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# Pre-Construction Bat Monitoring for the Proposed Ujekamanzi Wind Energy Facility 1, Mpumalanga Province
# Scoping Report

**on behalf of**

## ABO Wind Renewable Energies (PTY) LTD

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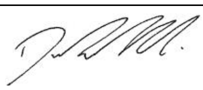
| **Signature** |  |  | |

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| (a) details of the specialist who prepared the report; and the expertise of that specialist to compile a specialist report including a *curriculum vitae*; | Appendix C |
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| (c) an indication of the scope of, and the purpose for which, the report was prepared; | Section 1.2 |
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| (cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change; | Sections 4 and 5 |
| (d) the duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment; | Section 2 |
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| (i) a description of any assumptions made and any uncertainties or gaps in knowledge; | Section 1.3 |
| (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; | Section 3 |
| (k) any mitigation measures for inclusion in the EMPr; | Section 5 and 6 |
| (l) any conditions for inclusion in the environmental authorisation; | Section 8 |
| (m) any monitoring requirements for inclusion in the EMPr or environmental authorisation; | Section 6 |
| (n) a reasoned opinion—<br>i. as to whether the proposed activity, activities or portions thereof should be authorised;<br>iA. Regarding the acceptability of the proposed activity or activities; and<br>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 8 |
| (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. | A site sensitivity verification report aligned with the requirements of Part A of GN 320 has been included in this report (Appendix 1). No specific protocol for bat assessment has been gazetted. |

## EXECUTIVE SUMMARY

Arcus Consultancy Services South Africa (Pty) Ltd, an ERM Group Company was appointed to conduct the required 12-months of pre-construction bat monitoring and impact assessment for the proposed Ujekamanzi Wind Energy Facility (WEF) 1, the results of which are included in this Scoping Report and will feed into the final Impact Assessment Report for the Ujekamanzi WEF 1.

Monitoring is currently underway and is in accordance with the South African Good Practice Guidelines for Assessing Bats (2020) at WEFs, assessing bat activity across the area using static mast acoustic monitoring, field surveys, roost searches and GIS modelling. The results thus far were analysed and compiled into a baseline scoping report of bat activity and used to assess potential impacts of the development on bats.

Of the sixteen species that can potentially occur on site, at least eight species (and at most ten) were recorded. Seven of these species exhibit behaviour that could bring them into contact with turbines, with six being high risk and one being medium – high risk. The preliminary impact assessment currently reveals that the overall risk to bats posed by wind energy development at the site is predominantly low to medium, assuming that all mitigations outlined in the impact assessment and sensitivities mapped are adhered to.

Residual impacts from bat collisions with turbines may still occur. Should the fatality threshold be reached during the operational phase of the WEF, additional mitigation measures will need to be implemented to reduce impacts to acceptable levels below the fatality threshold as defined by the latest South African Bat Fatality Threshold Guidelines (MacEwan et al., 2018).

Cumulative impacts are predicted to be very high before mitigation and medium after mitigation. As such, the development of the Ujekamanzi WEF 1 will not result in unacceptable impacts to bats (according to the current data) and can be authorised to proceed to EIA phase.

# 1 INTRODUCTION

ABO Wind renewable energies (Pty) Ltd (hereafter referred to as 'ABO'), has appointed SiVEST SA (Pty) Ltd (hereafter referred to as 'SiVEST') to undertake the required Scoping and Environmental Impact Assessment (S&EIA) process for the proposed development of the renewable energy cluster, located south of Ermelo in the Mpumalanga province. The project will consist of four separate EIAs as follows - 2 x Wind Energy Facilities (WEFs), a Main Transmission Substation (MTS) (potentially including 2 x 132kV overhead powerlines) and a Loop-In-Loop-Out (LILO) for the grid connection (Table 1 below). Each of the projects will require its own Environmental Authorisation.

***Table 1: Project Component Overview***

| Projects | Description |
|---|---|
| 2 x Wind Energy Facilities | • Approximate combined capacity: 650 MWac;<br>• Approximate properties affected/Site extent: 20,000 ha;<br>• Associated infrastructure include:<br>▪ Wind Turbine Generators;<br>▪ Substation complex, O&M buildings (workshop etc.);<br>▪ Battery energy storage systems of 500MW/500MWh, which could be either lithium-ion or redox flow technology, etc.;<br>▪ Underground cabling (33kV);<br>▪ Overhead powerlines (132kV);<br>▪ Temporary site compound;<br>▪ Laydown areas; and<br>▪ Access roads |
| 1 x Main Transmission Substation | The proposed development of a 400/132 kV MTS, including associated infrastructure at the MTS (potentially including 2 x 132kV OHL) |
| 1 x Loop-In-Loop-Out Grid Connection | The proposed development of a 400 kV Loop-In-Loop-Out (LILO) from the existing 400 kV Overhead Power Line to the proposed MTS |

Arcus Consultancy Services South Africa, an ERM Group Company ('Arcus'), was appointed to conduct the pre-application monitoring and assessment for the potential impacts to bats. The results of the monitoring campaign (which is still underway and expected to conclude in May 2023) informed the scoping impact assessment process required for environmental authorisation in terms of the National Environmental Management Act,1998 (Act 107 of 1998, as amended) (NEMA) and associated Environmental Impact Assessment (EIA) regulations of 2014 as amended (EIA regulations). At the conclusion of this monitoring campaign, the final results and impacts will be explored in the Bat Environmental Impact Assessment Reports.

The aim of the monitoring was to document bat activity in the area of interest and, based on this activity, assess the potential impacts on bats as a result of the proposed WEF and the risk to development consent (i.e. environmental authorisation). This data will establish a pre-construction baseline of bat species diversity and activity and be used to inform the EIA. The monitoring data will also assist in providing solutions to avoid and mitigate impacts, if required, by informing the final design of the WEF, and the construction and operational management strategies to be implemented. The baseline will also be used to compare impacts to bats during the operational phase of the projects.

This scoping report presents a summary of results from the pre-construction bat monitoring campaign undertaken between 17 May 2022 and 26 January 2023 (255 sample nights), which will continue until 17 May 2023 and ***preliminary assessment*** **of the potential impacts associated with the Ujekamanzi WEF 1** on bat populations in the receiving environment.

None of the projects fall within a Renewable Energy Development Zone (REDZ) or a strategic power corridor.

## 1.1 Description of Proposed Development

The proposed development, comprising two WEFs with a total extent of approximately 20 000 ha and an approximate combined capacity of 650 MWac, is located south of Ermelo in the Dr. Pixley Ka Isaka Seme Local Municipality within the Mpumalanga Province (Figure 1).

A description of the technical details for the proposed WEFs is presented in Table 2 below.

***Table 2: Project Technical Details***

| **Ujekamanzi WEF 1 & 2** | | |
|---|---|---|
| **Component** | **Dimensions** | |
| Wind Turbine Generators (WTGs) | Number of WTGs | The number of WTGs TBD. The client is requesting authorization for a buildable area. |
| | MW output per WTG | Up to 10 MW |
| | Total Installed Capacity | 650 MW (TBC) |
| | Hub Height from ground | Up to 180 m |
| | Rotor Diameter | Up to 200 m |
| | Blade Length | Up to 100 m |
| | Total footprint of WTG and Laydown area | Up to approx. 1 ha per WTG (WTG dependent) |
| | Crane pad | General temporary Hardstand Area (boom erection, storage, and assembly area): 1 ha per WTG |
| | Permanently affected area (foundation size) | Up to 1 ha, may be able to rehabilitate some of this area |
| Roads | Width of internal access roads | Up to 10 m; circle/bypass TBC (WTG specific) |
| | Length of internal access roads | TBC |
| | Site access points | TBC |
| Upgrading of existing access road/s | Yes/No | Yes, where necessary |
| | Current width | TBC (likely between 6 m and 8 m) |
| | Upgraded width | Up to 10 m |
| Construction Compounds and Laydown Areas | Footprint | Up to approx. 10 ha (for Temporary construction period laydown / staging area) |
| Operational and Maintenance (O&M) control centre building area | Footprint | Up to 1 ha (within on-site Substation Hub) |
| On-site Substation Hub | Included | The proposed project will include one on-site substation hub incorporating the facility substation, switchyard, collector infrastructure, battery energy storage system (BESS) and associated O&M buildings. |
| | Footprint | Up to 19 ha |
| | Capacity | Substation: 33 / 132 kV (Project 1 and 2)<br>Grid Connection: 132 / 400 kV (Project 3 and 4) |

| Ujekamanzi WEF 1 & 2 | | |
|---|---|---|
| **Component** | **Dimensions** | |
| | Height | Up to 10 m |
| | Communications tower Height | Up to 32 m (TBC) |
| Battery storage | Battery Technology Type | Electrochemical Batteries including:<br>A) Lead Acid and Advanced Lead Acid<br>B) Lithium ion, NiCd, NiMH-based Batteries<br>C) High Temperature (NaS, Na-NiCl2, Mg/PB-Sb)<br>D) Flow Batteries (VRFB, Zn-Fe, Zn-Br)<br>The BESS would therefore comprise the selected batteries together with chargers, inverters and related equipment. |
| | Approximate footprint | Up to 5 ha (within On-site Substation Hub) |
| | Maximum height | Up to 8 m or higher as recommended (TBC) |
| | Capacity | 500 MW/ 500 MWh |
| Internal Transmissions and/or distribution lines on site | Under or aboveground | Underground, unless not possible due to environmental reasons |
| | Capacity (kVA) | Typically 33 kV |
| | Height if aboveground | TBC. "Cables to be buried along access roads, where feasible, with overhead 33kV lines grouping turbines to crossing valleys and ridges outside of the road footprints to get to the on-site substation." |
| | Depth if below ground | Up to 1 m |
| | Length | To follow internal site roads (length TBC) |
| Perimeter fencing | Height | TBC |
| | Type | TBC |
| Construction Periods | Months | 24 Months |
| Wind Monitoring Masts (if applicable) | | Currently 1 met mast installed with a second met mast planned |
| Proximity to Grid Connection | | On-site: The proposed development of a 400 kV Loop-In-Loop-Out (LILO) from the existing 400 kV Overhead Power Line to the proposed MTS |

## 1.2 Terms of Reference

The aim of this report is to present the baseline environment with respect to bats that may be influenced by the development and operation of the WEF 1. Based on this baseline, a description and evaluation of the potential impacts the project may pose to bats is provided. The following terms of reference were utilised for the preparation of this report:

- Describe the baseline receiving environment in and surrounding the site, including a description of key no-go areas or features or other sensitive areas to be avoided;

- Describe the methodology and processes used to source information, collect baseline data, generate models and the age or season when the data were collected;
- Describe any assumptions made and any uncertainties or gaps in knowledge;
- Describe relevant legal regulations, policies, standards and guidelines.
- Identify potentially significant environmental impacts that may arise in the construction, operation and decommissioning phases of the project, including cumulative impacts (to be further expanded in the EIA Report);
- Conduct an impact assessment of identified impacts under the pre-mitigation and post-mitigation scenarios (to be further expanded in the EIA Report);
- Conduct an assessment of any alternatives, where relevant, and the No-Go alternative;
- Provide a discussion on the overall impact and a reasoned opinion as to whether the proposed activity, or portions of the activity can be authorised (to be further expanded in the EIA Report); and
- Identify potential mitigation or enhancement measures to minimise impacts to bats (to be further expanded in the EIA Report).

## 1.3 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, demographics, local and regional distribution patterns, spatial and temporal movement patterns (including migration and flying heights) and how bats may be impacted by wind energy, including cumulatively, 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 adopt a precautionary approach when extrapolating data from echolocation surveys over large areas due to the limited sample size (i.e., 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 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 5.4.7 (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 is presented as relative abundance.
- The potential impacts of wind energy on bats presented in this report represent the current knowledge in this field. New evidence from research and consultancy projects may become available in future, meaning that impacts and mitigation options presented and discussed in this report may need to be adjusted if the project is developed.
- 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 report included investigation of the current 8 months of monitoring data which has been captured at the proposed project site. It should be noted that this data does not give the full scope of activity and presence throughout all four seasons, and that monitoring is continuing. The findings presented in this report are, therefore, **preliminary and are subject to change, following further on-site assessments.** The full 12 months of pre-construction monitoring data will be presented and explored in the EIA Report.

### 1.4 Applicable Legislation, Policies, Treaties and Standards

The following items provide a governance framework and guidelines for the consideration and management of impacts to biodiversity and are applicable to the development of infrastructure, including wind farms, that may result in such impacts:

- The Equator Principles (2013)
- International Finance Corporation Environmental, Health, and Safety Guidelines for Wind Energy (2015)
- 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)
- The IFC Performance Standards on Environmental and Social Sustainability (2012)
- The Red List of Mammals of South Africa, Swaziland and Lesotho (2016)
- National Biodiversity Strategy and Action Plan (2005)
- South African Best Practise Guidelines for Surveying Bats in Wind Energy Facility Developments – Pre-Construction (2020)
- Government Notice No. 320 has been gazetted, therefore a verification report aligned with the requirements have been included in this report (Appendix 1).

