory sizes range from 1 pair or family group per 4.4 – 8.6km<sup>2</sup> (Hockey *et al.* 2005), with an estimated 27 pairs or family groups potentially resident in the development areas. Being a raptor, permanent displacement is highly unlikely, even during the construction phase (Madders and Whitfield 2006; Hötter *et al.* 2006; Gove *et al.* 2013).

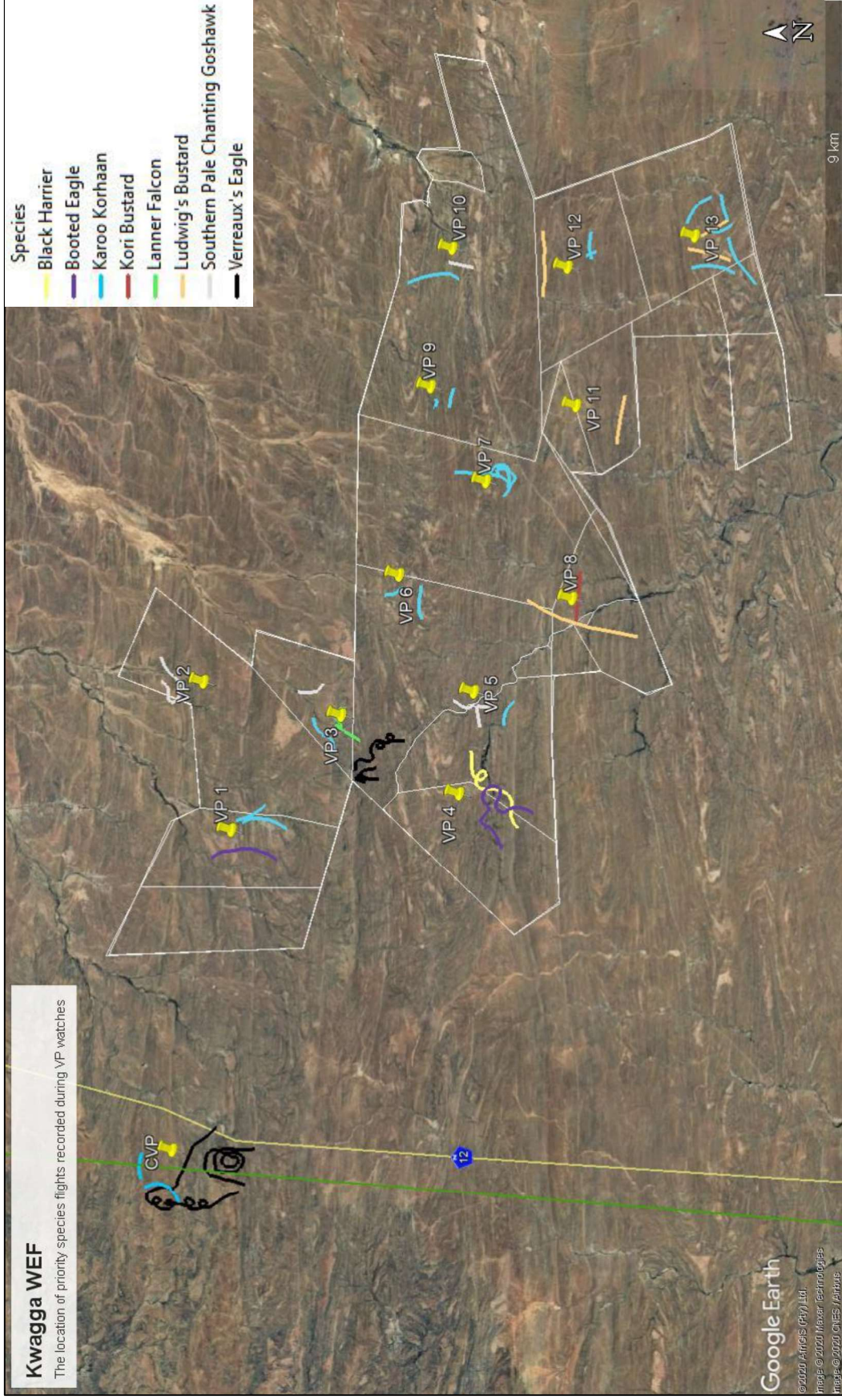


Figure 10: The locality of all priority species flight lines recorded during vantage point watches

