SiVEST SA (PTY) LTD

FINAL BAT MONITORING REPORT FOR THE PROPOSED CONSTRUCTION OF THE KAREE WIND ENERGY FACILITY AND ASSOCIATED GRID INFRASTRUCTURE, NEAR CERES, WESTERN CAPE PROVINCE, SOUTH AFRICA

Final Report: Bat Monitoring at the Karee Wind Energy Facility, Western Cape

DFFE Reference: TBA
Report Prepared by: **Stephanie Dippenaar Consulting trading as EkoVler**
Issue Date: *23 September 2022*
Version No.: 1

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FINAL REPORT

EXECUTIVE SUMMARY

South Africa Mainstream Renewable Power Developments (Pty) Ltd (hereafter referred to as "Mainstream") has appointed SiVEST SA (Pty) Ltd (hereafter referred to as "SiVEST") to undertake the required Basic Assessment (BA) process for the proposed 200-megawatt (MW) Karee Wind Energy Facility (WEF) and associated grid infrastructure near Touws River in the Western Cape Province (hereafter referred to as the "Project"). The project site is approximately 11 841 hectares (ha) in extent and is situated within the Komsberg Wind Renewable Energy Development Zone (REDZ) (namely REDZ 2). The proposed Karee WEF footprint covers a smaller area of 1 753,1 ha within the overall project site.

Stephanie Dippenaar Consulting, trading as EkoVler, was appointed to undertake a 12-month pre-construction bat monitoring programme between 11 June 2021 and 27 June 2022 to inform the BA process.

Important conservation features in the vicinity include the Bokkeriviere Nature Reserve, a provincial nature reserve situated approximately 17 km south-west from the proposed site. The boundary of the Vaalkloof Private Nature Reserve is also situated within 3 km of the Karee WEF. Regionally the project site falls within three bioregions, namely the Inland Saline Vegetation, the Rainshadow Valley Karoo and the Western Fynbos-Renosterveld Bioregions.

The development area is dominated by low shrubland, predominantly "suurveld", which is used for game and limited cattle farming. As part of the Komsberg REDZ, various farms in the nearby vicinity are currently leased to developers for solar and wind energy production.

A large part of the wider development area comprises mountains, with numerous rocky outcrops and valleys which provide ample roosting opportunities for bats. Although the majority of the project site comprises typical Karoo vegetation, relatively dense vegetation occurs along some of the drainage lines, especially towards the southern section of the development site. These dense bushes provide roosting opportunities for those bats preferring to roost in vegetation or under the bark of trees. Non-perennial rivers and farm dams provide open water sources for bats throughout the year. Water collected in the valleys during rainy spells could provide breeding grounds for insects, which serve as food for bats.

Of the 12 bat species which have distribution maps overlaying the proposed WEF, four have a conservation status of Near Threatened in South Africa and one has a status of Vulnerable, while three have a global conservation status of Near Threatened. Three bat species occurring in the area are endemic.

According to the likelihood of fatality risk, as indicated in the latest pre-construction guidelines (MacEwan, *et al*., 2020), four species have a high risk of fatality, with a further four species having a medium-high and medium risk of fatality.

Data from passive monitoring systems, transects, roost surveys and a desktop study informed this report. Four static SM4BAT systems were deployed within the project site, with two systems located near-ground and two within the sweep of the turbine blades.

75% of the bat activity was by *Tadarida aegyptiaca* (Egyptian free-tailed bat) which is a high-risk species, physiologically adapted to fly at high altitudes within the vicinity of the turbine blades. Due to this foraging preference, the risk of collision and barotrauma is high. Two more species, *Sauromys Petrophilus* (Roberts' flat-headed bat) (13%) and *Neoromicia capensis* (Cape serotine bat) (9%) also showed a significant presence, while 2% of the activity was for the Near Threatened species *Miniopterus natalensis* (Natal long-fingered bat) and 1% was for the endemic species *Eptesicus hottentotus* (Long-tailed house bat). At the Karee WEF, the Molossidae family (namely Free-tailed bats) is more dominant at the high-altitude systems, with *S. petrophilus* and *T. aegyptiaca* comprising nearly 100% of all the activity recorded at height (Systems D and E).

A rapid increase in bat activity was recorded in spring (September), when warmer temperatures were experienced. A gradual decrease in activity was recorded from December to April, with bats generally being less active during the colder months between April and August.