The requirements for Specialist Study being undertaken in support of applications for Environmental Authorisation follow those specified in Appendix 6 of the 2014 NEMA EIA Regulations (as amended), as well as the Assessment Protocols that were published on the 20th of March 2020, in Government Gazette 43110, GN 320 and the Assessment Protocols that were published on the 30th of October 2020, in Government Gazette 43855, GN 1150. These protocols stipulate the Procedures for the Assessment and Minimum Criteria for reporting on identified environmental themes in terms of Sections 24(5)(A) and (H) and 44 of the NEMA, when applying for EA.

As no bat-specific environmental theme protocols have been prescribed, the required level of assessment is based on the findings of the site sensitivity verification (Appendix A) and formulated to comply with Appendix 6 of the EIA Regulations; and any relevant legislation and guidelines deemed necessary.

## 2 METHODS

### 2.1 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 project area. Literature was also sought to understand the current state of knowledge of wind energy and impacts to bats, globally. Very limited research has been published in this regard, without much being 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 and operational monitoring reports, 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.

## 2.2 Field Surveys

The pre-construction monitoring was designed to monitor bat activity across the area of interest encompassed by the proposed WEF, as well as a broader study area representative of habitats within the WEF boundary itself. A broader study area was used because bats are mobile animals and may cross the site boundary to access resources. The monitoring was undertaken in accordance with South African best practice[1]. Sampling of bat activity took place at four locations using Song Meter SM4 bat detectors (Wildlife Acoustics, Inc.). Ultrasonic microphones were mounted on masts at 10 m ("ground level") at 3 of these locations. The other location was associated with an existing meteorological mast on which microphones were placed at a height of 10 m, 55 m and 110 m on each mast. All detectors were configured to record nightly from 30 minutes before sunset until 30 minutes after sunrise (Figure 1).

The distribution of monitoring locations across the site 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, on top or ridges, in open areas with low habitat complexity).

In addition to 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.). These included buildings, rocky outcrops and trees.

## 2.3 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 bat calls is termed 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 5.4.6, Wildlife Acoustics, Inc.). Bat species were automatically identified from their echolocation calls using the embedded echolocation call library in the software. The results were vetted by random or selective (for certain species) checks through manually identifying recordings to verify the results. The total number of files was used as a proxy for the number of bat passes which is considered as a standard approach to quantifying bat activity.

## 2.4 Preliminary Impact Assessment

The significance of impacts was assessed based on the methods in Appendix B.

[1] MacEwan, K., Sowler, S., Aronson, J. and Lötter, C., 2020. South African best practice guidelines for pre-construction monitoring of bats at wind energy facilities.

# 3 BASELINE ENVIRONMENT

## 3.1 Habitat

The study area is located in the Drakensberg Grasslands, Woodlands and Forest biome and consists of two vegetation types: Amersfoort Highveld Clay Grassland and Wakkerstroom Montane Grassland. The landscape consists of on undulating plains, which are mainly used for livestock grazing with cultivated land in between (Figure 1).

For foraging bats, one of the most important ecological constraints is clutter; objects (e.g. vegetation) that have to be detected and avoided by bats during flight (Schnitzler and Kalko 2001). Clutter presents perceptual and mechanical problems for bats. Perceptually, bats are constrained by their sensory capabilities to find prey amongst clutter (e.g. having an echolocation system adapted to find prey in dense vegetation versus in the open). Mechanically, bats are constrained by their flight ability (e.g. adaptations in wing morphology that enable flight in dense vegetation versus in the open). Habitats can therefore be defined according to clutter conditions. These include uncluttered space (open spaces, high above the ground and far from vegetation), background cluttered space (near the edges of vegetation, in vegetation gaps, and near the ground or water surfaces), and highly cluttered space (very close to surfaces such as leaves or the ground). Habitat complexity is therefore an important consideration for bats because areas that offer a variety of clutter conditions are more likely to support a greater diversity of bat species. The landscape is largely homogenous and is used mostly for grazing.

The availability of roosting space is a critical factor for bats (Kunz and Lumsden 2003) and a major determinant of whether bats will be present in a landscape, as well as the diversity of species that can be expected. There are several potential roosting features on site that may be used by bats. These include buildings and trees (which are mainly associated with the farmsteads). Cape serotine and Egyptian free-tailed bats, readily make use of buildings as roosts (Monadjem et al. 2020). Bats can also roost in rocky outcrops, but no suitable rocky outcrops were found to date.

Water sources are important for bats as a direct resource for drinking and because these areas tend to attract insects and promote the growth of vegetation (e.g. riparian vegetation). Therefore, besides providing drinking water, bats can also be attracted to water sources as potential foraging and roosting sites (Greif and Siemers 2010; Sirami et al. 2013). Dams, open reservoirs, rivers and streams are present in the study area that will be attractive to bats. Rivers, and drainage lines will be equally important for foraging and commuting. Although the landscape is largely transformed, cultivated land is known to be important for foraging, as some species forage over agricultural fields to hunt insect pests (Noer et al. 2012; Taylor et al. 2011).

Bats are known to use linear landscape features for commuting routes to get to and from foraging sites, roost sites and to access water sources. Linear landscape elements, such as tree lines and edge habitats, provide protection to bats from predators, shelter from wind, orientation cues as well as foraging habitat (Verboom and Huitema 1997; Verboom 1998). The primary linear landscape features are drainage lines, which typically (but not always) are associated with vegetation, providing linear and edge habitats that bats can access. Rivers, tree lines, and other edge habitats might also be used as commuting routes or navigation cues.

## 3.2 Bat Species

Approximately sixteen bat species can potentially occur in the study area (African Chiroptera Report 2022; Monadjem et al. 2020). It is possible that more (or fewer) species may be present because the distributions of some bat species in South Africa, particularly rarer species, are poorly known. Analysis of the acoustic monitoring data to date suggests that at least ten bat species are present (Table 3). 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 wind farm developments. The likelihood of risk to impacts of wind energy was determined from the relevant bat monitoring guidelines and is based on the foraging and flight ecology of bats and migratory behaviour.

***Table 3: Potential and Confirmed Bat Species Present on site and their Sensitivity to WEFs***

| Species | Species Code | # of Bat Passes | Conservation Status[2] | | Likelihood of Risk |
|---|---|---|---|---|---|
| | | | Regional | Global | |
| Egyptian free-tailed bat *Tadarida aegyptiaca* | TADAEG | 10,400 | Least Concern | Least Concern | **High** |
| Long-tailed Serotine Bat *Eptesicus hottentotus* | VES30 | 1,600 | Least Concern | Least Concern | **High** |
| African yellow bat *Scotophilus dinganii* | | | Least Concern | Least Concern | **Med-High** |
| Lesser long-fingered bat *Miniopterus fraterculus* | MINFRA | 4 | Least Concern | Least Concern | **High** |
| Natal long-fingered bat *Miniopterus natalensis* | VES50/NLB | 379 | Least Concern | Least Concern | **High** |
| Zulu serotine *Neoromicia zuluensis* | | | Least Concern | Least Concern | **High** |
| Cape serotine *Neoromicia capensis* | NEOCAP | 12,422 | Least Concern | Least Concern | **High** |
| Welwitsch's bat Myotis welwitschii | | - | Least Concern | Least Concern | **Med-High** |
| Temminck's myotis *Myotis tricolor* | | - | Least Concern | Least Concern | **Med-High** |
| Egyptian slit-faced bat *Nycteris thebaica* | | - | Least Concern | Least Concern | **Low** |
| Darling's horseshoe bat *Rhinolophus darlingi* | RHIDAR | 2 | Least Concern | Least Concern | **Low** |
| Bushveld horseshoe bat *Rhinolophus simulator* | | - | Least Concern | Least Concern | **Low** |
| Swinny's horseshoe bat Rhinolophus swinnyi | | - | Vulnerable | Least Concern | **Low** |
| Blasius's horseshoe bat *Rhinolophus blasii* | RHIBLA | 10 | Near Threatened | Least Concern | **Low** |
| Geoffroy's horseshoe bat *Rhinolophus clivosus* | RHICLI | 3 | Least Concern | Least Concern | **Low** |
| Egyptian fruit bat *Rousettus aegyptiacus* | | - | Least Concern | Least Concern | **High** |

* Endemic to South Africa.

## 3.3 Spatio-Temporal Bat Activity Patterns

During the sample period, ten species were detected and a total of 24,819 bat passes were recorded from 255 sample nights across all detectors (Table 4).

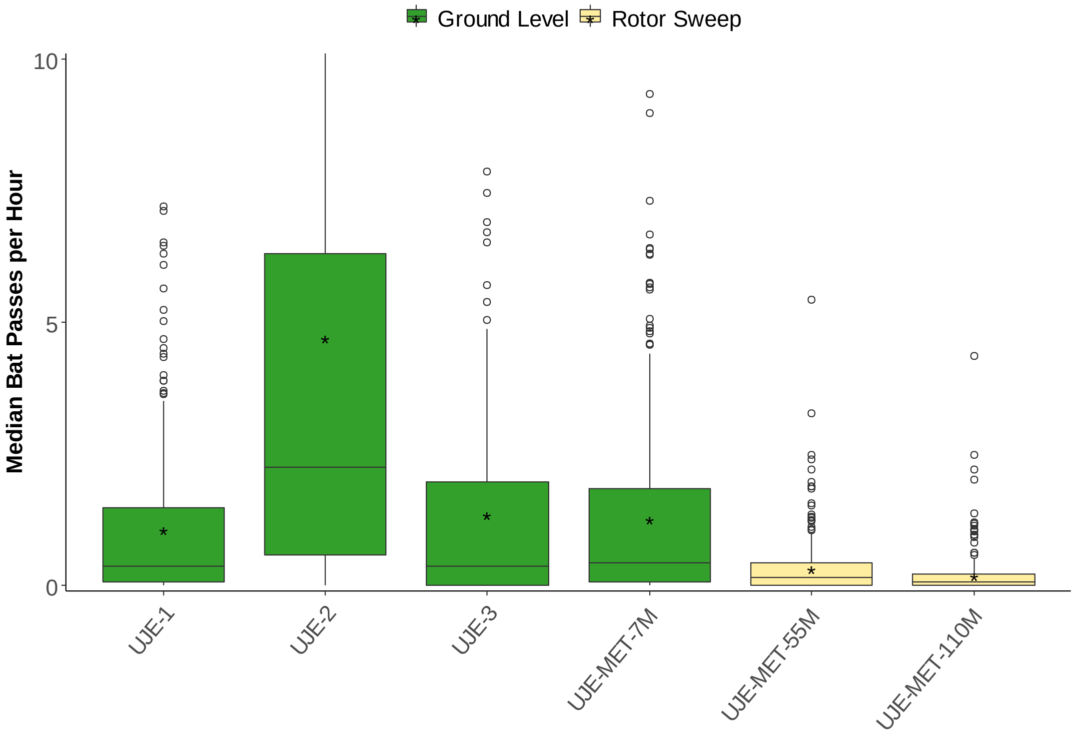
The Cape serotine bat accounted for 50 % of total activity while the Egyptian free-tailed bat accounted for 42% of the activity (Table 5).

[2] 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.