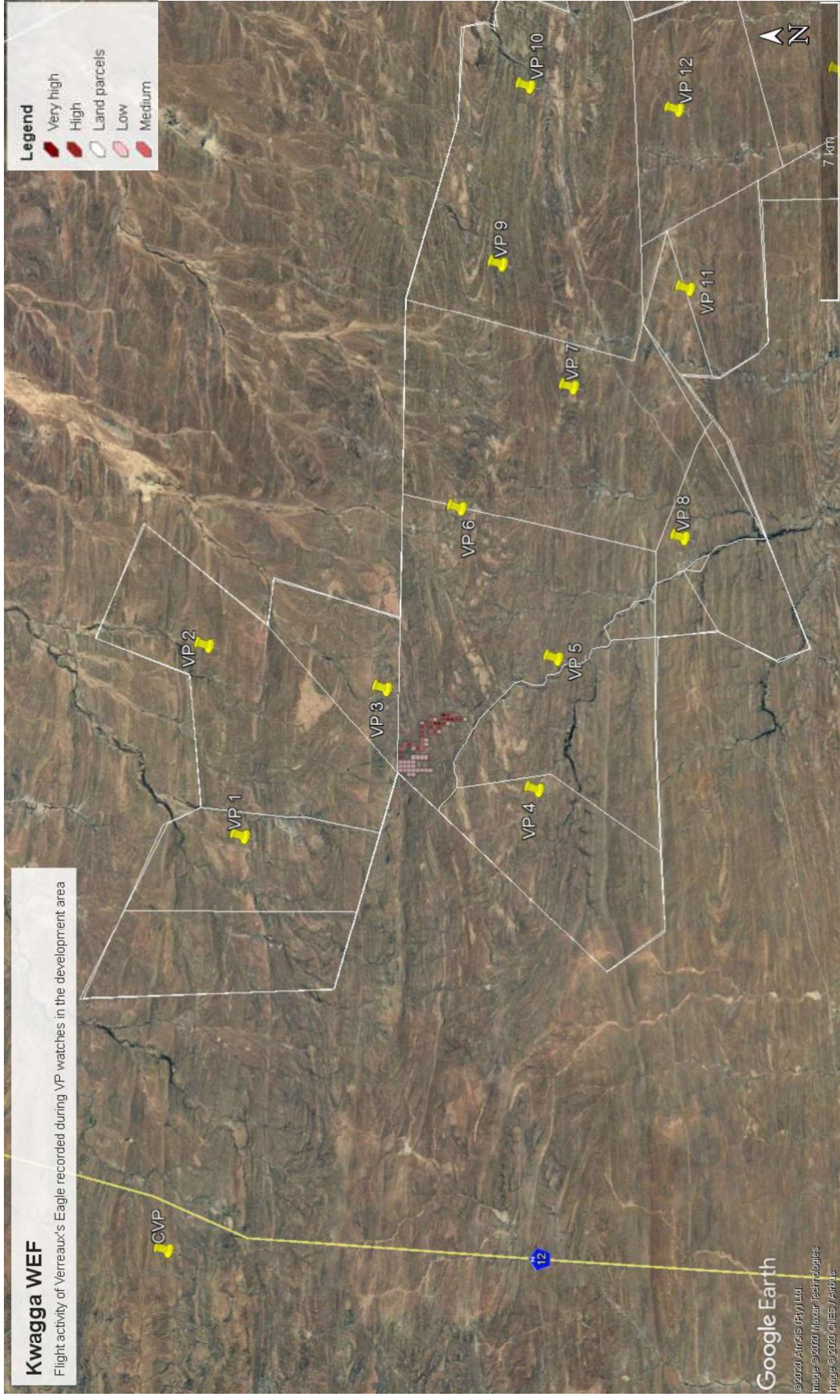


Figure 11: Flight activity of Verreaux's Eagle in the development areas

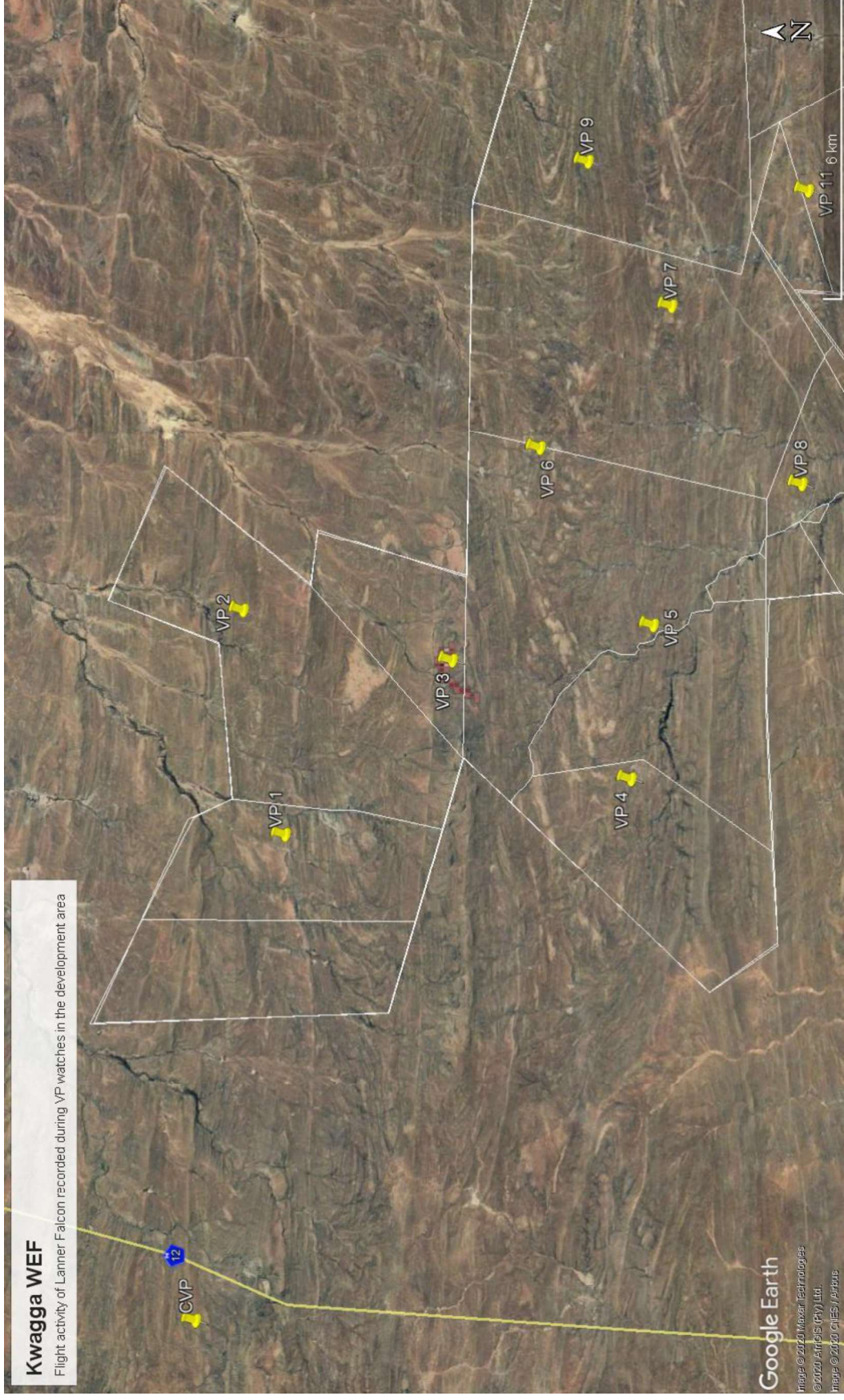


Figure 12: Flight activity of Lanner Falcon in the development areas

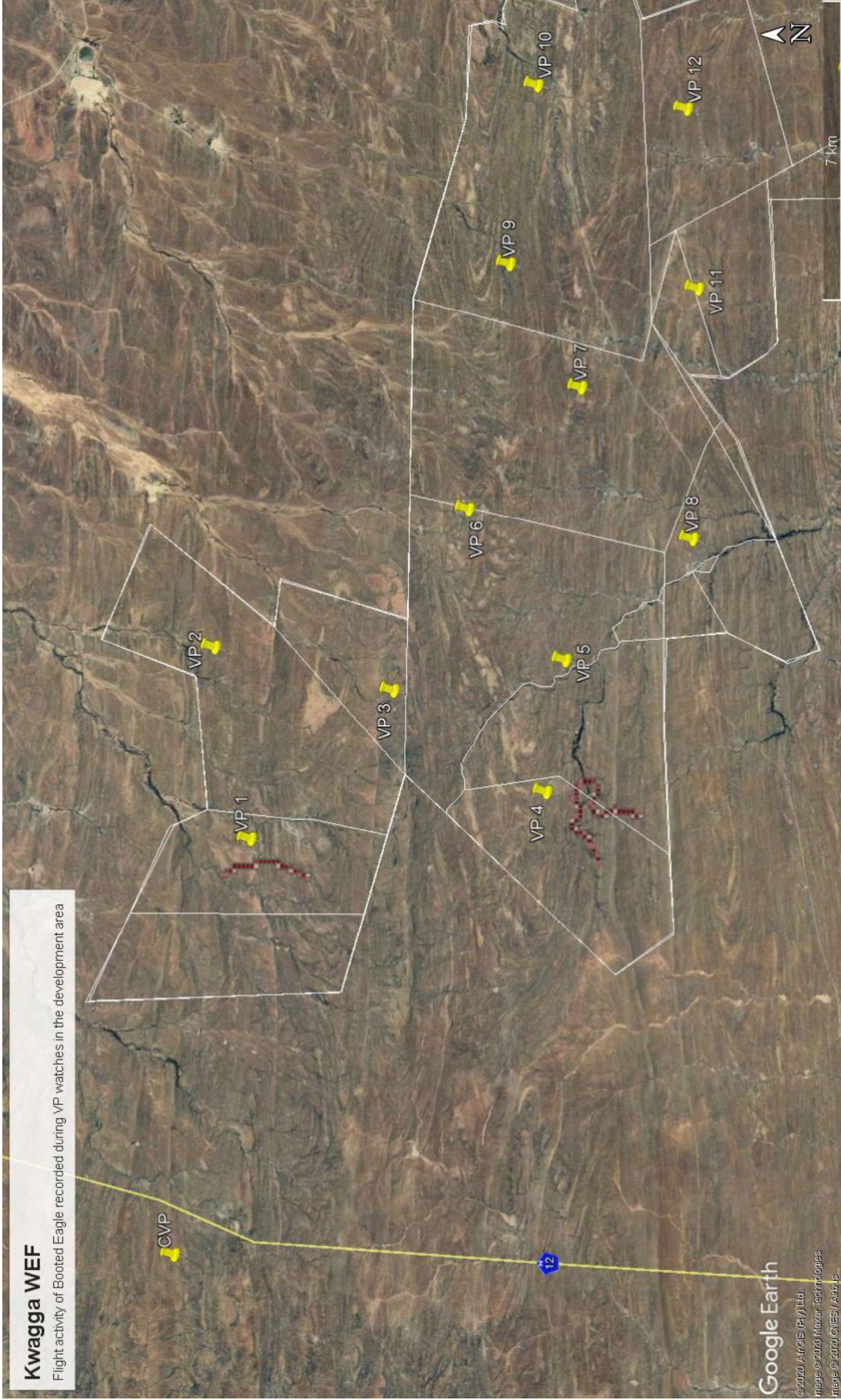


Figure 13: Flight activity of Booted Eagle in the development areas

### 6.1.3 Ludwig's Bustard

The was the third most recorded species during drive and walk transects. This southern African near-endemic is classified as both locally and globally Endangered (Taylor *et al.* 2015). The current regional population is unknown but certainly suspected to be >10 000 mature individuals (Taylor *et al.* 2015). Ludwig's Bustard occurs in the flat, open, semi-arid shrublands in the Nama Karoo (Taylor *et al.* 2015). They appear to be nomadic and partially migratory, moving in response to rainfall, perhaps to take advantage of locally abundant food sources (Shaw 2013). It is not possible to make an estimate of the population in the development area, as it is likely to vary widely depending on the availability of food resources. Temporary displacement is likely during the construction phase, but re-colonisation is likely once the construction activities are over, although post-construction densities might be lower. The biggest potential impact (if any) is likely to be habitat fragmentation by the road network, rather than the actual physical habitat destruction (Strickland *et al.* 2011). Shaw (2013) found that the species avoid areas within 500m of roads.

### 6.1.4 Kori Bustard and Booted Eagle

The only other priority species that were recorded during transects counts in the development areas were the near Threatened Kori Bustard (Taylor *et al.* 2015) and Booted Eagle, which is not regarded as threatened. Both species were recorded in very low numbers. In the case of Kori Bustard, the situation is likely to be the same as with Ludwig's Bustard. i.e. temporary displacement is likely during the construction phase, but re-colonisation is likely once the construction activities are over, although post-construction densities might be lower. The biggest potential impact (if any) is likely to be habitat fragmentation by the road network, rather than the actual physical habitat destruction (Strickland *et al.* 2011). In the case of Booted Eagle, an intra-African and Palearctic summer migrant, it can be reasonably assumed that the birds that were recorded were moving through the development areas to breeding grounds further to the south, in the Swartberg Mountains. Being a raptor, permanent displacement is highly unlikely, even during the construction phase (Madders and Whitfield 2006; Hötter *et al.* 2006; Gove *et al.* 2013).

## 6.2 Collisions

The passage rate of 0.11 birds/hour for priority species recorded over the four surveys during the 12-months pre-construction, is low<sup>7</sup>.

### 6.2.1 Verreaux's Eagle

The locally Vulnerable Verreaux's Eagle (Taylor *et al.* 2015) emerged as the species with the highest site-specific collision risk rating at 0.41, which is 4.5 times higher than the average rating for priority species recorded flight activity. This is a surprise finding, as the habitat is not suitable for Verreaux's Eagles at all. The flight records were limited to a period of four days in March 2019, when, what was presumably the same adult individual, was also recorded at the control area. This is also an indication of how little medium altitude flights were recorded in general for priority species, as the total recorded flying time for the bird (all altitudes) was only four minutes and forty-five seconds in 624 hours of observation. It is difficult to speculate why the bird found itself so far from suitable habitat, as there is definitely not suitable breeding or foraging habitat in the development areas for this cliff-nesting and specialised Rock Hyrax *Procavia capensis* hunter. The most probable explanation is that the bird was a floater, i.e. a non-breeding individual without a territory, which may have wandered into the area for a short while. Because these birds are not tied to breeding territories, they sometimes wander widely. The risk of turbine collisions for the species is regarded as low, notwithstanding the collision risk rating in this instance, as it is extremely unlikely that the species will occur regularly in the development areas.

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<sup>7</sup> The passage rate is the sixth lowest out of 51 potential and operational wind farm areas which were surveyed by the authors countrywide, and the third lowest out of 29 areas located within the Nama and Succulent Karoo biomes (Van Rooyen unpubl. data).

### 6.2.2 Lanner Falcon

The locally Vulnerable Lanner Falcon (Taylor *et al.* 2015) emerged with the second highest site-specific collision risk rating at 0.15, which is 1.6 times higher than the average rating for priority species recorded flight activity. The national population is estimated at <5000 breeding individuals (Taylor *et al.* 2015). The species is a partial seasonal migrant, and there is a post-breeding movement from the core breeding range in the eastern sour grasslands (December-January), with apparent movements westwards in the non-breeding season into *inter alia* the Nama Karoo, returning May-June ( Taylor *et al.* 2015). Movements may be more variable and nomadic in character and are probably related to rainfall and availability of prey. The species has been able to take advantage of existing crow nests on transmission poles in the Karoo, enabling it to inhabit large expanses of otherwise treeless habitat (Taylor *et al.* 2015). The development areas limited suitable breeding habitat for the species in the form of Eucalyptus trees and disused windmills where they might attempt to breed in a crow nest. No breeding was recorded, and it is estimated that the development areas is suitable for 3 - 4 pairs of birds at most due to limited nesting opportunities. Occasional mortalities of especially juvenile birds can be expected, but not beyond the critical threshold of 12% of breeding adults in the regional population (Tack *et al.* 2017), which could lead to a gradual decline in the population.

### 6.2.3 Booted Eagle

The species is an intra-African and Palearctic summer migrant. The species is regarded as locally fairly common (Hockey *et al.* 2005).. The species emerged with the third highest collision risk rating, which at 0.11 is 1.2 times higher than the average risk rating of 0.09 for priority species at the areas. All the flight activity was recorded in summer, when the intra-African migrants are in their southern breeding grounds. The flight activity was very low with a total of only three minutes of flight activity recorded by two individuals over the whole period of observations. The species is expected to move through the areas regularly to their breeding grounds in the mountains south of the areas. The species have been killed at wind farms in South Africa (van Rooyen unpubl. data) (Ralston-Patton *et al.* 2017, Perold *et al.* 2018, Ralston - Patton & Camagu 2019), therefore sporadic mortality could be expected. The local population is regarded as “locally fairly common” with an estimated breeding population of >700 pairs in the former Cape Province (Hockey *et al.* 2005), therefore the impact of the occasional mortality is not expected to push the annual background mortality beyond the critical threshold of 12% of breeding adults in the regional population (Tack *et al.* 2017), which could lead to a gradual decline in the population.