*Table 4: Acoustic Monitoring Summary*

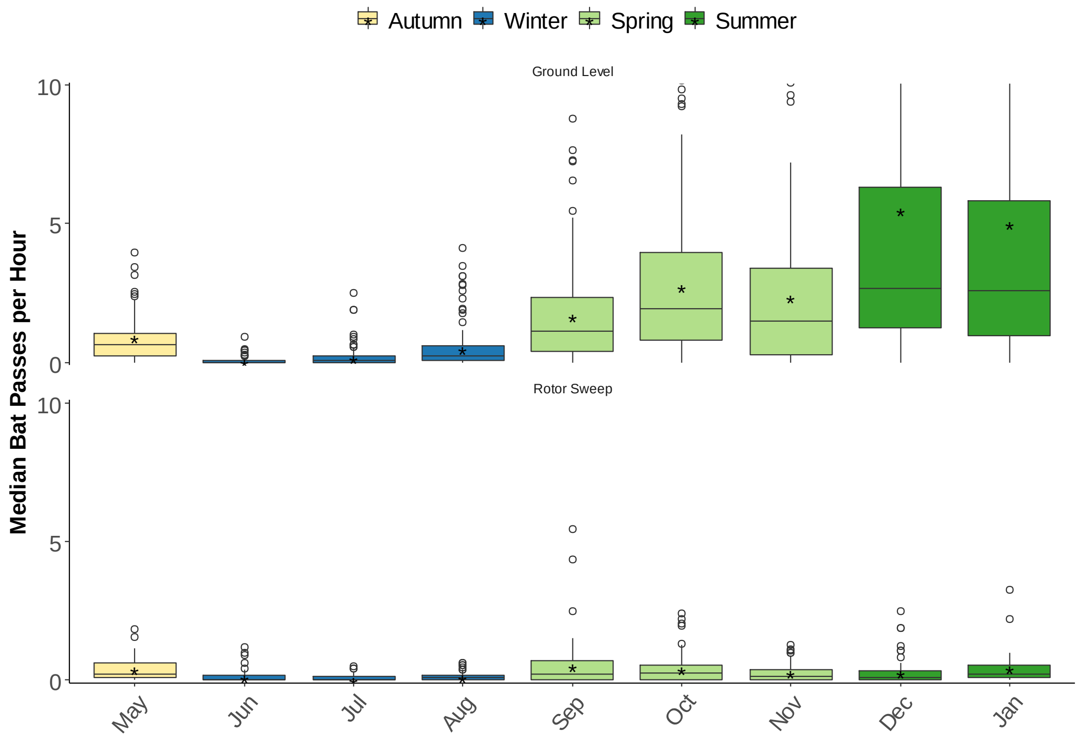
| Detector | Habitat | # of Sample Nights | % of Sample Nights with Bat Activity | Total Bat Passes |
|---|---|---|---|---|
| UJE-1 | Small drainage line | 253 | 79% | 3 298 |
| UJE-2 | River | 233 | 94% | 13 015 |
| UJE-3 | Cultivated Land (open) | 177 | 72% | 2 936 |
| UJE-MET-7m | Ridge (Open) | 255 | 78% | 3 972 |
| UJE-MET-55m | Ridge (Open) | 253 | 67% | 1 079 |
| UJE-MET-110m | Ridge (Open) | 184 | 52% | 519 |

UJE-2 had the highest bat activity for the study period with a median of 2.24 bpph (bat passes per hour), which is considered high for the grassland biome. The other ground level monitoring locations which include UJE-1, UJE-3 and UJE-MET-7m, was relatively similar with moderate levels of bat activity with medians of 0.36, 0.36 and 0.43 bpph. At height, bat activity was moderate and reduced with an increase in height. At the met mast, bat activity reduced from 0.43 median bpph at 7 m, to 0.14 median bpph at 55 m and 0.07 median bpph at 110 m (Graph 1, Table 3).




**Graph 1: Median bat passes per hour per monitoring location.**

At ground level, bat activity decreased from 0.63 median bpph in May to 0 median bpph in June. Activity increased from spring and reached a high level of bat activity in October (1.92 median bpph), with a decrease to moderate levels in November (1.47 median bpph) before reaching a peak in December with a median of 2.65 median bpph. Bat activity at rotor height was overall moderate (Graph 2; Table 5).




**Graph 2: Monthly median bat passes per hour**

***Table 5: Median bat passes per hour per location***

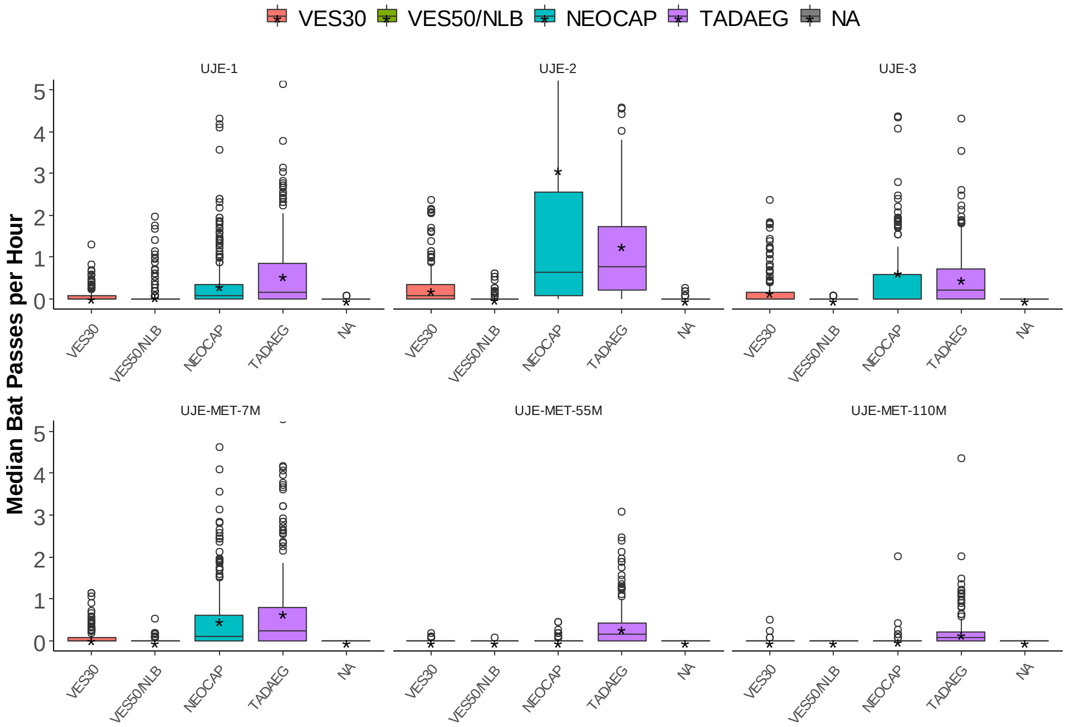
| | May* | Jun* | Jul* | Aug* | Sep* | Oct* | Nov* | Dec* | Jan* | Combined* |
|---|---|---|---|---|---|---|---|---|---|---|
| UJE-1 | 0.17 | 0 | 0.07 | 0.07 | 0.62 | 1.44 | 0.93 | 1.86 | 1.22 | 0.36 |
| UJE-2 | 1.04 | 0 | 0.14 | 0.72 | 3.05 | 2.70 | 2.92 | 9.24 | 11.28 | 2.24 |
| UJE-3 | - | 0 | 0.07 | 0.22 | 1.00 | 2.11 | 0.60 | 2.30 | - | 0.36 |
| UJE-MET 7m | 0.70 | 0.03 | 0.07 | 0.14 | 1.11 | 1.77 | 1.52 | 1.78 | 1.97 | 0.43 |
| **Combined Near Ground** | 0.63 | 0 | 0.07 | 0.21 | 1.13 | 1.92 | 1.47 | 2.65 | 2.56 | 0.63 |
| | | | | | | | | | | |
| UJE-MET 55m | 0.56 | 0.03 | 0.07 | 0.07 | 0.34 | 0.24 | 0.17 | 0.18 | 0.22 | 0.14 |
| UJE-MET 110m | 0.14 | 0 | 0 | 0 | 0.15 | 0.25 | 0.09 | 0 | - | 0.07 |
| **Combined Rotor Sweep** | 0.21 | 0 | 0 | 0.07 | 0.19 | 0.24 | 0.12 | 0.09 | 0.22 | 0.09 |

*Low risk indicated in green (< 0.23 and <0.04 median bpph for Ground Level and Rotor Sweep respectively), Medium risk in orange (0.23-1.76 and 0.04-0.39 median bpph for Ground Level and Rotor Sweep respectively) and High risk in red (> 1.76 and >0.39 median bpph for Ground Level and Rotor Sweep respectively) for the Drakensberg Grasslands, Woodlands and Forest biome based on SABAA guidelines[3].

[3] MacEwan, K., Sowler, S., Aronson, J. and Lötter, C., 2020. South African best practice guidelines for pre-construction monitoring of bats at wind energy facilities.

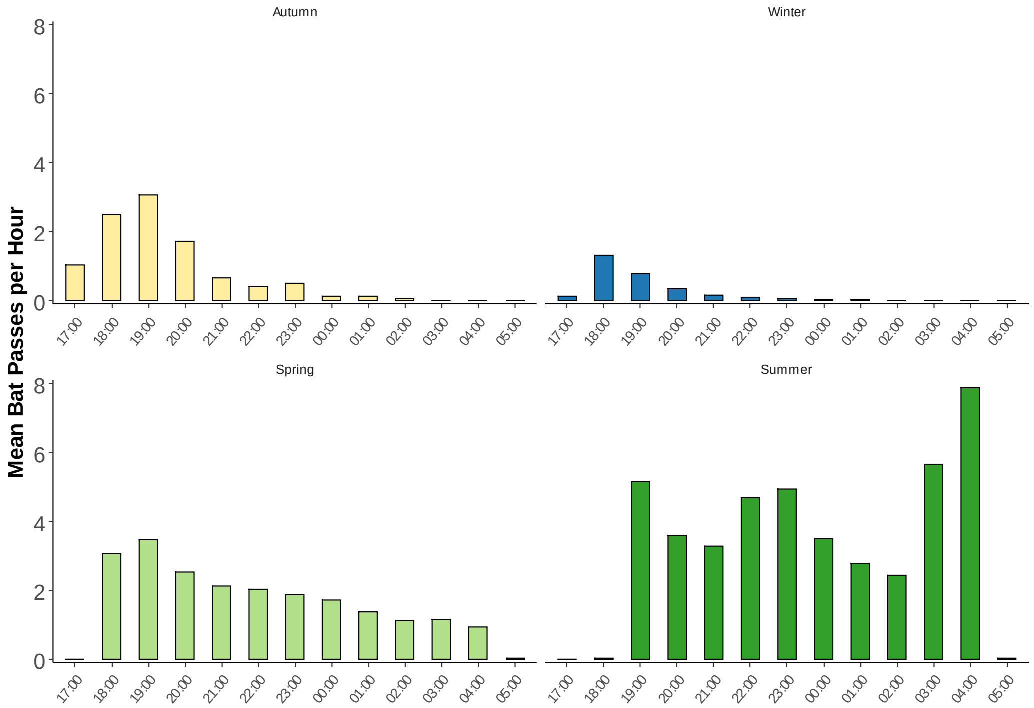
At UJE-2, which had the highest bat activity, the Cape serotine bat accounted for 64 % of the bat passes followed by the Egyptian free-tailed bat which accounted for 29 % of the bat passes. Activity at the 55 m and 110 m was substantially lower than at 7 m at the met mast (Graph 3).

Overall, the Cape serotine bat and Egyptian free-tailed bat was the most common species at Ujekamanzi. The Cape serotine bat and Egyptian free-tailed bat accounted for approximately 53 % and 38 % of the bat activity at ground level respectively. At rotor sweep level, the Cape serotine bat only accounted for 5 % of the bat activity, while the Egyptian free-tailed bat accounted for 94 % of the activity. A higher diversity of species were found at locations such as UJE-2, next to a watercourse with more vegetation clutter.




**Graph 3: Median bat passes per hour of per species at each monitoring location. VES30 – Long-tailed Serotine and African Yellow bat; VES50/NLB – Zulu serotine and Natal long-fingered bat, NEOCAP – Cape serotine bat; TADAEG – Egyptian free-tailed bat; NA - other**

Bats were recorded between 17:00 and 05:00 across the study area with differences observed in activity times between seasons (Graph 4). Activity generally peaked early and then decreased for the rest of the night, except for during summer when activity was higher and more evenly spread throughout the night.




**Graph 4: Mean number of bat passes per time period. Each time represents a one-hour period (i.e. 18:00 = 18:00 – 19:00).**

# 4 IDENTIFICATION OF POTENTIAL IMPACTS

## 4.1 Construction Phase

### *4.1.1 Impact 1: Direct Habitat and Roost Destruction*

WEFs have the potential to impact bats directly through the physical destruction of roosts during construction. Relevant activities include the construction of roads, Operation and Maintenance (O&M) buildings, sub-station(s), grid connection transmission lines and installation of wind turbines. Potential roosts that may be impacted by construction activities include trees, crevices in rocky outcrops and buildings. Roost destruction can impact bats either by removing potential roosting spaces, which reduces available roosting sites or, if a roost is destroyed while bats are occupying the roost, this could result in bat mortality. Reducing roosting opportunities for bats or killing bats during the process of destroying roosts will have negative impacts if not mitigated.

### *4.1.2 Impact 2: Roost Disturbance and Displacement*

WEFs have the potential to impact bats directly through the disturbance of roosts during construction. Relevant activities include the construction of roads, O&M buildings, sub-station(s), internal transmission lines and installation of wind turbines. Excessive noise and dust during the construction phase could result in bats abandoning their roosts, depending on the proximity of construction activities to roosts. This impact will vary depending on the species involved; species that may roost in trees are likely to be impacted more (e.g. Cape serotine and Egyptian free-tailed bats; Monadjem et al. 2010), because tree roosts are less buffered against noise and dust compared to roosts in buildings and rocky crevices. Roosts are limiting factors in the distribution of bats and their availability is a major determinant in whether bats would be present in a particular location. Reducing roosting opportunities for bats is likely to have negative impacts. No roosts have been found on site thus far.

## 4.2 Operational Phase

### *4.2.1 Impact 3: Bat Mortality during Commuting and/or Foraging*

The major potential impact of wind turbines on bats is direct mortality resulting from collisions with turbine blades and/or barotrauma (Grodsky et al. 2011; Horn et al. 2008; Rollins et al. 2012). These impacts will be limited to species that make use of the airspace in the rotor-swept zone of the wind turbines. At least five of the species of bat that were recorded at the project site are high risk with one potential medium-high risk species that exhibit behaviour that may bring them into contact with wind turbine blades (Table 3).

### *4.2.2 Impact 4: Bat Mortality during Migration*

It has been suggested that some bats may not echolocate when they migrate (Baerwald and Barclay 2009), which could explain the higher numbers of migratory species suffering mortality in WEF studies in North America and Europe. Therefore, the direct impact of bat mortality may be higher when they migrate compared to when they are commuting or foraging. This is considered here as a separate impact of the WEF on the Natal long-fingered bat, which is the only species recorded during pre-construction monitoring known to exhibit long-distance migratory behaviour.

### *4.2.3 Impact 5: Light Pollution*

Currently the local region experiences very little light pollution from anthropogenic sources and the construction of a WEF will marginally increase light pollution. This excludes turbine aviation lights which do not appear to impact bats (Baerwald and Barclay 2011; Horn et al. 2008; Jain et al. 2011; Johnson et al. 2003). During the operation of the WEF, it is assumed that the only light sources would be motion sensor security lighting for short periods and lighting associated with the substations.

This artificial lighting would impact bats indirectly via the mortality of their insect prey, thereby reducing foraging opportunities for certain bat species. Lighting attracts (Blake et al. 1994; Rydell 1992; Stone 2012) and can cause direct mortality of insects. These local reductions in insect prey may reduce foraging opportunities for bats, particularly for species that avoid illuminated areas. it should be noted that there are bat species that actively forage around artificial lights due to the higher numbers of insects which are attracted to these lights (Blake et al. 1994; Rydell 1992; Stone 2012). This may bring these species into the vicinity of the project and indirectly increase the risk of collision/barotrauma particularly for species that are known to forage around lights. These include the Cape serotine and the Egyptian free-tailed bat (Fenton et al. 2004).

## 4.3 Decommissioning Phase

### *4.3.1 Impact 6: Disturbance and Displacement*

The impacts to bats during this phase are likely to be restricted to disturbance due to construction vehicles and activities associated with deconstructing turbines and other infrastructure. Provided decommissioning activities are restricted to daylight hours, the impact to bats is predicted to be negligible.

### *4.3.2 Impact 7: Cumulative Impact*

The cumulative impact on bats was considered by searching for current and potential future development of WEFs within 35 km of the project. According to the DFFE Renewable Energy Development Database (Quarter 4 2022) there is currently only one renewable energy facilities (a solar PV facility) approved for development (Figure 3).

It is important to consider cumulative impacts across the entire scale that potentially affected animals are likely to move, especially mobile animals like bats. Impacts at a local scale could have negative consequences at larger scales if the movement between distant populations is impacted (Lehnert et al. 2014; Voigt et al. 2012). This is particularly relevant to bats that migrate. Although the activity of one such migratory bat (the Natal long-fingered bat) was relatively low compared to free-tailed bats, cumulative impacts could be detrimental to this species.

The cumulative impacts could be lower for species that do not migrate over such large distances or resident species that are not known to migrate. All species recorded during the pre-construction monitoring (except for the Natal long-fingered bat) do not migrate over such large distances. The sphere of the cumulative impact would then likely be restricted to the home ranges and foraging distances of different species, which can range from 1 km to at least 15 km for some insectivorous bats (Jacobs and Barclay 2009; Serra-Cobo and Sanz-Trullen 1998) and up to at least 24 km for some fruit bats (Jacobsen et al. 1986).

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 at each respective facility. 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.

# 5 ASSESSMENT OF IMPACTS

## 5.1 Impact 1: Direct Habitat and Roost Destruction

| Environmental Parameter | Impact | Environmental Significance Before Mitigation | | | | | | | | | Mitigation Measures | Environmental Significance After Mitigation | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | E | P | R | L | D | I | T | Status | S | | E | P | R | L | D | I | T | Status | S |
| **Construction Phase** | | | | | | | | | | | | | | | | | | | | |
| Bats, bat roosts and vegetation | Clearing of vegetation and/or destruction of roosting structures (especially large, mature trees, rocky outcrops, and buildings) for roads and infrastructure. | 2 | 1 | 2 | 2 | 3 | 3 | 30 | - | Medium | 1) During construction laydown areas and temporary access roads should be kept to a minimum in order to limit direct vegetation loss and habitat fragmentation. Construction of the infrastructure should, where possible, be situated in areas that are already disturbed.<br>2) This impact must be reduced by limiting the removal of vegetation, particularly large mature trees within 50 m of turbine positions.<br>3) Following construction, rehabilitation of all areas disturbed (e.g. temporary access tracks and laydown areas) must be undertaken and a habitat restoration plan must be developed by a specialist and included within the EMPr.<br>4) The WEF must be designed and constructed in such a way as to avoid the destruction of potential and actual roosts, particularly large mature trees, buildings, and rocky crevices (if blasting is required).<br>5) It is recommended that potential roosts, specifically buildings and rocky crevices, are buffered by 200 m, inside which no turbine infrastructure may be placed. No turbines should be installed within 200 m of large mature trees. | 1 | 1 | 2 | 2 | 2 | 2 | 16 | - | Low |

## 5.2 Impact 2: Roost Disturbance and Displacement

| | Impact | Environmental Significance Before Mitigation | Mitigation Measures | Environmental Significance After Mitigation |
|---|---|---|---|---|

| Environmental Parameter | | E | P | R | L | D | I | T | Status | S | | E | P | R | L | D | I | T | Status | S |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Construction Phase** | | | | | | | | | | | | | | | | | | | | |
| Bats and bat roosts | Disturbance of bats or bat roosts from construction activities by way of excessive noise or dust. | 1 | 2 | 1 | 2 | 1 | 2 | 14 | - | Low | 1) It may be possible to limit roost abandonment by avoiding construction activities near roosts.<br>2) Large mature trees within 200 m of the turbine positions should be inspected for roosting bats.<br>3) It is recommended that potential roosts, specifically buildings and rocky crevices, are buffered by 200 m, inside which no turbine infrastructure may be placed. No turbines should be installed within 200 m of large mature trees. | 1 | 1 | 1 | 2 | 1 | 1 | 6 | - | Low |

## 5.3 Impact 3: Bat Mortality during Commuting and/or Foraging

| Environmental Parameter | Impact | Environmental Significance Before Mitigation | | | | | | | | | Mitigation Measures | Environmental Significance After Mitigation | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | E | P | R | L | D | I | T | Status | S | | E | P | R | L | D | I | T | Status | S |
| **Operational Phase** | | | | | | | | | | | | | | | | | | | | |
| Bats | Fatality of bats due to barotrauma or direct collision with wind turbine blades | 2 | 4 | 2 | 3 | 3 | 4 | 56 | - | High | 1) Designing the layout of the project to avoid areas that are more frequently used by bats will reduce the likelihood of mortality and should be the primary mitigation measure. These areas include key microhabitats such as water features, large mature trees, buildings, and rocky crevices. These areas have been buffered by 200 m. No turbines are currently located within the buffers.<br>2) The height of the lower blade swept area must be maximised, and should try to be kept above 50 m. If the minimum blade sweep is lower than 50 m, the facility runs the risk of reaching fatality thresholds sooner. | 2 | 4 | 2 | 2 | 3 | 2 | 26 | - | Medium |

| Environmental Parameter | Impact | Environmental Significance Before Mitigation | | | | | | | | | Mitigation Measures | Environmental Significance After Mitigation | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | E | P | R | L | D | I | T | Status | S | | E | P | R | L | D | I | T | Status | S |
| **Operational Phase** | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | 3) Operational monitoring should be undertaken according to the guidelines for the first 2 years and every 5 years thereafter. During this monitoring fatality estimations must be evaluated every 3 – 4 months against the South African Bat Assessment Association fatality threshold guidelines (i.e. if they exceed an estimated 270[4] bat fatalities per year as per current threshold) to determine escalation of mitigation options.<br><br>4) Blade feathering should be implemented at the start of operation.<br><br>5) Apply curtailment during spring, summer and potentially autumn based on an appropriate curtailment plan and/or instal acoustic deterrents (based on input from an appropriate bat specialist) if mortality occurs beyond threshold levels as determined based on applicable guidance (MacEwan et al. 2018). The threshold calculations must be done at a minimum of once a quarter (i.e. not only after the first year of operational monitoring) so that mitigation can be applied as quickly as possible should thresholds be reached. | | | | | | | | | |

[4] Assuming an area of influence of 13,494 hectares, and a threshold of 0.2 bats per hectare for the Drakensberg Montane Grasslands, Woodlands and Forests ecoregion.

## 5.4 Impact 4: Bat Mortality during Migration

| Environmental Parameter | Impact | Environmental Significance Before Mitigation | | | | | | | | | Mitigation Measures | Environmental Significance After Mitigation | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | E | P | R | L | D | I | T | Status | S | | E | P | R | L | D | I | T | Status | S |
| **Operational Phase** | | | | | | | | | | | | | | | | | | | | |
| Migrational bat species | Fatality of migrational bat species due to barotrauma or direct collision with wind turbine blades while migrating | 4 | 3 | 2 | 3 | 3 | 3 | 45 | - | High | 1) Designing the layout of the project to avoid areas that are more frequently used by bats will reduce the likelihood of mortality and should be the primary mitigation measure. These areas include key microhabitats such as water features, large mature trees, buildings, and rocky crevices. These areas have been buffered by 200 m. No turbines are currently located within the buffers.<br>2) The height of the lower blade swept area must be maximised, and should try to be kept above 50 m. If the minimum blade sweep is lower than 50 m, the facility runs the risk of reaching fatality thresholds sooner.<br>3) Operational monitoring should be done according to the guidelines for the first 2 years and every 5 years thereafter. During this monitoring fatality estimations 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 270 bat fatalities per year as per current threshold) to determine escalation of mitigation options.<br>4) Blade feathering should be implemented at the start of operation. | 3 | 2 | 2 | 2 | 3 | 2 | 24 | - | Medium |

| | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | 5) Apply curtailment during spring, summer and potentially autumn based on an appropriate curtailment plan and/or instal acoustic deterrents (based on input from an appropriate bat specialist) if mortality occurs beyond threshold levels as determined based on applicable guidance (MacEwan et al. 2018). The threshold calculations must be done at a minimum of once a quarter (i.e. not only after the first year of operational monitoring) so that mitigation can be applied as quickly as possible should thresholds be reached. | | | | | | | | | |

## 5.5 Impact 5: Light Pollution

| Environmental Parameter | Impact | Environmental Significance Before Mitigation | | | | | | | | | Mitigation Measures | Environmental Significance After Mitigation | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | E | P | R | L | D | I | T | Status | S | | E | P | R | L | D | I | T | Status | S |
| **Operational Phase** | | | | | | | | | | | | | | | | | | | | |
| Bats and insects | Increased light in a rural area risks include loss of insect prey and increased collision risks for bats foraging closer to turbines | 2 | 1 | 2 | 1 | 3 | 2 | 18 | - | Low | 1) This impact can be mitigated by using as little lighting as possible, and only where essential for operation of the facility.<br>2) Where lights need to be used such as at the collector substation and switching station and elsewhere, these should have low attractiveness for insects such as low pressure sodium and warm white LED lights (Rydell 1992; Stone 2012). High pressure sodium and white mercury lighting is attractive to insects (Blake et al. 1994; Rydell 1992; Svensson & Rydell 1998) and should not be used as far as possible.<br>3) Lighting should be fitted with movement sensors to limit illumination and light spill, and the overall lit time. In addition, | 1 | 1 | 2 | 1 | 3 | 1 | 8 | - | Low |

| Environmental Parameter | Impact | Environmental Significance Before Mitigation | | | | | | | | | Mitigation Measures | Environmental Significance After Mitigation | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | E | P | R | L | D | I | T | Status | S | | E | P | R | L | D | I | T | Status | S |
| **Operational Phase** | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | light spread should be directed downwards and below the horizontal plane to minimise light trespass and sky glow.<br>4) Increasing the spacing between lights, and the height of light units can reduce the intensity and volume of the light to minimise the area illuminated and give bats an opportunity to fly in relatively dark areas between and over lights. | | | | | | | | | |