### 6.2.4 Kori Bustard

Some flight activity at medium altitude was also recorded for the Near Threatened Kori Bustard (Taylor *et al.* 2015), albeit less than the average for priority species. A single bird was recorded for one minute in March 2019, flying at medium altitude. The species has not yet been recorded as a turbine collision victim in South Africa (Ralston-Patton *et al.* 2017, Perold *et al.* 2018, Ralston - Patton & Camagu 2019). Indications are that bustards, which are highly vulnerable to power line collisions, are not prone to wind turbine collisions. Monitoring in South Africa from 2014 to 2018 recovered 848 bird carcasses at 16 WEFs with at least 12 months of post-construction monitoring, but only one confirmed bustard, a Ludwig’s Bustard, was among those mortalities (Perold *et al.* 2020). A Spanish database of over 7000 recorded turbine collisions contains no Great Bustards *Otis tarda* (A. Camiña 2012), a species of comparable size to the Kori Bustard. This is indicative of a high avoidance rate for the bustard taxon as a whole.

### 6.2.5 Southern Pale Chanting Goshawk

This species has already been discussed under 6.1.2. The flight activity was very low with a total of only 6 minutes and 30 seconds of flight activity recorded for the species over the total period of observations. Although the species is the commonest raptor in the development areas, it is not a very aerial species and it seldom soars. All of the flight activity was recorded below rotor height. The species have been killed at wind farms in South Africa (van Rooyen unpubl. data) (Ralston-Patton *et al.* 2017, Perold *et al.* 2018, Ralston - Patton & Camagu 2019), therefore sporadic mortality could be expected. The species is regarded as “rare to locally common” (Hockey *et al.* 2005).

The impact of the occasional mortality is not expected to push the annual background mortality beyond the critical threshold of 12% of breeding adults in the regional population (Tack *et al.* 2017), which could lead to a gradual decline in the population.

#### **6.2.6 Black Harrier**

At an estimated global population of about 1000 mature individuals, Black Harriers are the scarcest endemic raptor in southern Africa (Taylor *et al.* 2015) and is classified as locally Endangered (Taylor *et al.* 2015). The Black Harrier received a collision risk rating of zero, because no flights within rotor height were recorded. A single flight of 2 minutes and 45 seconds was recorded below rotor height. Given the extreme aridity of the proposed development areas, it is not expected that Black Harriers will regularly forage in the area, but they can occur sporadically, especially after good rains when the vegetation has recovered. Black Harriers migrate between breeding and non-breeding areas, undertaking long and rapid movements as they traverse the arid Karoo (Garcia-Heras *et al.* 2019). Distances of 1000 kilometres can be covered in as little as four days when birds move east in summer (i.e. December/January) to the higher altitude habitats of the Drakensberg and highveld. Return trips in early winter (May-July) also traverse the Karoo but are often slower and more meandering (Garcia-Heras *et al.* 2019). An occasional mortality cannot be excluded, but it should not be a regular occurrence,

#### **6.2.7 Ludwig's Bustard**

Ludwig's Bustard emerged with a collision risk rating of zero, because no medium altitude flights were recorded. Ludwig's Bustard is classified as Endangered, both globally (IUCN 2020) and regionally (Taylor *et al.* 2015). As stated earlier, indications are that bustards, which are highly vulnerable to power line collisions, are not prone to wind turbine collisions (see 6.2.4).

#### **6.2.8 Karoo Korhaan**

The species is discussed under 6.1.1. Karoo Korhaan flights constituted the vast majority of recorded flight activity for all priority species at the development areas, namely 34 minutes and 15 seconds, but all of it was at low altitude. Karoo Korhaan does not fly easily and when it does fly, it tends to fly at low altitudes for a short distance (pers. observation). So far, there have been no published reports of Karoo Korhaan fatalities at wind farms in South Africa (Ralston-Patton *et al.* 2017, Perold *et al.* 2018, Ralston - Patton & Camagu 2019).

## **7. Sensitive areas**

The following high sensitivity areas were identified (see Figure 14), which are all linked to the presence of surface water, which is a huge attractant for most birds, especially in very arid areas, such is the case with the development areas. Within these 400 m buffer areas, no turbines should be constructed, to prevent displacement of birds during the construction phase, and to reduce the collision risk during the operational phase.

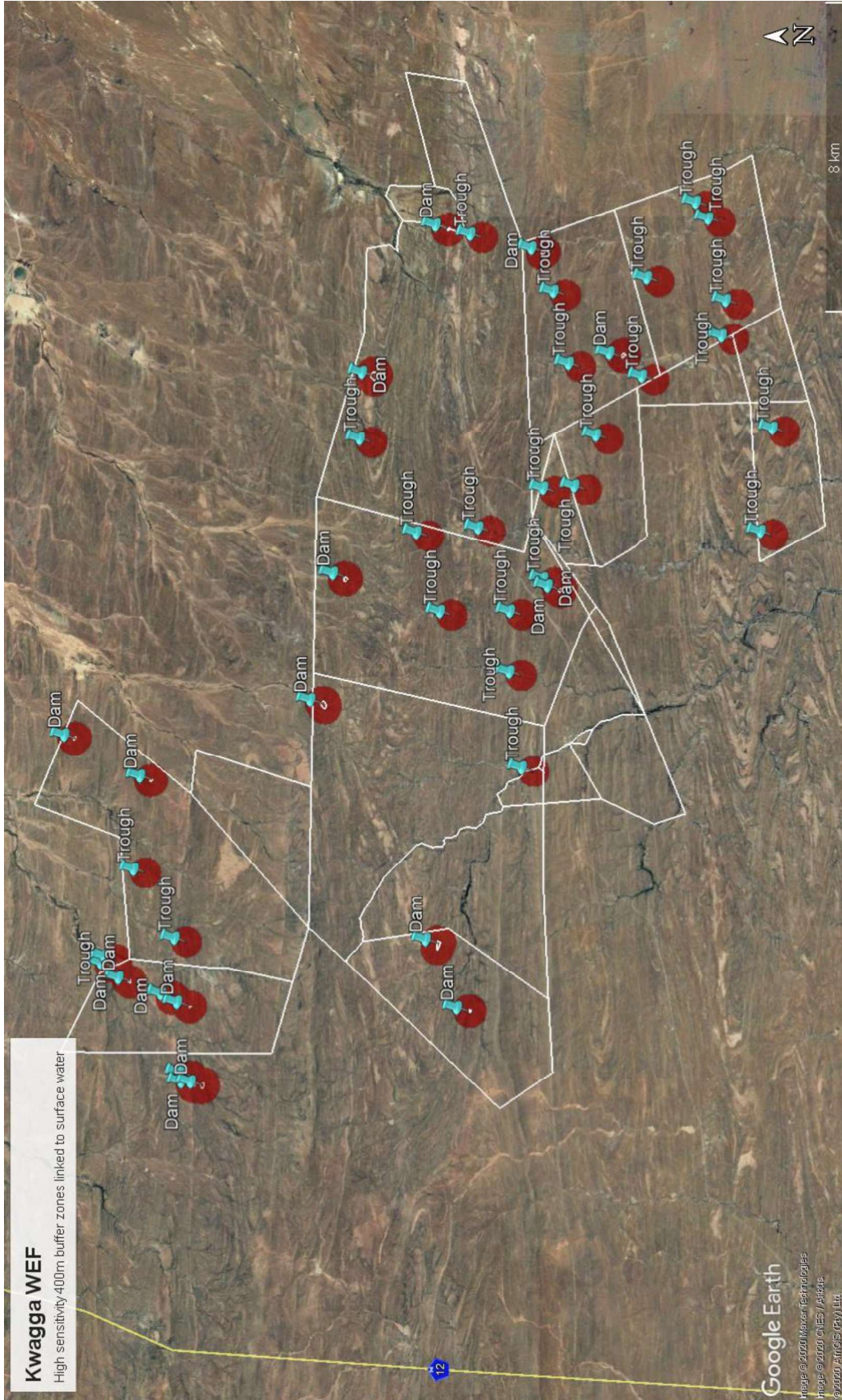


Figure 14: High sensitivity, 400 m no turbine buffer zones linked to surface water.

## 8. Conclusions

The avifaunal pre-construction monitoring, conducted over a 12-months period in 2019 and 2020, has not revealed any fatal flaws, which stand in the way of the development of the proposed wind farms. However, this conclusion is subject to the implementation of the recommendations listed in Section 9.

## 9. Recommendations

### 9.1 Displacement

- Construction activity should be restricted to the immediate footprint of the infrastructure, and in particular to the proposed road network. Access to the remainder of the area should be strictly controlled to prevent unnecessary disturbance of priority species.
- Removal of vegetation must be restricted to a minimum and must be rehabilitated to its former state where possible after construction.
- Construction of new roads should only be considered if existing roads cannot be upgraded.
- Once operational, vehicle and pedestrian access to the area should be controlled and restricted to access roads to prevent unnecessary disturbance of priority species.
- Formal live-bird monitoring should be implemented in the operational phase, as per the most recent edition of the Best Practice Guidelines at the time (Jenkins *et al.* 2015). The purpose of this would be to establish if displacement of priority species has occurred and to what extent. The exact time when operational monitoring should commence, will depend on the construction schedule, and should commence when the first turbines starts to turn.
- No turbines should be constructed in the buffer zones as indicated in the sensitivity map in Section 4. These buffer zones are all linked to surface water, which could attract many birds, including some threatened raptors species such as the Martial Eagle.

### 9.2 Collisions

- The results of the pre-construction monitoring must guide the lay-out of the turbines, especially as far as proposed no-turbine zones are concerned. No turbines must be constructed in the buffer zones which were identified based on the results of the pre-construction monitoring, with a specific view to limiting the risk of collisions to a variety of birds, including several Red Data species.
- Formal live-bird monitoring should be in the operational phase, as per the most recent edition of the Best Practice Guidelines at the time (Jenkins *et al.* 2015) to assess collision rates.
- If collision rates indicate unacceptable mortality levels of priority species, i.e. in excess of 12% of the adult breeding populations which could potentially be directly impacted by the wind farm, additional measures will have to be implemented which could include shut down on demand or other measures.

### 9.3 General

- The Best Practice Guidelines require that, as an absolute minimum, operational monitoring should be undertaken for the first two (preferably three) years of operation, and then repeated again in year 5, and again every five years thereafter for the operational life-time of the facility. The exact scope and nature of the post-construction monitoring will be determined on an ongoing basis by the result of the monitoring through a process of adaptive management.

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- Camiña, A. 2012. Email communication on 17 November 2012 to the author by Alvaro Camiña, Spanish ornithologist with decades' experience in avifaunal monitoring at wind farms in Spain.
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## APPENDIX 1: PHOTOGRAPHS OF PRIORITY SPECIES



Figure 1: Black Harrier



Figure 2: Lanner Falcon



Figure 3: Booted Eagle



Figure 4: Southern Pale Chanting Goshawk



Figure 5: Kori Bustard



Figure 6: Verreaux's Eagle



Figure 7: Karoo Korhaan



Figure 8: Ludwig's Bustard



## 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

##### 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](mailto:EIAAdmin@environment.gov.za)

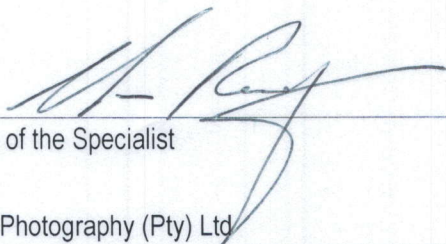
**1. SPECIALIST INFORMATION**

Specialist Company Name:	Afrimage Photography (Pty) Ltd t/a Chris van Rooyen Consulting		
B-BBEE	Contribution level (indicate 1 to 8 or non-compliant)	4	
Specialist name:	Chris van Rooyen		
Specialist Qualifications:	BA LLB		
Professional affiliation/registration:	I work under the supervision of and in association with Albert Froneman (MSc Conservation Biology) (SACNASP Zoological Science Registration number 400177/09) as stipulated by the Natural Scientific Professions Act 27 of 2003.		
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Postal code:	2194		2194
Telephone:	0824549570		0824549570
E-mail:	Vanrooyen.chris@gmail.com		Vanrooyen.chris@gmail.com

**2. DECLARATION BY THE SPECIALIST**

I, Chris 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

Afrimage Photography (Pty) Ltd

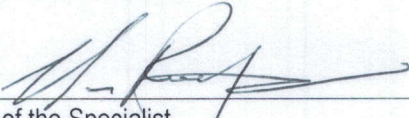
Name of Company:

28 May 2021

Date

3. UNDERTAKING UNDER OATH/ AFFIRMATION

I, Chris 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.



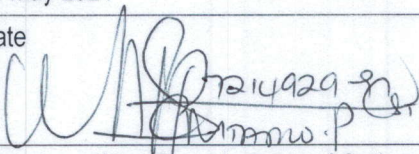
Signature of the Specialist

Afrimage Photography (Pty) Ltd

Name of Company

28 May 2021

Date



07214929-80  
P

Signature of the Commissioner of Oaths



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.4

## Bats



**ARCUS**

**BAT SCOPING REPORT**

for the

**PROPOSED KWAGGA 1 WIND ENERGY FACILITY,  
WESTERN CAPE PROVINCE**

On behalf of

**ABO WIND RENEWABLE ENERGIES (PTY) LTD**

February 2021



Prepared By:

**Arcus Consultancy Services South Africa (Pty) Limited**

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Registered in South Africa No. 2015/416206/07

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## CONTENTS OF THE SPECIALIST REPORT – CHECKLIST

Regulation GNR 326 of 4 December 2014, as amended 7 April 2017, Appendix 6	Section of Report
(a) details of the specialist who prepared the report; and the expertise of that specialist to compile a specialist report including a <i>curriculum vitae</i> ;	Appendix 2, Appendix 3
(b) a declaration that the specialist is independent in a form as may be specified by the competent authority;	Appendix 3
(c) an indication of the scope of, and the purpose for which, the report was prepared;	Section 2
(cA) an indication of the quality and age of base data used for the specialist report;	Section 3
(cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	To be included in the EIA phase
(d) the duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment;	Section 3
(e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	Section 3
(f) details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives;	To be included in the EIA phase
(g) an identification of any areas to be avoided, including buffers;	Section 4.4
(h) a map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	Figure 1, Figure 2
(i) a description of any assumptions made and any uncertainties or gaps in knowledge;	Section 2.2
(j) a description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives on the environment, or activities;	To be included in the EIA phase
(k) any mitigation measures for inclusion in the EMPr;	To be included in the EIA phase
(l) any conditions for inclusion in the environmental authorisation;	To be included in the EIA phase
(m) any monitoring requirements for inclusion in the EMPr or environmental authorisation;	To be included in the EIA phase
(n) a reasoned opinion— i. as to whether the proposed activity, activities or portions thereof should be authorised; iA. Regarding the acceptability of the proposed activity or activities; and ii. if the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr or Environmental Authorization, and where applicable, the closure plan;	Section 6. This will be expanded on during the EIA phase.
(o) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	None received as yet
(p) any other information requested by the competent authority	None received
Where a government notice gazetted by the Minister provides for any protocol or minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply.	Government Notice No. 320 has been gazetted, and a site sensitivity verification report aligned with the requirements of Part A of GN 320 has been included in this report (Appendix 1). No protocol for bat assessment has been gazetted.

## 1 INTRODUCTION

ABO Wind Renewable Energies (Pty) Ltd ('ABO'), is proposing to develop the Kwagga 1 Wind Energy Facility (WEF)<sup>1</sup> and its associated infrastructure, to be located approximately 60 km south of Beaufort West in the Western Cape Province.

Arcus Consultancy Services South Africa (Pty) Ltd ('Arcus') was appointed to conduct the required twelve-month pre-construction monitoring at the proposed development site. The monitoring commenced on 24 April 2019 and ended on 27 July 2020. The results informed the impact assessment process required for environmental authorisation in terms of the National Environmental Management Act (Act 107 of 1998, as amended) (NEMA) and associated EIA regulations of 2014 as amended (EIA regulations).

The aim of the monitoring was to document bat activity in the area of interest and, based on this activity, assess the proposed WEF with regards to potential impacts to bats and the risk to development consent. The data generated based on the activity assessed, establishes a pre-construction baseline of bat species diversity and activity, and has been used to compile this bat scoping report. The monitoring data will assist in providing solutions to mitigate impacts, if required, by informing the final design, construction and operational management strategy of the WEF. The baseline will also be used to compare impacts to bats during the operational phase of the project.

Each Kwagga WEF has been assessed separately and three separate scoping reports have been produced. The aim of this report is to assess the impacts of the Kwagga 1 WEF (proposed development) on bats.

The proposed Kwagga 1 WEF is 5 136 hectares in extent. The WEF will consist of up to 45 turbines, each with an output of 6.2 MW and a total site generation capacity of up to 279 MW. The turbines will have a maximum hub height of 180 m, a maximum rotor diameter of 200 m, and a blade tip height of up to 280 m.

The site will include a 33 /132 kV substation (expected to be a maximum of 250 000 m<sup>2</sup>) along with operations and maintenance buildings that will be approximately one (1) hectare each. The temporary hardstand areas and construction period laydown areas cover approximately 15 ha and 6 ha respectively and approximately 45 km of internal access roads (width of 6-8 m) will be constructed.

ABO is still investigating options for possible grid connection to a major transmission station (MTS), and therefore this scoping report does not include the Grid Connection for the WEF.

## 2 SCOPE OF STUDY

This specialist assessment has been produced as part of an iterative design process being undertaken for this project. As part of this process, various design and layout options have been considered, assessed and further refined to ensure adherence to the environmental and technical constraints present on site. No alternatives are assessed in this report, as the layout has been refined during the iterative design process.

### 2.1 Terms of Reference

The National Gazette, No. 43110 of 20 March, 2020: "National Environmental Management Act (107/1998) Procedures for the Assessment and Minimum Criteria for Reporting on

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<sup>1</sup> ABO is proposing to design, construct and operate three Wind Energy Facilities (WEFs), namely Kwagga 1, 2 and 3 WEF. The WEFs will each have a total installed capacity of 279 MW (Kwagga 1 WEF), 341 MW (Kwagga 2 WEF) and 204.6 MW (Kwagga 3 WEF), respectively. The study areas earmarked for the proposed development of Kwagga 1, Kwagga 2 and Kwagga 3 WEFs comprise a total of approximately 23 700 ha; however, each WEF development footprint will cover only about 250 ha which could be further reduced during the scoping phase.

Identified Environmental Themes in terms of sections 24 (5) (a) and (h) and 44 of the Act, when applying for Environmental Authorisation”, where a specialist assessment is required and no specific environmental theme protocol has been prescribed, therefore the impact assessment followed Appendix 6 of the EIA Regulations 2014, as amended. Further compliance to Appendix 6 of the EIA Regulations, 2014, as amended will occur at the EIA phase.

The aim of this report is to present the baseline environment with respect to bats that may be influenced by the development of the WEF and associated infrastructure. Based on this baseline, a summary of the pre-construction monitoring and plan of study for the EIA Phase is provided.

The terms of reference for this scoping report were to provide:

- Details of the specialist who prepared the report and their expertise to compile a specialist report including a curriculum vitae and declaration of independence;
- An indication of the scope of, and purpose for which, the report was prepared;
- The date and season of the site investigation and the relevance of the season to the outcome of the assessment;
- A description of any assumptions made and any uncertainties or gaps in knowledge;
- A description of the policy and legislative context;
- A description of the methodology adopted in preparing the report or carrying out the specialised process;
- A baseline description of the site and environmental attributes/conservation significance in terms of bats;
- The sensitivity of the site and its associated infrastructure to bats;
- A discussion of anticipated cumulative impacts;
- An assessment of impacts and risks of the project to bats; and
- A plan of study for the EIA.

## 2.2 Purpose and Aim of this Report

The aim of this scoping study is to describe the baseline environment with respect to bats that may be influenced by the development of the proposed project. This will also include a description and evaluation of the potential impacts the project may pose to bats.

## 2.3 Assumptions and Limitations

The following assumptions and limitations relevant to this study are noted:

- The knowledge of certain aspects of South African bats including natural history, population sizes, local and regional distribution patterns, spatial and temporal movement patterns (including migration and flying heights) and how bats may be impacted by wind energy is very limited for many species.
- Bat echolocation calls (i.e. ultrasound) operate over ranges of metres therefore acoustic monitoring samples only a small amount of space (Adams *et al.* 2012). Recording a bat using sound is influenced by the type and intensity of the echolocation call produced, the species of bat, the bat detector system used, the orientation of the signal relative to the microphone and environmental conditions such as humidity. One must therefore be cautious when extrapolating data from echolocation surveys over large areas because only small areas are actually sampled.
- There can be considerable variation in bat calls between different species and within species. The accuracy of the species identification is also very dependent on the quality of the calls used for identification. Species call parameters can often overlap, making species identification difficult.