## 5.6 Impact 6: Disturbance and Displacement

| Environmental Parameter | Impact | Environmental Significance Before Mitigation | | | | | | | | | Mitigation Measures | Environmental Significance After Mitigation | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | E | P | R | L | D | I | T | Status | S | | E | P | R | L | D | I | T | Status | S |
| **Decommissioning Phase** | | | | | | | | | | | | | | | | | | | | |
| Bats and Bat roosts | Displacement and disturbance of bats and due to disturbance associated with the decommissioning activities | 1 | 2 | 1 | 2 | 1 | 1 | 7 | - | Low | The impacts to bats during this phase are likely to be restricted to disturbance. Provided decommissioning activities are restricted to daylight hours, the impact to bats is predicted to be negligible. | 1 | 2 | 1 | 2 | 1 | 1 | 7 | - | Low |

## 5.7 Impact 7: Cumulative Impacts

| Environmental Parameter | Impact | Environmental Significance Before Mitigation | | | | | | | | | Mitigation Measures | Environmental Significance After Mitigation | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | E | P | R | L | D | I | T | Status | S | | E | P | R | L | D | I | T | Status | S |
| **Cumulative** | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Broad-scale ecological processes with regards to bats | Transformation from and presence of the facility will contribute to cumulative habitat loss and impacts on broad-scale ecological processes with regards to bats such as fragmentation, multiple roost destruction and disturbance, and mortalities at multiple facilities. | 3 | 4 | 3 | 3 | 3 | 4 | 64 | - | Very High | 1) Designing the layout of the project to avoid areas that are more frequently used by bats will reduce the likelihood of mortality and should be the primary mitigation measure. These areas include key microhabitats such as water features, large mature trees, buildings, and rocky crevices. These areas have been buffered by 200 m. No turbines are currently located within the buffers.<br>2) The height of the lower blade swept area must be maximised, and should try to be kept above 50 m. If the minimum blade sweep is lower than 50 m, the facility runs the risk of reaching fatality thresholds sooner.<br>3) Operational monitoring should be done according to the guidelines for the first 2 years and every 5 years thereafter. During this monitoring fatality estimations 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 270 bat fatalities per year) to determine escalation of mitigation options.<br>4) Blade feathering should be implemented at the start of operation.<br>5) Apply curtailment during spring, summer and potentially autumn based on an appropriate curtailment plan and/or instal acoustic deterrents (based on input from an appropriate bat specialist) if mortality occurs beyond threshold levels as determined based on applicable guidance (MacEwan et al. 2018). The threshold calculations must be done at a minimum of once a quarter (i.e. not only | 3 | 3 | 2 | 2 | 3 | 3 | 39 | - | Medium |

| | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | after the first year of operational monitoring) so that mitigation can be applied as quickly as possible should thresholds be reached. | | | | | | | | | |

## 5.8 No-Go Alternative

The 'No-Go' alternative reduces the opportunity to progress the de-carbonisation transition of the economy and achieve various climate change mitigation targets outlined by (amongst others) the South Africa's Low Emission Development Strategy, The National Development Plan, The National Climate Change Response Policy, Integrated Resource Plan the National Climate Change Adaptation Strategy and ultimately South Africa's commitment to the Paris Agreement. The proposed development site appears to be well suited for the development of renewable energy facilities as proposed if best practice guidelines are followed.

## 5.9 Substation Alternatives Assessment

It is relevant to note that location alternatives are being considered for the Ujekamanzi WEF 1 substation. More specifically, four options are being considered for the proposed substation:

- Substation Hub 1
- Substation Hub 2
- Substation Hub 3
- Substation Hub 4

Of these four substation options, Substation Hub 3 is the only one that does not overlap with bat sensitivity features/buffers. Nonetheless, in the opinion of the bat specialist, the impacts anticipated to occur as a result of the construction of this substation are considered to be low, due to the type of impacts likely to occur and the small extent of this infrastructure footprint. It is therefore unlikely that either of the four proposed substation options will pose a significant threat to the local bat community on site, and all four options are considered acceptable for implementation. Nonetheless, Substation Hub 3 is considered the preferred option (due to no overlap with bat sensitive areas) from a bat perspective, to further reduce the potential of negative impacts from occurring.

# 6 DISCUSSION

The bat activity was overall moderate for the study period. Activity was low during winter and moderate to high from spring to summer. Areas around important features such as watercourses had higher bat activity and species diversity than open areas further away from these features. Bat activity was lower at rotor sweep height (55 m and 110 m) than near the ground (7 m), and a difference in species composition and species diversity was also noted.

The Cape serotine bat and Egyptian free-tailed bat accounted for approximately 53 % and 38% of the bat activity at ground level respectively. At rotor sweep height, the Egyptian free-tailed bat accounted for 94% of bat passes and are at highest risk of wind turbine collisions across the site. The *Rhinolophus and Nycteris* species are low flying species and therefore rarely recorded when monitoring at 7 m or higher.

According to a recent study reviewing data from 25 wind farms, 45 % of bat carcasses found at WEFs in South Africa were Egyptian free-tailed bats, the Cape serotine and Natal long-fingered bat are the second and third most impacted species (Aronson, 2022).

The Natal long-fingered bat and Lesser long-fingered bat migrate up to 150 km away to hibernation roosts every winter (Manadjem et al., 2020). The impacts within this region could therefore affect colonies further away, especially if the wind farm is located within a major migratory pathway. A low number of calls were recorded for these species and the site is therefore unlikely to be within a major migratory pathway.

The impact assessment currently reveals that the overall risk to bats posed by wind energy development at the site is predominantly low to medium, assuming that all mitigations outlined in the impact assessment and sensitivities mapped are adhered to. Should these mitigations not be adhered to, impacts are predicted to be medium to high. The cumulative impacts are also predicted to be medium should all mitigations be followed and very high should mitigations not be implemented.

Mitigation strategies can be categorised into avoidance and minimisation techniques. Avoidance strategies are prioritised and includes buffering key habitats and considering turbine design so that potential interactions between bats and wind turbines are spatially limited as much as possible. Where negative impacts on bats can't be avoided or if residual impacts are likely, impacts can be minimised by various forms of curtailment or by using acoustic deterrents.

Possible avoidance mitigation techniques have been incorporated by buffering key habitat features for bats. These include possible roosting habitat (rocky crevices, trees and buildings), foraging resources (trees, rivers, water courses and aquatic habitat) and commuting resources (water courses). All aquatic habitat and water courses with defined riparian structures have been buffered by 200 m while some less sensitive water courses which do not have permanent water or a defined riparian structure, were buffered by 100 m. Large trees and buildings have been buffered by 200 m. It is exceptionally difficult to find bats roosting in small numbers and therefore all buildings defined as highly suitable roosts for bats have been buffered by 500 m (Figure 2). All buffers are considered as no-go for turbines to blade tip.

An additional mitigation that could be used to avoid impacts to bats is the choice of wind turbine technology. Evidence of a relationship between turbine size and bat fatality is equivocal. Some evidence suggests that larger turbines kill more bats (Baerwald and Barclay 2009), or that as the distance between the blade tips and the ground increases, bat fatality decreases (Georgiakakis et al. 2012). However, other studies have found no evidence that turbine height or the number of turbines influences bat mortality (Berthinussen et al. 2014; Thompson et al. 2017). Some species in South Africa that are not adapted for flight at height have suffered mortality from wind turbines (e.g. the Cape serotine), suggesting that some bats may be killed in the lower edge of the rotor swept zone. The data presented in this report corroborates this as higher activity was seen at 7 m, when compared to 55 m and 110m. Therefore, using taller towers and limiting the rotor diameter so that the minimum distance between the lower blade tips and the ground is 55 m or more, could help to minimise impacts to bats, especially lower flying species.

# 7 PLAN OF STUDY FOR THE EIA

Only eight months of the full 12 months of monitoring has been analysed and included in this report. All data from the full year of pre-construction monitoring will be included in the final Environmental Impact Assessment (EIA). As with this report, the potential impacts will be assessed based on the methodology provided by the Environmental Assessment Practitioner (EAP), SiVest for inclusion in the EIA. 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 extent, probability, reversibility, irreplaceable loss of resource, duration, and magnitude 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 35 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.

# 8 CONCLUSION

The data collected during the monitoring period so far suggests that the risk to bats posed by the wind energy development could be lower for clutter-edge bat species, as the correct placement of turbines and increasing the minimum distance between the blades and the ground will limit the impact to these species. Open air bat species are at a higher risk as free-tailed bats account for more than 94 % of bat activity at height. Since free-tailed bat activity also decreases with height, it is advisable to select a combination of hub height and turbine blade length that increases the lower tip height as much as possible (preferably 50 m or higher).

Overall, impacts to bats are expected to be medium-high without mitigation and low-medium with mitigation at the Ujekamanzi WEF 1 site. Cumulative impacts are expected to be very high without mitigation and medium with mitigation.

Initial mitigation measure to avoid impacts is the correct placement of turbines to avoid sensitive bat habitat, which is considered as a no-go area for turbines. No turbine blades should intrude into such areas (Figure 2).

Due to bat activity being moderate to high across the site between September and January, residual impacts are possible even with the initial mitigation measures to avoid sensitive areas. Therefore if fatality thresholds (MacEwan et al. 2018) are reached during the operational phase of the wind farm, active mitigation of these residual impacts should include the use of curtailment and/or acoustic deterrents.

Provided these considerations are met, the development of wind farms at Ujekamanzi WEF 1 may be compatible with bat conservation. These conclusions are however preliminary, and the monitoring campaign will continue until 17 May 2023 after which a final conclusion will be made with the full 12-months of monitoring data.

The application process can proceed to the EIA phase.

# 9 ADDITIONS TO THE ENVIRONMENTAL MANAGEMENT PROGRAMME (EMPR)

| Impact | Mitigation | Responsibility | Methodology | Mitigation Objectives | Frequency |
|---|---|---|---|---|---|
| **Direct Habitat and Roost Destruction** | 1) Avoidance of natural vegetation<br>2) Limiting of Vegetation removal (particularly large mature trees)<br>3) Rehabilitation of disturbed areas<br>4) Avoidance of important roost features<br>5) Buffering of important roost features | ABO Wind Renewable Energies | 1) During construction laydown areas and temporary access roads should be kept to a minimum in order to limit direct vegetation loss and habitat fragmentation. Construction of the infrastructure should, where possible, be situated in areas that are already disturbed.<br>2) This impact must be reduced by limiting the removal of vegetation, particularly large mature trees within 200 m of turbine positions.<br>3) Following construction, rehabilitation of all areas disturbed (e.g. temporary access tracks and laydown areas) must be undertaken and a habitat restoration plan must be developed by a specialist and included within the EMPr.<br>4) The WEF must be designed and constructed in such a way as to avoid the destruction of potential and actual roosts, particularly large mature trees, buildings, and rocky crevices (if blasting is required).<br>5) It is recommended that potential roosts, specifically buildings and rocky crevices, are buffered by 200 m, inside which no turbine infrastructure may be placed. No turbines should be installed within 200 m of large mature trees. | Limit the loss of bats, roosts, roosting structures and natural habitat (such as vegetation and rocky crevices) | Throughout the construction phase of the development |
| **Roost Disturbance and Displacement** | 1) Avoidance of roosts and roosting structures<br>2) Inspection of roosting structures<br>3) Buffering of roosting structures | ABO Wind Renewable Energies | 1) It may be possible to limit roost abandonment by avoiding construction activities near roosts.<br>2) Large mature trees and buildings within 200 m of the turbine positions should be inspected for roosting bats.<br>3) It is recommended that potential roosts, specifically buildings and rocky crevices, are buffered by 200 m, inside which no turbine infrastructure may be placed. No turbines should be installed within 200 m of large mature trees. | Limit the disturbance of bats, roosts, roosting structures and natural habitat (such as vegetation and rocky crevices) | Throughout the construction phase of the development |
| **Bat Mortality during Commuting and/or Foraging** | 1) Buffering of important bat features<br>2) Maximising wind turbine lower-tip height<br>3) Operational Monitoring Campaigns<br>4) Blade feathering<br>5) Curtailment should threshold mortalities be reached | ABO Wind Renewable Energies, Ujekamanzi Wind Farm | 1) Designing the layout of the project to avoid areas that are more frequently used by bats will reduce the likelihood of mortality and should be the primary mitigation measure. These areas include key microhabitats such as water features, large mature trees, buildings, and rocky crevices. These areas have been buffered by 200 m. No turbines are currently located within the buffers.<br>2) The height of the lower blade swept area must be maximised, and should try to be kept above 50 m. If the minimum blade | Limit the direct and indirect mortalities of bats caused by wind turbines | Throughout the lifespan of the facility |

| Impact | Mitigation | Responsibility | Methodology | Mitigation Objectives | Frequency |
|---|---|---|---|---|---|
| | | | sweep is lower than 50 m, the facility runs the risk of reaching fatality thresholds sooner.<br><br>3) Operational monitoring should be done according to the guidelines for the first 2 years and every 5 years thereafter. During this monitoring fatality estimations 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 270 bat fatalities per year as per current threshold) to determine escalation of mitigation options.<br><br>4) Blade feathering should be implemented at the start of operation.<br><br>5) Apply curtailment during spring, summer and potentially autumn based on an appropriate curtailment plan and/or instal acoustic deterrents (based on input from an appropriate bat specialist) if mortality occurs beyond threshold levels as determined based on applicable guidance (MacEwan et al. 2018). The threshold calculations must be done at a minimum of once a quarter (i.e. not only after the first year of operational monitoring) so that mitigation can be applied as quickly as possible should thresholds be reached. | | |
| **Bat Mortality during Migration** | 1) Buffering of important bat features<br>2) Maximising wind turbine lower-tip height<br>3) Operational Monitoring Campaigns<br>4) Blade feathering<br>5) Curtailment should threshold mortalities be reached | ABO Wind Renewable Energies, Ujekamanzi Wind Farm | 1) Designing the layout of the project to avoid areas that are more frequently used by bats will reduce the likelihood of mortality and should be the primary mitigation measure. These areas include key microhabitats such as water features, large mature trees, buildings, and rocky crevices. These areas have been buffered by 200 m. No turbines are currently located within the buffers.<br><br>2) The height of the lower blade swept area must be maximised, and should try to be kept above 50 m. If the minimum blade sweep is lower than 50 m, the facility runs the risk of reaching fatality thresholds sooner.<br><br>3) Operational monitoring should be done according to the guidelines for the first 2 years and every 5 years thereafter. During this monitoring fatality estimations would need to be evaluated every 3 – 4 months against the South African Bat | Limit the direct and indirect mortalities of migrational bat species caused by wind turbines during migrations | Throughout the lifespan of the facility |

| Impact | Mitigation | Responsibility | Methodology | Mitigation Objectives | Frequency |
|---|---|---|---|---|---|
| | | | Assessment Association fatality threshold guidelines (i.e. if they exceed an estimated 270 bat fatalities per year as per current threshold) to determine escalation of mitigation options.<br><br>4) Blade feathering should be implemented at the start of operation.<br><br>5) Apply curtailment during spring, summer and potentially autumn based on an appropriate curtailment plan and/or instal acoustic deterrents (based on input from an appropriate bat specialist) if mortality occurs beyond threshold levels as determined based on applicable guidance (MacEwan et al. 2018). The threshold calculations must be done at a minimum of once a quarter (i.e. not only after the first year of operational monitoring) so that mitigation can be applied as quickly as possible should thresholds be reached. | | |
| **Light Pollution** | 1) Limit lighting to essential lighting only<br>2) Low pressure sodium and warm white lighting<br>3) Movement sensor lighting and downward facing light spill<br>4) Maximise spacing and height of lights | ABO Wind Renewable Energies, Ujekamanzi Wind Farm | 1) This impact can be mitigated by using as little lighting as possible, and only where essential for operation of the facility.<br><br>2) Where lights need to be used such as at the collector substation and switching station and elsewhere, these should have low attractiveness for insects such as low pressure sodium and warm white LED lights (Rydell 1992; Stone 2012). High pressure sodium and white mercury lighting is attractive to insects (Blake et al. 1994; Rydell 1992; Svensson & Rydell 1998) and should not be used as far as possible.<br><br>3) Lighting should be fitted with movement sensors to limit illumination and light spill, and the overall lit time. In addition, light spread should be directed downwards and below the horizontal plane to minimise light trespass and sky glow.<br><br>4) Increasing the spacing between lights, and the height of light units can reduce the intensity and volume of the light to minimise the area illuminated and give bats an opportunity to fly in relatively dark areas between and over lights | Limit the mortalities of insect prey and bats attracted to the wind facility by light | Throughout the lifespan of the facility |
| **Disturbance and Displacement** | None | ABO Wind Renewable Energies, | None | Limit the disturbance of bats when | Throughout the decommission phase of the facility |

| Impact | Mitigation | Responsibility | Methodology | Mitigation Objectives | Frequency |
|---|---|---|---|---|---|
| | | Ujekamanzi Wind Farm | | decommissioning wind farm | |

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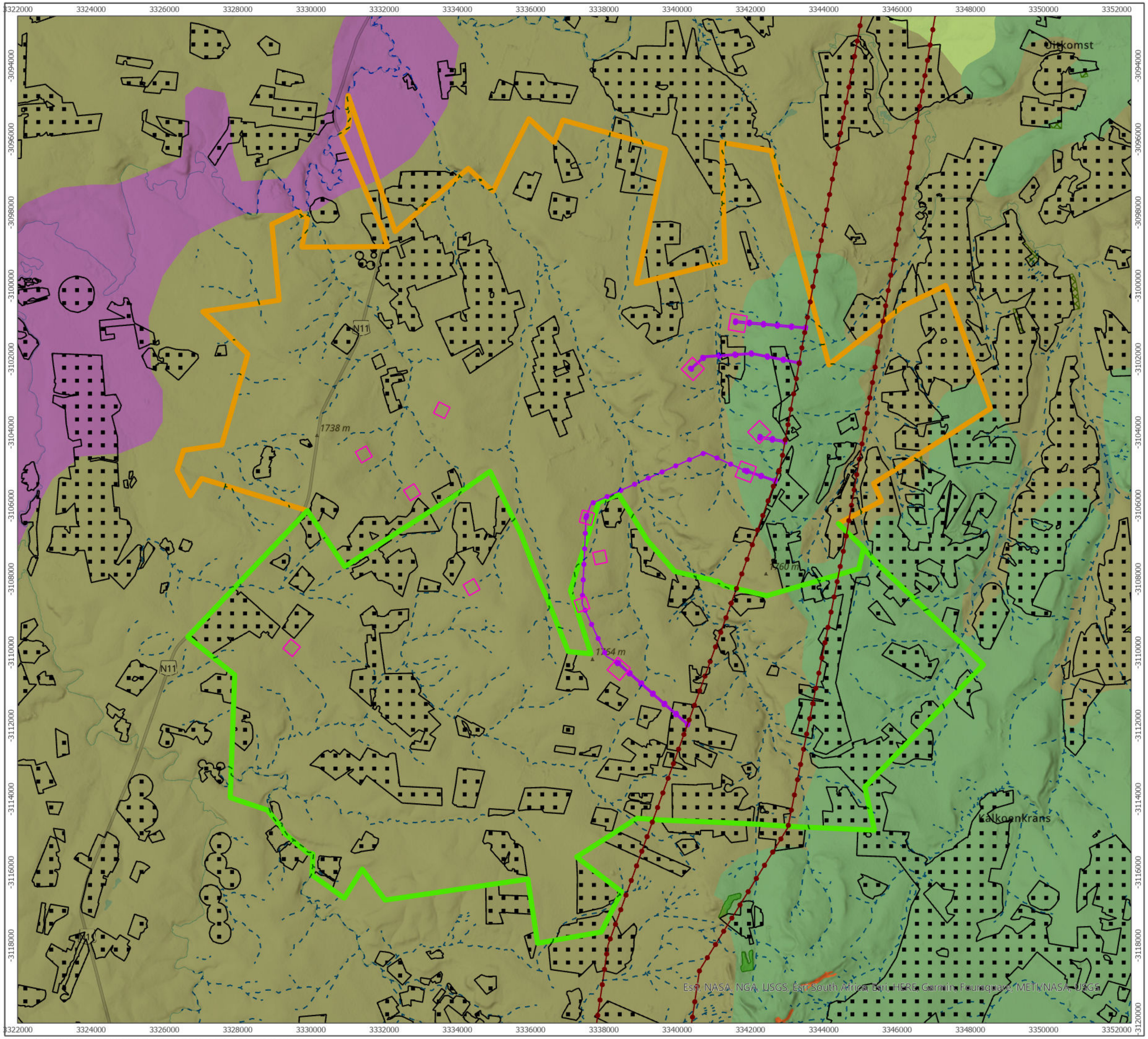
**FIGURE 1**




G:\Ecology\4807 Ujekamanzi\4807 Ujekamanzi.aprx\4807 -GIS-001 Ujekamanzi Location Map

ARCUS

- Ujekamanzi 1 WEF Boundary
- Ujekamanzi 2 WEF Boundary
- Proposed Substation
- Proposed Grid Connection
- Existing Eskom 400 kV OHL
- Drainage Areas

**Land Use**

- Cultivated Land
- Orchard / Vineyard
- Plantation

**Vegetation Types**

- Amersfoort Highveld Clay Grassland
- Eastern Highveld Grassland
- Northern Afrotemperate Forest
- Soweto Highveld Grassland
- Wakkerstroom Montane Grassland


1:100,000 Scale @ A3

0 2 4 km

NORTH

| | |
|---|---|
| Produced By: OD | Ref: 4807-GIS-001 |
| Checked By: MB | Date: 4/15/2023 |

**Site Location Map**
Figure 1

**Ujekamanzi**
**Bat Scoping Report**

**FIGURE 2**


ARCUS

Project Feature

Project Boundary

Bat Feature Buffers (plus 100 m blade length)

No-Go Buffer (Scoping Phase)

Artificial Water Buffer

Vegetation Buffer

1:80,000 Scale @ A3

0 1.5 3 km

NORTH

| | |
|---|---|
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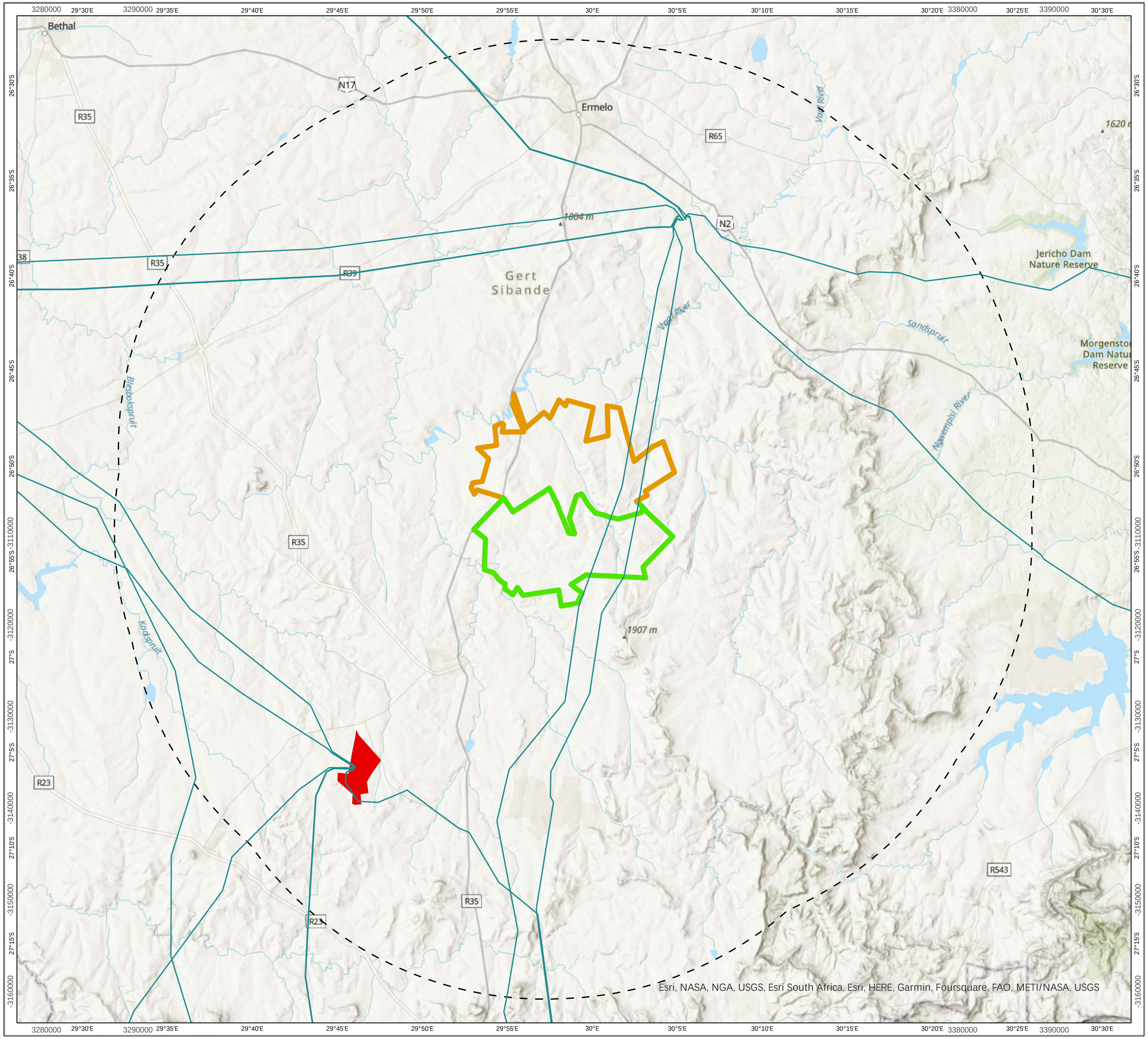
| Checked By: MB | Date: 4/15/2023 |