- Automatic bat classifiers in Kaleidoscope Pro Version 5.1.9g (Wildlife Acoustics, Inc.) were used to identify bat species. Post-processing was used to manually verify the performance of the classifiers but owing to the large number of files recorded, not all recordings could be verified manually. There may be instances where the software was unable to identify species or made incorrect identifications.
- Bat activity recorded by bat detectors cannot be used to directly estimate abundance or population sizes because detectors cannot distinguish between a single bat flying past a detector multiple times or between multiple bats of the same species passing a detector once each (Kunz *et al.* 2007a). This is interpreted using the specialists' knowledge and presented as relative abundance.
- There is currently no standard scale to rate bat activity as low, medium or high. Activity was therefore classed based on bat activity observed at developments of wind energy facilities in South Africa.
- While the data presented in this report provides a baseline of bat activity for the period sampled, it does not allow for an understanding of interannual variation in bat activity. It is therefore possible that during the lifespan of the facility, bat activity could be significantly different (lower or higher) compared to the baseline presented here.
- The potential impacts of wind energy on bats presented in the impact assessment represent the current knowledge in this field. New evidence from research and consultancy projects may become available in future, including during the EIA process, meaning that impacts presented, discussed and evaluated in this scoping report may be adjusted.

## 2.4 Legislative Context

The following legalisation, policies, regulations and guidelines are all relevant to this report and the potential impact it may have on bats and habitats that support bats:

- Convention on the Conservation of Migratory Species of Wild Animals (1979)
- Convention on Biological Diversity (1993)
- Constitution of the Republic of South Africa, 1996 (Act No. 108 of 1996)
- National Environmental Management Act, 1998 (NEMA, Act No. 107 of 1998)
- National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004)
- Environmental Impact Assessment Regulations, 2014, as amended
- Western Cape Nature Conservation Laws Amendment Act, 2000 (Act No. 3 of 2000)
- The Equator Principles (2013)
- The Red List of Mammals of South Africa, Swaziland and Lesotho (2016)
- National Biodiversity Strategy and Action Plan (2005)
- South African Good Practise Guidelines for Surveying Bats in Wind Energy Facility Developments – Pre-Construction (2020)
- South African Good Practise Guidelines for Operational Monitoring for Bats at Wind Energy Facilities (2020)
- IUCN Red List of Threatened Species (2020)
- South Africa National Red Data List (2020)

## 3 METHODOLOGY

### 3.1 Desktop Review

A desktop study of available bat locality data, literature and mapping resources was undertaken to determine the likelihood of bats being present at the proposed WEF. Literature was also sought to understand the current state of knowledge of wind energy-bats impacts globally. Very little published research on this regard is available for the South African context. Data sources included:

- Academic sources such as research papers and published texts;
- Information on bat activity at other nearby renewable energy developments such as from pre-construction monitoring reports, Environmental Impact Assessment (EIA) Reports and Environmental Management Programmes (EMPrs);
- Bat distribution records and maps; and
- A review of the habitats on the site to identify, if possible, habitats, roosts and features which may be associated with bats.

The National Gazette, No. 43110 of 20 March, 2020: "National Environmental Management Act (107/1998) Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes in terms of sections 24 (5) (a) and (h) and 44 of the Act ('the Regulations'), when applying for Environmental Authorisation" includes the requirement that a Site Sensitivity Verification must be produced (Appendix 1).

The National Web-Based Screening Tool was used to generate the potential environmental sensitivity of the site. The outputs were compared with satellite imagery and GIS maps of the project site.

### 3.2 Field Surveys

The Kwagga 1 WEF forms part of a larger cluster of three wind farms, which together comprise the area of interest. The pre-construction monitoring was designed to monitor bat activity across the entire area of interest proposed by the Kwagga WEFs<sup>2</sup>. The baseline environment was investigated by using acoustic monitoring to document bat activity between 24 April 2019 and 27 July 2020 (i.e. 461 sample nights).

The monitoring was undertaken in accordance with South African best practice (Sowler *et al.* 2017). Sampling of bat activity took place at eleven locations (Figure 1) using Song Meter 4 (SM4) bat detectors (Wildlife Acoustics, Inc.). Ultrasonic microphones were mounted on temporary masts at 12 m above ground level at each location. Three additional ultrasonic microphones were mounted at heights of 12 m, 50 m and 100 m on a meteorological mast (KW9\_12m, KW9\_50m and KW9\_100m). All detectors were configured to record every night from 30 minutes before sunset until 30 minutes after sunrise. Five<sup>3</sup> of the bat detectors were placed in riparian zones where bat activity is expected to be higher, and were paired with detectors placed at varying distances away from the riparian zone to attempt to understand how bat activity varies across distances from these key habitat features.

The distribution of monitoring locations across the area of interest was determined based on vegetation types, land-use, and topography with the aim to sample bat activity in areas where bat activity was expected to be higher (e.g. near water and buildings, along riparian vegetation) but also in areas where bat activity was expected to be lower (e.g. away from water and buildings, in open areas with low habitat complexity).

In addition to the acoustic monitoring, potential structures that bats could use as roosts were investigated during the day for the presence or evidence of roosting bats (e.g. guano and culled insect remains, etc.) whenever the Arcus team was on site. These included buildings, rocky outcrops and trees. The Arcus team conducted five survey field trips with survey 1 being from 28-29 May 2019, survey 2 from 31 July to 2 August 2019, survey 3 from 14-17 September 2019, survey 4 from 18-20 November 2019, and survey 5 from 5-7 February 2020.

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<sup>2</sup> The area of interest in which the bat monitoring took place includes the area of interest for the proposed Kwagga 1 WEF, Kwagga 2 WEF and Kwagga 3 WEFs.

<sup>3</sup> KW5 was originally placed in riparian habitat but was moved on 3 August 2019 for security reasons, and ultimately re-installed in non-riparian habitat.

### 3.3 Data Analysis

Bats emit ultrasonic echolocation calls for orientation, navigation and foraging. These calls can be recorded by bat detectors enabling bat species to be identified from various features in their calls (e.g. the frequency of the call). A sequence of calls is a bat pass defined as two or more echolocation calls separated from other calls by more than 500 milliseconds (Hayes 1997; Thomas 1988). Quantifying the number of bat passes recorded can be used to quantify the relative abundance of bat species.

Acoustic data from each bat detector were analysed using Kaleidoscope® Pro (Version 5.1.9g, Wildlife Acoustics, Inc.) to identify species present and to quantify their activity. Bat species were automatically identified from their echolocation calls using the embedded echolocation call library in the software. The results were vetted by randomly or selectively (for certain species) manually identifying echolocation calls.

A sequence of bat echolocation pulses is called a pass defined as two or more echolocation calls separated from other calls by more than 500 milliseconds (Hayes 1997; Thomas 1988). This was used as the basic unit for quantifying the relative magnitude of bat activity. However, bat passes recorded from bat detectors cannot be used to directly estimate population sizes because they cannot distinguish between a single bat flying past a detector multiple times and multiple bats of the same species passing a detector once each (Kunz *et al.* 2007). The total number of files was used as a proxy for the number of bat passes.

## 4 BASELINE ENVIRONMENT

### 4.1 Habitats

The vegetation at the proposed site comprises of Gamka Karoo vegetation that is dominated by Karoo dwarf shrubs with some low trees such as *Vachellia karroo* especially along drainage lines (Mucina and Rutherford, 2006). The predominant land use on the site is stock farming.

Resources present within the site that are important for bats include farm dams, water reservoirs, non-perennial drainage areas, riparian habitat, scattered tall trees, and buildings.

Several roosting features for bats were identified on the site including trees, and buildings but no active roosts were located. Landowners commented that bats were previously present in some buildings but potentially due to the prolonged drought currently being experienced in the region, this appears to no longer be the case. Inspections of buildings, trees and cliffs on site did not reveal any roosting bats.

### 4.2 Bat Species

The proposed Kwagga 1 WEF project falls within the actual or predicted distribution range of approximately eleven species of bat (African Chiroptera Report, 2013; Monadjem *et al.* 2010). However, the distributions of some bat species in South Africa, particularly rarer species, are poorly known so it is possible that more (or fewer) species may be present. Analysis of the acoustic monitoring data suggests that at least five species of bat are present (Table 1). The sensitivity of each of these species to the project is a function of their conservation status and the likelihood of risk to these species from WEF development. The likelihood of risk to impacts of wind energy was determined from the guidelines and is based on foraging and flight ecology of bats and their migratory behaviour.

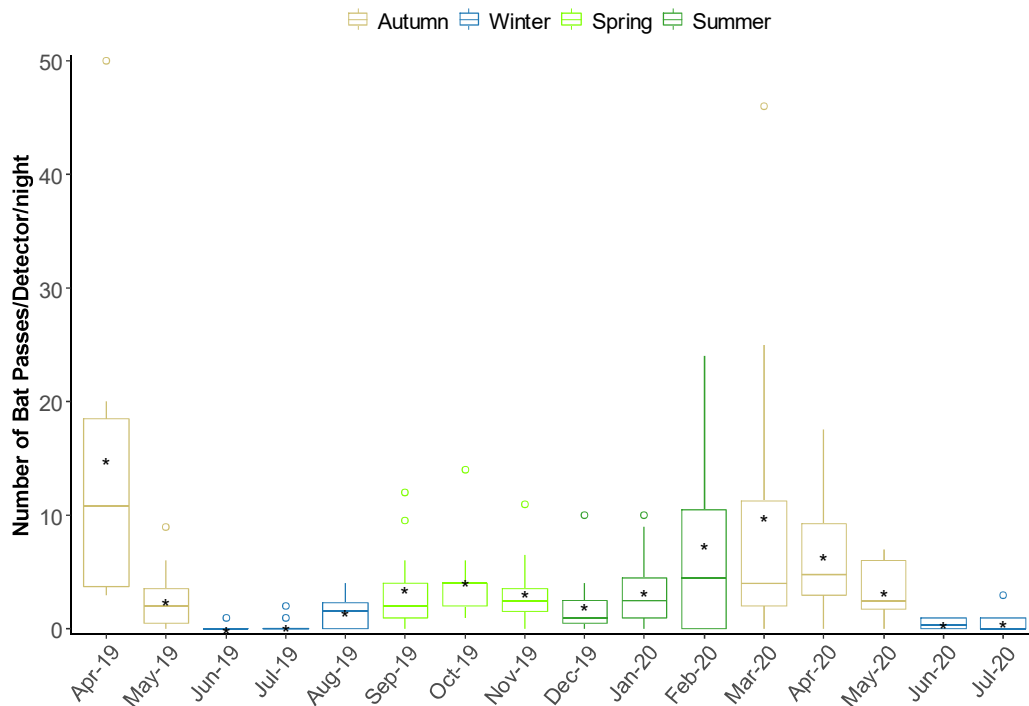
**Table 1: Bat Species Recorded at the Area of Interest and their Sensitivity to WEFs**

Species	Species Code	# of Bat Passes	Conservation Status <sup>4</sup>		Likelihood of Risk
			National	International	
Egyptian free-tailed bat <i>Tadarida aegyptiaca</i>	EFB	22,545	Least Concern	Least Concern	High
Roberts’s Flat-headed Bat <i>Sauromys petrophilus</i>	RFB	3,016	Least Concern	Least Concern	High
Natal long-fingered bat <i>Miniopterus natalensis</i>	NLB	1,253	Least Concern	Least Concern	High
Cape serotine <i>Neoromicia capensis</i>	CS	7,194	Least Concern	Least Concern	Medium-High
Long-tailed serotine <i>Eptesicus hottentotus</i>	LTS	226	Least Concern	Least Concern	Medium

### 4.3 Spatio-Temporal Bat Activity Patterns

During the sample period five bat species were detected and a total of 34,234 bat passes were recorded from 461 sample nights across all detectors. The Egyptian free-tailed bat accounted for 66 % of total activity (Table 1).