**Bat Sensitivity Map**
Figure 2

**Ujekamamzi**
**Bat Scoping Report**

G:\Ecology\4807 Ujekamanzi\4807 Ujekamanzi.aprx\4807 -GIS-002 Ujekamanzi Sensitivity Map

**FIGURE 3**




ARCUS

Existing Main Transmission Network

Ujekamanzi 1 WEF Boundary

Ujekamanzi 2 WEF Boundary

35 km Radius

## Renewable Energy Application Sites

Approved 65 MW Solar PV at Majuba Power Station (14//12/16/3/3/2/752)

1:400,000 Scale @ A3

0 10 20 km NORTH

| | |
|---|---|
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| Checked By: AB | Date: 4/16/2023 |

**Renewable Energy Application Sites**

Figure 4

**Ujekamanzi Bat Scoping Report**

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**APPENDIX A: SITE SENSITIVITY VERIFICATION REPORT**

# BAT SITE VERIFICATION REPORT FOR THE PROPOSED UUJEKAMANZI WIND ENERGY FACILITY, MPUMALANGA PROVINCE

**Introduction**

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. The outcome of the Initial Site Sensitivity must be provided in a report format which:

a) Confirms or dispute the current use of the land and environmental sensitivity as identified by the national web based environmental screening tool;

b) Contains a motivation and evidence of either the verified or different use of the land and environmental sensitivity; and

c) Is submitted together with the relevant reports prepared in accordance with the requirements of the Environmental Impact Assessment Regulations.

This initial site sensitivity report is produced to consider only the bats theme and to address the requirements of a) to c) above

**Initial Site Verification**

Table 1 and Figure 1 show the sensitivities identified by the DFFE Screening Tool. There are some suitable habitats and numerous waterbodies that can be used for drinking water, roosting, foraging and commuting in the study area. Bats are known to use linear landscape features such as rivers and tree lines for commuting routes to get to and from foraging sites, roost sites, to access water sources.

**Table 1: DFFE Screening Tool outcome for the bats (wind) theme**

| Theme | Very High Sensitivity | High Sensitivity | Medium Sensitivity | Low Sensitivity |
|---|---|---|---|---|
| Bats (Wind) Theme | | X | | |
| **Very High Sensitivity** | | | **Very High Sensitivity** | |
| High | | Within 500 m of a river | | |
| High | | Wetland | | |
| High | | Within 500 m of a wetland | | |
| Medium | | Croplands | | |

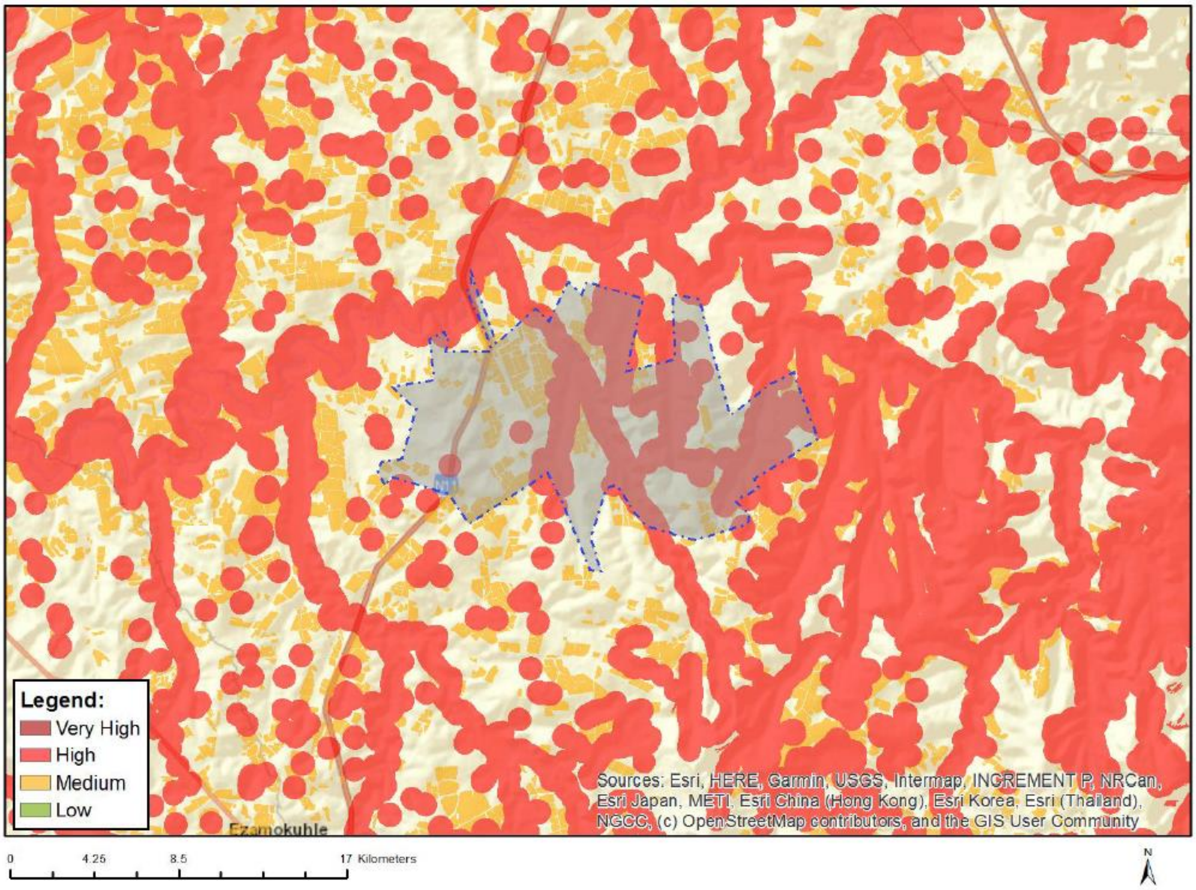


**Figure 1: DFFE Screening Tool outcome for the bats (wind) theme (Ujekamanzi Wind Energy Facility)**

The baseline environment for bats at the proposed development sites were defined utilising a desktop study of available bat locality data, literature and mapping resources. This information was examined to determine the potential location and abundance of bats, including their potential habitats which may be sensitive to the Ujekamanzi Wind Energy Facility (WEF) development.

**Outcome of the Initial Site Verification**

After the selected resources were mapped, they were aggregated to produce an initial constraints map for the development, under the assumption that areas where resources are concentrated will be more important for bats (Figure 2).

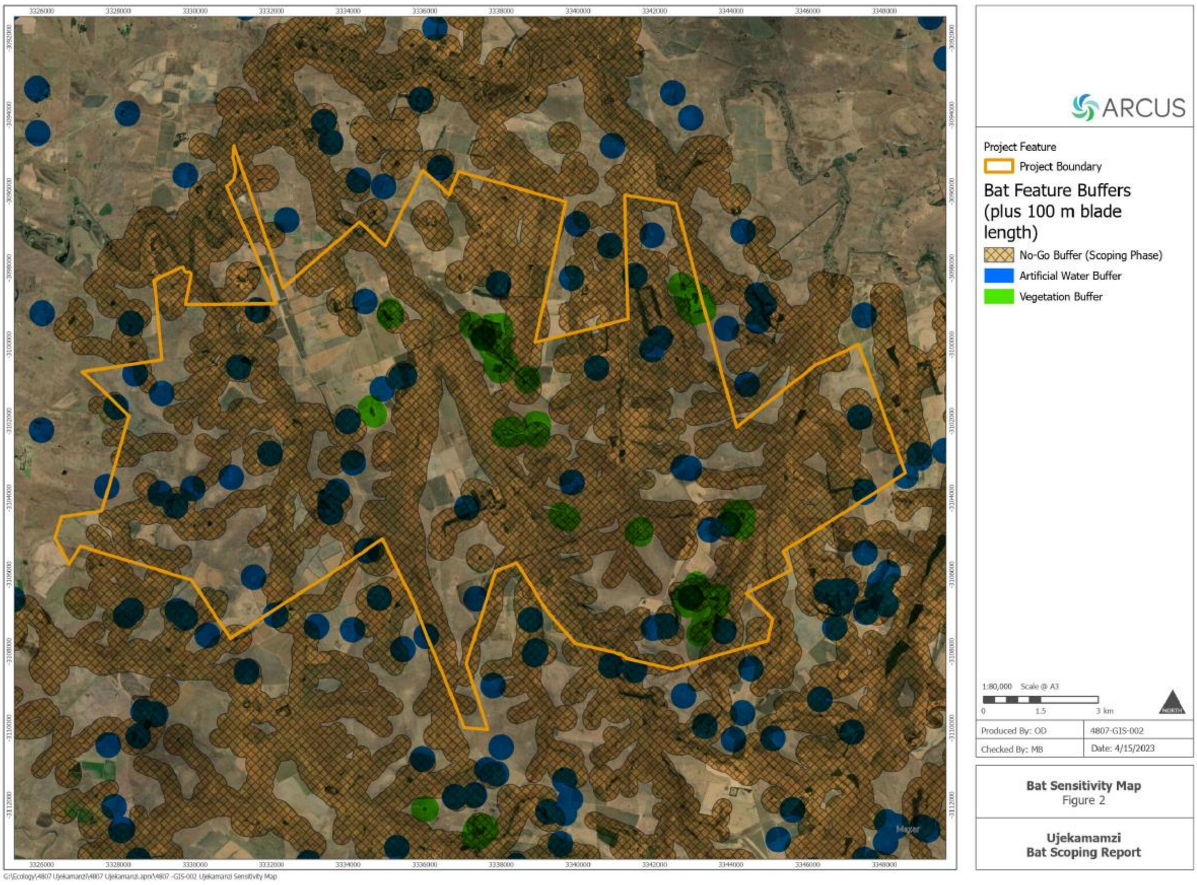


**Figure 2: Initial Constraints map (Ujekamanzi WEF 1)**

The methodology as described above found the site to be of **high sensitivity** in areas as identified by the DFFE Screening Tool as well as some additional high-sensitivity areas. A complete pre-construction monitoring programme is currently underway to assess the potential impacts on bats and a more detailed sensitivity map will be generated for the proposed development.

**Conclusion**

The DFFE Screening Tool identified two sensitivity ratings within the development footprint, namely, medium and high. The initial constraints mapped by the specialist identified the sensitivity rating as specific areas of high sensitivity and, in the specialist opinion, should be considered No-Go areas with the remainder of the site potentially hosting medium to no sensitivity for bats.

## APPENDIX B: IMPACT ASSESSMENT SCORING METHODS

# 1 ENVIRONMENTAL IMPACT ASSESSMENT (EIA) METHODOLOGY

The Environmental Impact Assessment (EIA) Methodology assists in evaluating the overall effect of a proposed activity on the environment. Determining of the significance of an environmental impact on an environmental parameter is determined through a systematic analysis.

## 1.1 Determination of Significance of Impacts

Significance is determined through a synthesis of impact characteristics which include context and intensity of an impact. Context refers to the geographical scale (i.e. site, local, national or global), whereas intensity is defined by the severity of the impact e.g. the magnitude of deviation from background conditions, the size of the area affected, the duration of the impact and the overall probability of occurrence. Significance is calculated as shown in **Table 1**.

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

## 1.2 Impact Rating System

The impact assessment must take account of the nature, scale and duration of effects on the environment and whether such effects are positive (beneficial) or negative (detrimental). Each issue / impact is also assessed according to the various project stages, as follows:

- Planning;
- Construction;
- Operation; and
- Decommissioning.

Where necessary, the proposal for mitigation or optimisation of an impact should be detailed. A brief discussion of the impact and the rationale behind the assessment of its significance has also been included.

***The significance of Cumulative Impacts should also be rated (As per the Excel Spreadsheet Template).***

### *1.2.1 Rating System Used to Classify Impacts*

The rating system is applied to the potential impact on the receiving environment and includes an objective evaluation of the possible mitigation of the impact. Impacts have been consolidated into one (1) rating. In assessing the significance of each issue the following criteria (including an allocated point system) is used:

**Table 1:** Rating of impacts criteria

| | | |
|---|---|---|
| **ENVIRONMENTAL PARAMETER** | | |
| A brief description of the environmental aspect likely to be affected by the proposed activity (e.g. Surface Water). | | |
| **ISSUE / IMPACT / ENVIRONMENTAL EFFECT / NATURE** | | |
| Include a brief description of the impact of environmental parameter being assessed in the context of the project. This criterion includes a brief written statement of the environmental aspect being impacted upon by a particular action or activity (e.g. oil spill in surface water). | | |
| **EXTENT (E)** | | |
| This is defined as the area over which the impact will be expressed. Typically, the severity and significance of an impact have different scales and as such bracketing ranges are often required. This is often useful during the detailed assessment of a project in terms of further defining the determined. | | |
| 1 | Site | The impact will only affect the site |
| 2 | Local/district | Will affect the local area or district |
| 3 | Province/region | Will affect the entire province or region |
| 4 | International and National | Will affect the entire country |
| **PROBABILITY (P)** | | |
| This describes the chance of occurrence of an impact | | |
| 1 | Unlikely | The chance of the impact occurring is extremely low (Less than a 25% chance of occurrence). |
| 2 | Possible | The impact may occur (Between a 25% to 50% chance of occurrence). |
| 3 | Probable | The impact will likely occur (Between a 50% to 75% chance of occurrence). |
| 4 | Definite | Impact will certainly occur (Greater than a 75% chance of occurrence). |
| **REVERSIBILITY (R)** | | |
| This describes the degree to which an impact on an environmental parameter can be successfully reversed upon completion of the proposed activity. | | |
| 1 | Completely reversible | The impact is reversible with implementation of minor mitigation measures |
| 2 | Partly reversible | The impact is partly reversible but more intense mitigation measures are required. |
| 3 | Barely reversible | The impact is unlikely to be reversed even with intense mitigation measures. |
| 4 | Irreversible | The impact is irreversible and no mitigation measures exist. |
| **IRREPLACEABLE LOSS OF RESOURCES (L)** | | |
| This describes the degree to which resources will be irreplaceably lost as a result of a proposed activity. | | |
| 1 | No loss of resource. | The impact will not result in the loss of any resources. |
| 2 | Marginal loss of resource | The impact will result in marginal loss of resources. |
| 3 | Significant loss of resources | The impact will result in significant loss of resources. |
| 4 | Complete loss of resources | The impact is result in a complete loss of all resources. |
| **DURATION (D)** | | |
| This describes the duration of the impacts on the environmental parameter. Duration indicates the lifetime of the impact as a result of the proposed activity. | | |

| | | |
|---|---|---|
| 1 | Short term | The impact and its effects will either disappear with mitigation or will be mitigated through natural process in a span shorter than the construction phase (0 – 1 years), or the impact and its effects will last for the period of a relatively short construction period and a limited recovery time after construction, thereafter it will be entirely negated (0 – 2 years). |
| 2 | Medium term | The impact and its effects will continue or last for some time after the construction phase but will be mitigated by direct human action or by natural processes thereafter (2 – 10 years). |
| 3 | Long term | The impact and its effects will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter (10 – 50 years). |
| 4 | Permanent | The only class of impact that will be non-transitory. Mitigation either by man or natural process will not occur in such a way or such a time span that the impact can be considered transient (Indefinite). |
| **INTENSITY / MAGNITUDE (I / M)** | | |
| Describes the severity of an impact (i.e. whether the impact has the ability to alter the functionality or quality of a system permanently or temporarily). | | |
| 1 | Low | Impact affects the quality, use and integrity of the system/component in a way that is barely perceptible. |
| 2 | Medium | Impact alters the quality, use and integrity of the system/component but system/ component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity). |
| 3 | High | Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component is severely impaired and may temporarily cease. High costs of rehabilitation and remediation. |
| 4 | Very high | Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component permanently ceases and is irreversibly impaired (system collapse). Rehabilitation and remediation often impossible. If possible rehabilitation and remediation often unfeasible due to extremely high costs of rehabilitation and remediation. |
| **SIGNIFICANCE (S)** | | |
| Significance is determined through a synthesis of impact characteristics. Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. This describes the significance of the impact on the environmental parameter. The calculation of the significance of an impact uses the following formula:<br><br>**Significance = (Extent + probability + reversibility + irreplaceability + duration) x magnitude/intensity.** | | |

| | | |
|---|---|---|
| The summation of the different criteria will produce a non-weighted value. By multiplying this value with the magnitude/intensity, the resultant value acquires a weighted characteristic which can be measured and assigned a significance rating. | | |
| **Points** | **Impact Significance Rating** | **Description** |
| | | |
| 5 to 23 | Negative Low impact | The anticipated impact will have negligible negative effects and will require little to no mitigation. |
| 5 to 23 | Positive Low impact | The anticipated impact will have minor positive effects. |
| 24 to 42 | Negative Medium impact | The anticipated impact will have moderate negative effects and will require moderate mitigation measures. |
| 24 to 42 | Positive Medium impact | The anticipated impact will have moderate positive effects. |
| 43 to 61 | Negative High impact | The anticipated impact will have significant effects and will require significant mitigation measures to achieve an acceptable level of impact. |
| 43 to 61 | Positive High impact | The anticipated impact will have significant positive effects. |
| 62 to 80 | Negative Very high impact | The anticipated impact will have highly significant effects and are unlikely to be able to be mitigated adequately. These impacts could be considered "fatal flaws". |
| 62 to 80 | Positive Very high impact | The anticipated impact will have highly significant positive effects. |

The table below is to be represented in the Impact Assessment section of the report. The excel spreadsheet template can be used to complete the Impact Assessment.

**Table 2:** Rating of impacts template and example

| ENVIRONMENTAL PARAMETER | ISSUE / IMPACT / ENVIRONMENTAL EFFECT/ NATURE | ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION | | | | | | | | | RECOMMENDED MITIGATION MEASURES | ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | E | P | R | L | D | I / M | TOTAL | STATUS (+ OR -) | S | | E | P | R | L | D | I / M | TOTAL | STATUS (+ OR -) | S |
| **Construction Phase** | | | | | | | | | | | | | | | | | | | | |
| Vegetation and protected plant species | Vegetation clearing for access roads, turbines and their service areas and other infrastructure will impact on vegetation and protected plant species. | 2 | 4 | 2 | 2 | 3 | 3 | 39 | - | Medium | **Outline/explain the mitigation measures to be undertaken to ameliorate the impacts that are likely to arise from the proposed activity. These measures will be detailed in the EMPr.** | 2 | 4 | 2 | 1 | 3 | 2 | 24 | - | Low |
| | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Operational Phase** | | | | | | | | | | | | | | | | | | | | |
| Fauna | Fauna will be negatively affected by the operation of the wind farm due to the human disturbance, the presence of vehicles on the site and possibly by noise generated by the wind turbines as well. | 2 | 3 | 2 | 1 | 4 | 3 | 36 | - | Medium | **Outline/explain the mitigation measures to be undertaken to ameliorate the impacts that are likely to arise from the proposed activity. These measures will be detailed in the EMPr.** | 2 | 2 | 2 | 1 | 4 | 2 | 22 | - | Low |
| | | | | | | | | | | | | | | | | | | | | |
| **Decommissioning Phase** | | | | | | | | | | | | | | | | | | | | |
| Fauna | Fauna will be negatively affected by the decommissioning of the wind farm due to the human disturbance, the presence and operation of vehicles and heavy machinery on the site and the noise generated. | 2 | 3 | 2 | 1 | 2 | 3 | 30 | - | Medium | **Outline/explain the mitigation measures to be undertaken to ameliorate the impacts that are likely to arise from the proposed activity. These measures will be detailed in the EMPr.** | 2 | 2 | 2 | 1 | 2 | 2 | 18 | - | Low |
| | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Cumulative** | | | | | | | | | | | | | | | | | | | |
| Broad-scale ecological processes | Transformation and presence of the facility will contribute to cumulative habitat loss and impacts on broad-scale ecological processes such as fragmentation. | 2 | 4 | 2 | 2 | 3 | 2 | 26 | - | Medium | **Outline/explain the mitigation measures to be undertaken to ameliorate the impacts that are likely to arise from the proposed activity. These measures will be detailed in the EMPr.** | 2 | 3 | 2 | 1 | 3 | 2 | 22 | - | Low |
| | | | | | | | | | | | | | | | | | | | |

**APPENDIX C: SPECIALIST CV**

# CURRICULUM VITAE


Craig Campbell *(Pr. Sci. Nat – Ecological Sciences)*

*Ecologist*

*Email: craigc@arcusconsulting.co.za*


**Specialisms**

- Bird and Bat baseline assessments
- Field Research
- Project Management
- Reporting and GIS analysis

**Summary of Experience**

Craig is an Ecologist at Arcus. He graduated with a Degree in Conservation Ecology from Stellenbosch University, South Africa. He is registered as a Professional Natural Scientist, in the field of Ecological Sciences (SACNASP). Since 2013, Craig has had extensive experience in ecological baseline studies, biodiversity monitoring surveys and due diligence on several renewable energy and other projects in South Africa, Mozambique, Portugal and Turkey. He has a sound background in management and ecology, and also focusses on project design & layout, GIS mapping, report compilation and stakeholder engagement.

**Professional History**

- Mar 2021 to present - Ecologist, Arcus Consultancy Services, Cape Town
- Aug 2017 to Mar 2021 – National Manager & Senior Ecologist, Bioinsight, Cape Town
- Nov 2013 to Aug 2017 – Ecologist, Bioinsight, Cape Town

**Qualifications**

**University of Stellenbosch**

2009-2013 BSc (hons) Conservation Ecology

2008-2009 Certificate in Aquaculture Production Management

**Project Experience**

**Pre-Construction Monitoring and/or Impact Assessment**

- Kudusberg Wind Energy Facility
- Sere Wind Energy Facility
- Boulders Wind Energy Facility
- Vredendal Wind Energy Facility
- Juno Wind Energy Facility
- Hartebeest Wind Energy Facility
- Rondekop Wind Energy Facility
- Noblesfontein 2 & 3 Wind Energy Facilities
- Haga Haga Wind Energy Facility
- Somerset East Wind Energy Facility
- Spitskop West Wind Energy Facility
- Witsand Wind Energy Facility
- Gouda 2 Wind Energy Facility
- Stormberg Wind Energy Facility
- Kruispad, Doornfontein and Heuningklip Photovoltaic Solar Energy Facilities
- Chelsea Photovoltaic Solar Energy Facility
- Springhaas Photovoltaic Solar Energy Facilities
- Kappa-Sterrekus Powerline Corridor Alignments
- Namaacha Wind Farm, Mozambique

**Operational Monitoring – Wind Energy Facility**

- Noblesfontein Wind Energy Facility
- Sere Wind Energy Facility
- Nxuba Wind Energy Facility
- West Coast 1 Wind Energy Facility

**Due Diligence**

- Bird monitoring at Kiyikoy Wind Energy Facility, Turkey

**APPENDIX D: SPECIALIST DECLARATION**

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

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

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

**PROJECT TITLE**

*ABO Ujekamanzi WEF Projects*

**Kindly note the following:**

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

**Departmental Details**

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

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

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

## 1. SPECIALIST INFORMATION

| | | | | |
|---|---|---|---|---|
| Specialist Company Name: | Arcus Consultancy Services South Africa (Pty) Ltd. | | | |
| B-BBEE | Contribution level (indicate 1 to 8 or non-compliant) | 4 | Percentage Procurement recognition | 100% |
| Specialist name: | Craig Campbell | | | |
| Specialist Qualifications: | BSc (Conservation Ecology) | | | |
| Professional affiliation/registration: | SACNASP Professional Natural Scientist (Ecological Sciences) - 119649 | | | |
| Physical address: | 240 Main Road, 1st Floor Great Westerford, Rondebosch | | | |
| Postal address: | 240 Main Road, 1st Floor Great Westerford, Rondebosch | | | |
| Postal code: | 7700 | Cell: | 082 420 6467 | |
| Telephone: | 082 420 6467 | Fax: | - | |
| E-mail: | craig.campbell@erm.com | | | |

## 2. DECLARATION BY THE SPECIALIST

*I, Craig Campbell, 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*

*Arcus Consultancy Services South Africa (Pty) Ltd.*

*Name of Company:*

26/05/2023

*Date*

### 3. UNDERTAKING UNDER OATH/ AFFIRMATION

*I, Craig Campbell, 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*

*Arcus Consultancy Services South Africa (Pty) Ltd.*

*Name of Company*

26/05/2023

*Date*

*Signature of the Commissioner of Oaths*

2023-05-26

*Date*

SOUTH AFRICAN POLICE SERVICE
COMMUNITY SERVICE CENTRE
26 MAY 2023
P.O. BOX 22, DURBANVILLE, 7551
TEL: 021 970 3831 • 021 970 3812
SOUTH AFRICAN POLICE SERVICE