Median bat activity was highest in April 2019 during autumn (10.75 bat passes/detector/night), activity decreased during winter and reached its lowest point during June and July (Graph 1). In mid-August activity began increasing, peaked again in October 2019 (spring) and decreased into the beginning of summer (December 2019). Thereafter, activity rose until April 2020 (autumn) where median activity was highest for that year (4.75 bat passes/detector/night) and fell again into the winter months. Activity was more variable during the autumn and spring months as shown by the wider interquartile ranges. The nights with the highest activity was also during spring and summer, 633 bat passes were recorded on 27 September 2019 and 572 bat passes were recorded on 10 April 2020 (Graph 1).

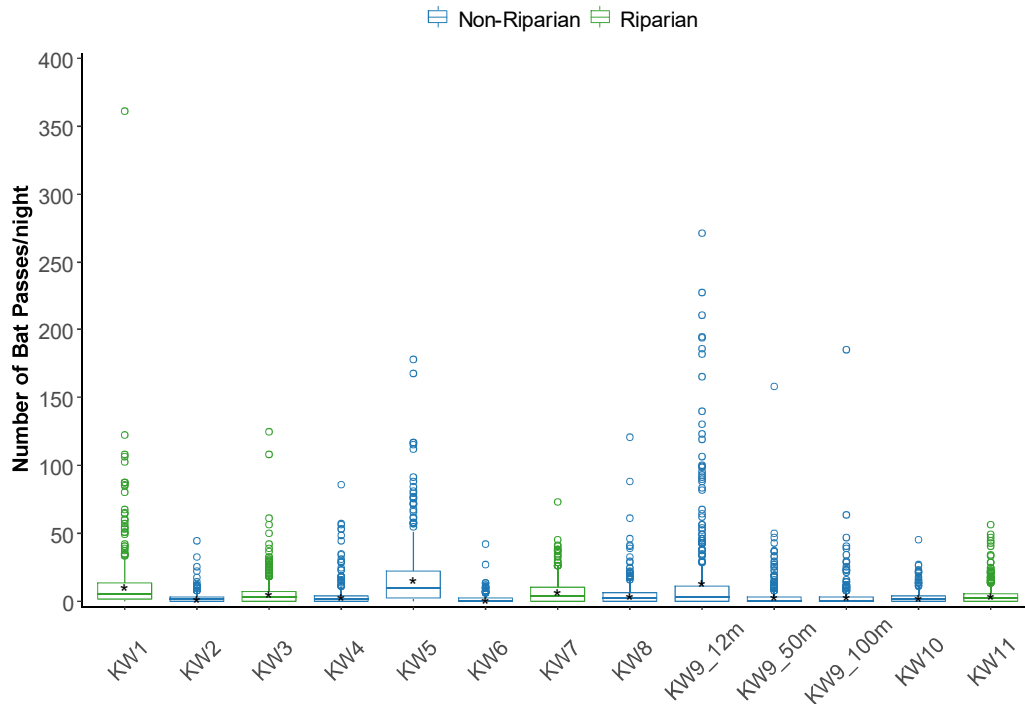


**Graph 1: Box and Whisker plot showing the monthly distribution of bat passes. \* = mean.**

<sup>4</sup> Child, M.F., Roxburgh, L., Do Linh San, E., Raimondo, D., Davies-Mostert, H.T. eds., 2016. The Red List of Mammals of South Africa, Swaziland and Lesotho. South African National Biodiversity Institute and Endangered Wildlife Trust, South Africa.

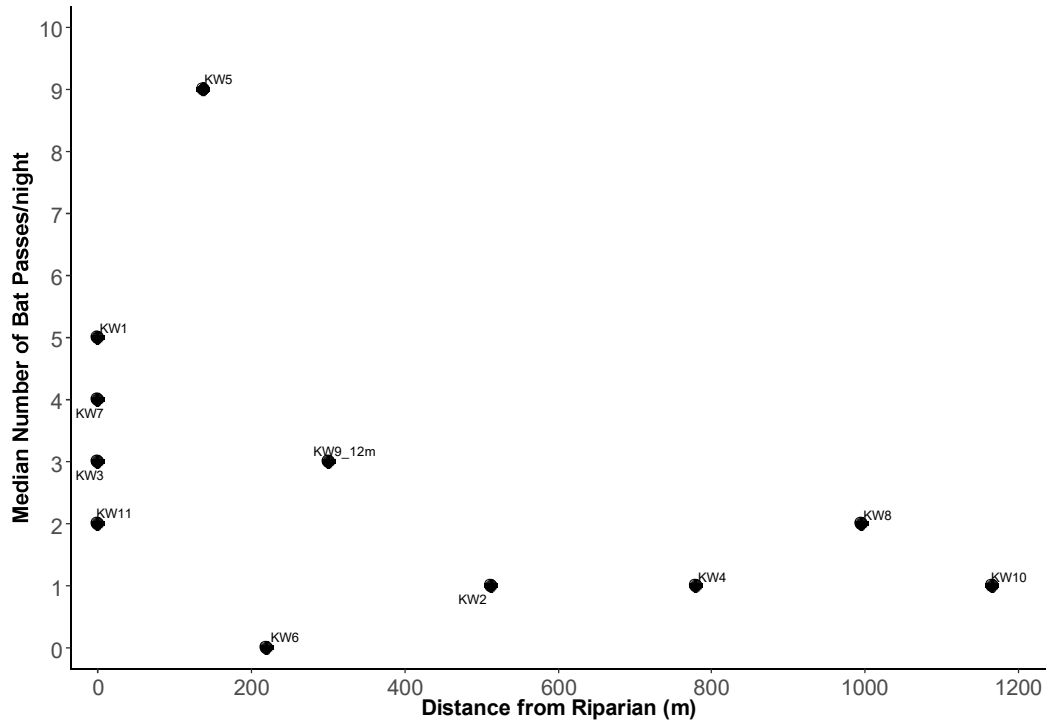
Median bat activity per night was highest at KW5, situated in a non-riparian habitat and the activity was mostly attributed to the Cape serotine. The second highest median activity was recorded at KW1 which was 0 m from the riparian edge (Table 2), where 46 % of the activity was attributed to Egyptian free-tailed and Cape serotine bats each. Overall, there was a general trend among all paired locations<sup>5</sup> of greater activity in riparian habitat compared to non-riparian habitat (Graph 2). While activity was greater nearer to riparian habitat, beyond 200 m there was little difference in activity with increasing distance from the riparian edge, except for KW9\_12m which had the second highest mean activity after KW5 (Graph 3).

Natal long-fingered bat and Cape serotine was recorded most often in riparian habitat or within 220 m from riparian habitat accounting for 90 % of their activity. The Long-tailed serotine and both free-tailed bat species were recorded more frequently in non-riparian habitat; 61 % of the Long-tailed serotine, 78 % of Roberts’s flat-headed bat activity and 62 % of Egyptian free-tailed bat activity was found in non-riparian habitat.



**Graph 2: Box and Whisker plot showing the distribution of bat passes at each monitoring location.**

<sup>5</sup> Paired locations: KW1-KW2; KW3-KW4; KW7-KW8; KW10-KW11.



**Graph 3: Scatterplot showing bat activity in relation to distance to the riparian edge.**

At the meteorological mast, median (and mean) activity was higher near the ground and reduced with height (Table 2). Looking at individual species, Egyptian free-tailed bat and Robert’s flat-headed bat activity (which comprised most of the at height<sup>6</sup> activity) reduced with height while the rest of the species only accounted for 3% of bat activity at the met mast.

**Table 2: Acoustic Monitoring Summary**

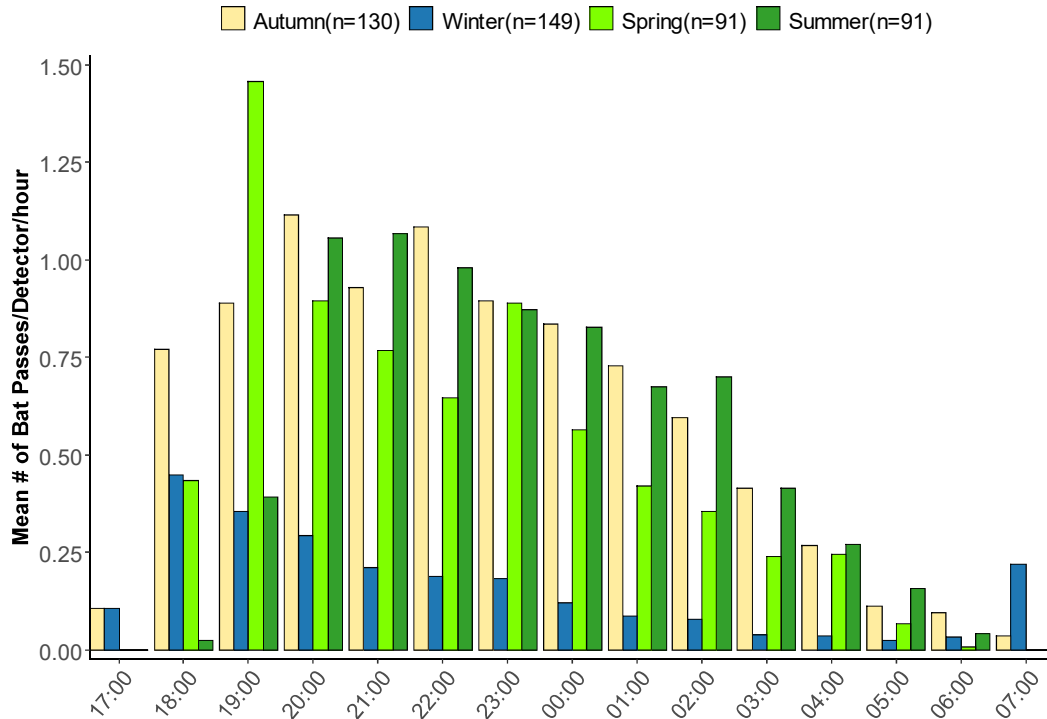
Detector	Habitat	Distance to Riparian (m)	# of Sample Nights	% of Sample Nights with Bat Activity	Median; Mean Bat Passes/night	Total Bat Passes
KW1	Riparian	0	462	76.6	5; 11.4	5,251
KW2	Non-Riparian	512	313	51.1	1; 2.2	726
KW3	Riparian	0	450	70.4	3; 6.2	2,797
KW4	Non-Riparian	780	399	61.4	1; 4.0	1,660
KW5	Non-Riparian	(0*) 137	360	79.9	9; 17.1	6,467
KW6	Non-Riparian	220	371	49.9	0; 1.7	629
KW7	Riparian	0	419	73.5	4; 7.1	3,043
KW8	Non-Riparian	996	409	67.5	2; 5.1	2,157
KW9_12m	Non-Riparian	300	429	71.3	3; 14.6	6,289
KW9_50m	Non-Riparian	305	430	47.4	0; 3.7	1,616
KW9_100m	Non-Riparian	317	213	33.3	0; 4.2	891
KW10	Non-Riparian	1166	274	52.9	1; 3.2	987
KW11	Riparian	0	365	64.9	2; 4.7	1,721

\*was originally installed in riparian habitat but was moved on 3 August 2019 for security reasons.

There was a notable peak in bat activity between 19:00 and 20:00 in spring during which an average of 1.4 bat passes per detector per night were recorded (Graph 4). Activity declined thereafter except for another smaller peak from 23:00 to 00:00. Autumn activity commenced an hour earlier compared to spring and activity was spread more evenly across

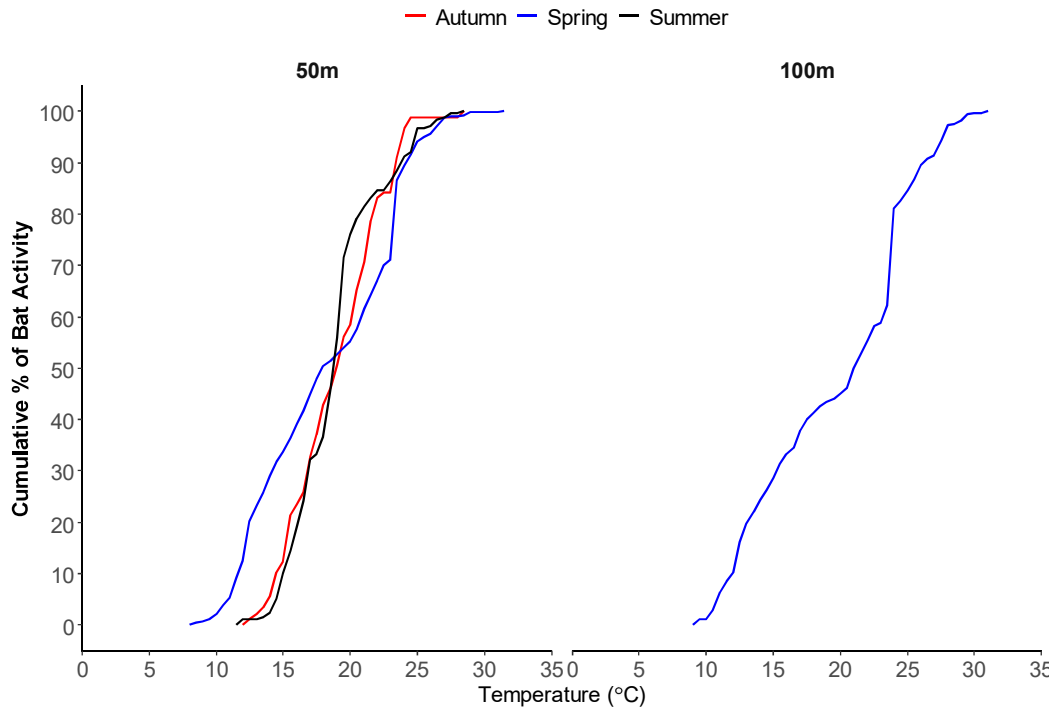
<sup>6</sup> 'at height' refers to activity recorded at 50 m and 100 m

hours (Graph 4). Activity peaked from 20:00 to 21:00 and declined thereafter except for a similar peak from 22:00 to 23:00. In summer, activity commenced two hours later than autumn, peaked between 20:00 to 22:00 and declined thereafter. Winter had the lowest overall activity, with a small peak (0.4 passes per detector per night) between 18:00 and 19:00 and another smaller peak from 07:00 to 8:00.

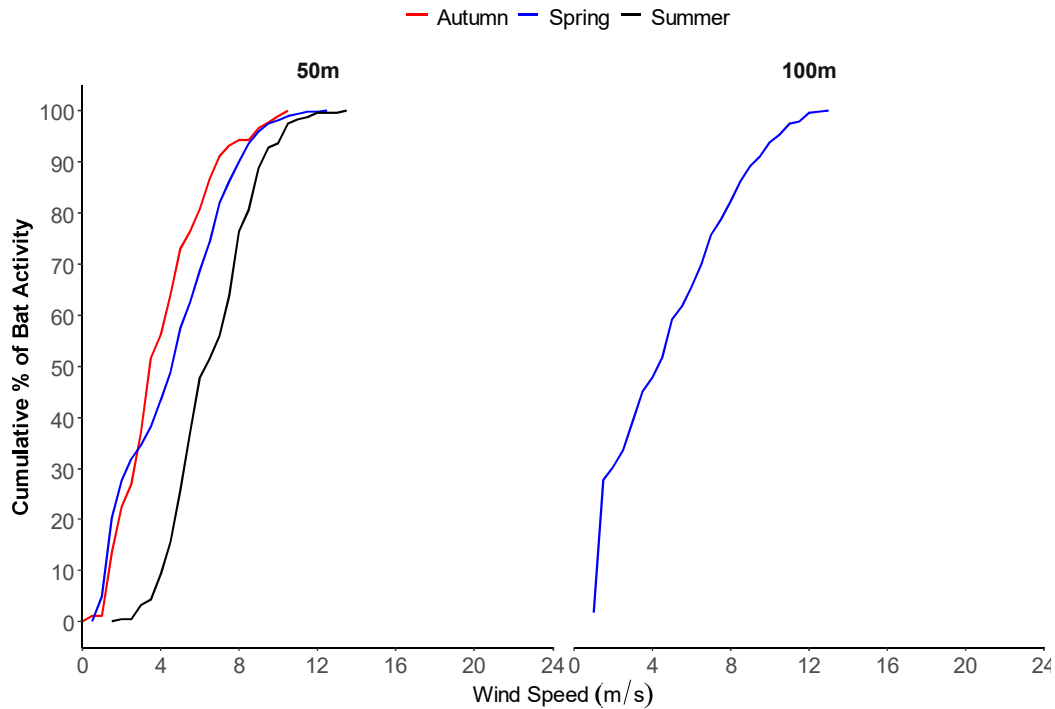


**Graph 4: The mean number of bat passes/detector/hour across all locations during the sampling period.**

Bat activity at different temperatures were relatively similar at 50 m during summer and autumn but during spring bats were active at lower temperatures and during wider temperature ranges (Graph 5). There were notable differences in bat activity at different wind speeds across seasons. Bats were more active at lower wind speeds during autumn and spring compared to summer in which bats are active at higher wind speeds (Graph 6). Note: There were no bat passes recorded at 100 m during summer and a portion of autumn due to equipment malfunctions. However, this does not impact the quality of results as more than a year of at height monitoring was conducted with sufficient amounts of data collected.



**Graph 5: Accumulation curve of bat activity with temperature.**



**Graph 6: Accumulation curve of bat activity with temperature.**

#### 4.4 Discussion

During the pre-construction monitoring study at the proposed Kwagga WEFs area of interest, bat activity was low to moderate and species diversity was typical for arid regions in South Africa (Cooper-Bohannon *et al.* 2016). Compared to five other projects in the Nama-Karoo biome, the bat activity at the Kwagga WEFs area of interest is similar during summer, autumn and spring but lower during winter. Three high risk and one medium-high risk species are confirmed to be present at the site. All species present on site, except the Roberts's Flat-headed Bat, are known to have suffered mortality at operational wind energy facilities in South Africa (Aronson *et al.* 2013; Doty and Martin 2012; MacEwan 2016).

Bat activity generally peaked during autumn followed by summer, then spring with low activity recorded during winter. The period in which the highest activity was observed was from February to April and activity was lower near the ground than at height.

Free-tailed bats are likely to occur in the rotor swept zone. The Egyptian free-tailed accounted for 66 % of the total bat activity during the sample period at the Kwagga WEF study area. This species is classified as high risk to wind energy development because its foraging ecology allows for activity in open areas, high above the ground where it may encounter wind turbine blades. At the met mast (KW9), activity at 100 m accounted for 11 % of activity, compared to 18 % at 50 m and 71 % at 12 m, suggesting that activity decreases with height. Similarly, Roberts's flat-headed bat is also classified as high risk and 8 % of its activity was at 100 m, compared to 17% at 50 m and 75 % at 12 m. Both of these species showed less association with riparian habitat, and were recorded more frequently in non-riparian habitat. In contrast, Natal long-fingered bat, a clutter-edge species, was recorded in riparian habitat up to 56 % of the time. The Cape serotine, also a clutter-edge species, was also recorded nearer to riparian habitat more often but at KW5, 137 m from the riparian edge, activity of this species was the highest.

There was a clear decrease in bat activity with increasing distance from the riparian edge although this relationship did not persist beyond 300 m. This suggests that a minimum of a 300 m buffer may be an effective means to reduce potential encounters between bats, particularly clutter-edge species, and wind turbines but also for open air species such as the free-tailed bats, which were active to a relatively high degree at ground level at KW9.

## 5 EVALUATION OF SITE RISK

### 5.1 Risk to Bats

WEFs have the potential to impact bats directly through collisions and barotrauma resulting in mortality (Horn *et al.* 2008; Rollins *et al.* 2012), and indirectly through the modification of habitats (Kunz *et al.* 2007b). Direct impacts pose the greatest risk to bats and, in the context of the project, habitat loss and displacement should not pose a significant risk (unless a large roost is discovered on site and bats are reluctant to leave this roost if disturbed) because the development footprint (i.e. turbines, roads, buildings, etc.) is small compared to the size of the project study area. In the current layout all substations and associated infrastructure have also avoided sensitive areas.

Direct impacts to bats will be limited to species that make use of the airspace in the rotor-swept zone of the wind turbines. Of the five species of bat that were recorded on site, all four exhibit behaviour that may bring them into contact with wind turbine blades and they are potentially at risk of negative impacts if not properly mitigated, although the magnitude of these impacts is unknown at this stage.

Important bat features include riparian habitats, buildings, cultivated areas, wetlands, and farm dams, all of which have been buffered by 300 m because data from KW9\_12m suggest

that free-tailed bats, which are high risk species, are active at this distance from riparian edges. All buffers are no-go for turbines to blade tip and result in 7 turbines that need to be relocated (Figure 1).

While these buffers may be effective in helping to avoid interactions between clutter-edge bats and wind turbines, the open air bats, particularly the Egyptian free-tailed bat, were active for approximately 30 % of the time at and above 50 m in the air. Therefore, buffers may be less effective in avoiding risks to these species since proportionally less of their time is spent at ground level at key habitat features. Additional avoidance measures can be incorporated through turbine design to reduce risks to free-tailed bats when they are active at height. Since 71% of bat activity occurs below 50 m it may be prudent to select a turbine with blades that do not sweep down past 50 m above the ground, if possible. Taking into account the turbine designs under consideration, the minimum blade sweep at Kwagga WEF 1 is recommended to not be lower than 30 m, as turbines with a lower ground clearance run the risk of reaching the fatality thresholds sooner. If the minimum blade sweep is lower than 30 m, fatality thresholds would need to be evaluated every 3 – 4 months against the South African Bat Assessment Association fatality threshold guidelines (i.e. if they exceed an estimated 101 bat fatalities per year for this project).

## 5.2 Cumulative Impacts

At least 9 onshore wind facilities and onshore wind/solar PV combined facilities are being considered according to the DEFF Renewable Energy database (Q3 2020) in this cumulative 50 km region (Figure 3). Usually a 560 km radius would be used as this is the maximum distance the Natal long-fingered bat can travel when migrating but, due to their low presence on site, the radius assessed was reduced to 50 km.

Cumulative impacts on bats could increase as new facilities are constructed (Kunz *et al.* 2007b) but are difficult to accurately predict or assess without baseline data on bat population size and demographics (Arnett *et al.* 2011; Kunz *et al.* 2007b) and these data are lacking for many South African bat species. It is possible that cumulative impacts could be mitigated with the appropriate measures applied to wind farm design and operation. Cumulative impacts could result in declines in populations of even those species of bats currently listed as Least Concern, if they happen to be more susceptible to mortality from wind turbines (e.g. high-flying open air foragers such as free-tailed and fruit bats) even if the appropriate mitigation measures are applied. Further research into the populations and behaviour of South African bats, both in areas with and without wind turbines, is needed to better inform future assessments of the cumulative effects of WEFs on bats.

## 5.3 Residual Impacts

Residual impacts may still warrant additional mitigation measures and applying curtailment and using deterrents are the main options once turbines are operational. Both of these mitigation measures are known to reduce bat fatality (Arnett and May 2016; Arnett *et al.* 2011; Hayes *et al.* 2019; Romano *et al.* 2019; Weaver *et al.* 2020). Curtailment techniques that can be considered are blade-feathering, raising the cut-in speed and if needed, shutting down turbines. The exact choice will depend on the scale of the impact and this must be evaluated against threshold levels (MacEwan *et al.* 2018).

Because so little is known about migration routes, fecundity rates and population numbers of bats in South Africa the fatality threshold is an ongoing discussion, but is usually influenced by natural mortality of bat species, density dependent factors, activity levels per ecoregion, percent loss to natural declines and size of the site. Research suggests 2% additional losses to bat populations from anthropogenic pressures in a particular ecoregion, bat populations start to decline. These losses can be calculated according to The South African Bat Assessment Association fatality threshold guidelines. Thresholds calculated for

the Kwagga WEF 1 Project equate to an estimate of 101 bat fatalities<sup>7</sup> per least concern insectivorous bat species or family per annum, with 358 bat fatalities<sup>8</sup> calculated for all three Kwagga WEF projects and summed for the entire area. Should these values be exceeded, curtailment or deterrents must be applied. In addition, if one fatality for various conservation important species occurs during a 12-month period, these mitigation measures will also need to be applied (refer to MacEwan *et al.* 2020 for species list). The probability that a conservation important species will trigger mitigation is low since none have been recorded at the site during the monitoring period.

If curtailment or deterrents are needed based on threshold values being exceeded, their use would be confined to specific periods of the year and under specific combinations of meteorological conditions (Table 3). During spring, bat activity accumulated slowly below approximately 13°C and above 23°C, and 50 % of activity occurred below a wind speed of 4.5 m/s. During summer bat activity accumulated slowly below 14°C and above 21°C, and 50 % of activity occurred below a wind speed of 6.5 m/s. During autumn, bat activity accumulated slowly below 14°C and above 24°C, and 50 % of activity occurs below 3.5 m/s. Over fifty percent of bat activity in spring occurs between 19h00 and 00h00, between 20h00 and 01h00 in spring and between 20h00 and 00h00 in autumn.

**Table 3: Preliminary Curtailment Parameters if Threshold Fatalities Exceeded**

	<b>1 September – 30 November (Spring)</b>	<b>1 December – 29 February (Summer)</b>	<b>1 March – 31 May (Autumn)</b>
<b>Time Period</b>	19h00 – 00h00	20h00 – 01h00	20h00 – 00h00
<b>Temperature</b>	Between 13°C and 23°C	Between 14 °C and 21°C	Between 13.5 °C and 22.5°C
<b>Cut in Wind Speed</b>	Below 4.5 m/s	Below 6.5 m/s	Below 4.5 m/s

## 6 PLAN OF STUDY FOR THE ENVIRONMENTAL IMPACT ASSESSMENT

All pre-construction data have been collected and analysed and included in this report. For inclusion in the Environmental Impact Assessment, the potential impacts will be assessed based on the methodology provided by the Environmental Assessment Practitioner (EAP), CSIR. A significance rating and impact assessment will be determined for each impact and mitigation measures provided where appropriate. For each impact, the significance will be determined by identifying the status, extent, duration, consequence, probability of occurrence, and reversibility of the impact (as well as the irreplaceability of resource loss) in the absence of any mitigation ('without mitigation'). Mitigation measures will be identified and the significance will be re-rated, assuming the effective implementation of the mitigation ('with mitigation'). Any comments received during the scoping phase will be addressed and incorporated into the EIA Report.

Cumulative impacts will be assessed as the incremental impact of the proposed activity on the baseline, when added to the impacts of other past, present or reasonably foreseeable future activities in 50 km radius.

The outcome of the EIA study will be a description of bat activity at the proposed project, an evaluation of potential risks/impacts to bats (including cumulative impacts), recommendations for WEF layout and design mitigation measures to reduce impacts, including an environmental management plan for the project.

<sup>7</sup> Assuming an area of influence of 5, 052 hectares, and a threshold of 0.2 bats per hectare for the Nama Karoo Shrublands ecoregion.

<sup>8</sup> Assuming an area of influence of 17, 903 hectares, and a threshold of 0.2 bats per hectare for the Nama Karoo Shrublands ecoregion.

## 7 CONCLUSION

The data collected during the monitoring period suggests that the risk to bats posed by wind energy development at the site is low for clutter-edge bat species and the correct placement of turbines will limit the impact to these species. Open air bat species are at a slightly higher risk as free-tailed bats account for 66% of bat activity at this site. An initial mitigation measure to avoid impacts to free-tailed bats is the choice of turbine design. Since 71% of free-tailed bats occur near the ground it is advisable to select a combination of hub height and turbine blade length that do not sweep down past 50 m above the ground, if possible. Taking into account the turbine designs under consideration, the minimum blade sweep is recommended to not be lower than 30 m. If the minimum blade sweep is lower than 30 m, fatality thresholds would need to be evaluated every 3 – 4 months against the South African Bat Assessment Association fatality threshold guidelines. More active mitigation such as curtailment and deterrents may be appropriate to reduce residual impacts should threshold bat mortality (i.e. 101 bats) for the Kwagga 1 WEF area be reached. As such, post construction acoustic monitoring and carcass searching is required. Provided these considerations are met, development of wind energy at the Kwagga 1 WEF project site is compatible with bat conservation.

Based on the preliminary assessment of impacts for the proposed development, the specialist is of the opinion that the project should be allowed to proceed to the EIA phase.

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**APPENDIX 1: SPECIALIST DECLARATION OF INDEPENDENCE**



## 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

##### 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](mailto:EIAAdmin@environment.gov.za)

**1. SPECIALIST INFORMATION**

Specialist Company Name:	Camissa Sustainability Consulting		
B-BBEE	Contribution level (indicate 1 to 8 or non-compliant)	4	Percentage Procurement recognition
			100%
Specialist name:	Jonathan Aronson		
Specialist Qualifications:	MSc (Zoology), MSc (Environment and Resource Management)		
Professional affiliation/registration:	SACNASP		
Physical address:	Krelis Louwenstraat 5 Amsterdam, Netherlands		
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Telephone:		Fax:	
E-mail:	jonathan@camissaconsulting.com		

**2. DECLARATION BY THE SPECIALIST**

I, Jonathan Aronson, 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

Camissa Sustainability Consulting

Name of Company:

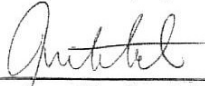
26/05/2021

Date

Details of Specialist, Declaration and Undertaking Under Oath

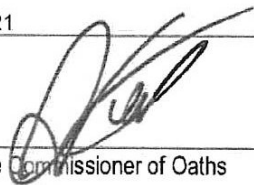
3. UNDERTAKING UNDER OATH/ AFFIRMATION

I, Jonathan Aronson, 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

Camissa Sustainability Consulting  
Name of Company

26/05/2021  
Date

  
Signature of the Commissioner of Oaths

26/05/2021  
Date

  
Commissioner of Oaths ex Officio  
Advocate. A FRIEDMAN  
Advocate of the High Court  
of South Africa  
81 Maude Street, Sandton  
Date. 26/05/2021