System F, situated at a height of 12 m on the Meteorological (i.e., Met) mast in the northern part of the terrain, recorded the highest bat activity, with significantly higher bat passes than the other systems. Within the sweep of the turbine blades, System E at a height of 55 m, recorded higher activity in comparison to System D at a height 105 m. One would therefore predict that highest mortality may be experienced in the lower parts of the turbine sweep.

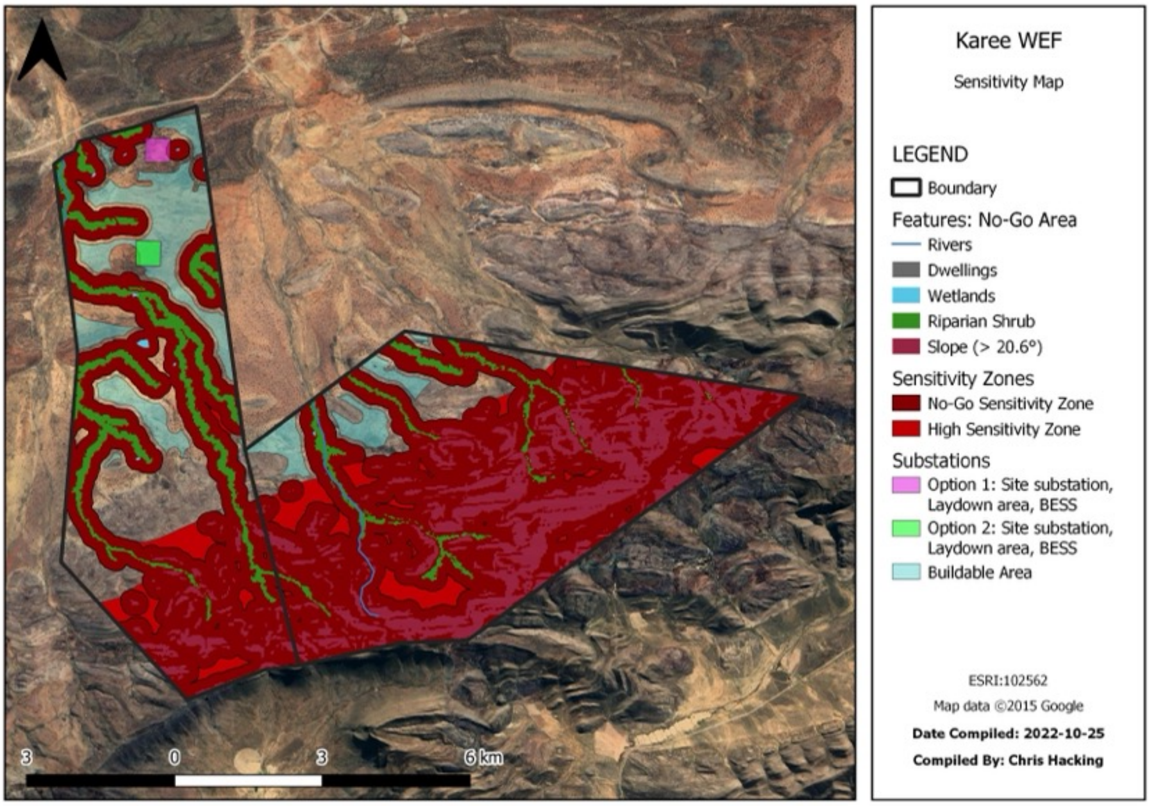
The general distribution of bat activity during each night, from sunset to sunrise, indicates a sharp increase in activity approximately two hours after sunset up to approximately 01:00 am at all systems. Thereafter, a sharp decrease in bat activity is experienced until two to three hours before sunrise.

According to the South African bat threshold guidelines, bat activity at near ground level, as well as within the rotor sweep area, falls in the highest risk category, with a combined hourly bat activity median of 0,51 near-ground and 0,35 in the rotor sweep. Due to the high bat activity on site, fatality minimisation measures are recommended for implementation during pre-construction as recommended in Section 9 of the main report.

Data from the high systems D and E on the Met mast were statistically analysed for correlations between weather conditions and bat activity. Optimal conditions for bat activity on the terrain include temperatures above 10 ℃, wind speeds below 9 m/s and humidity levels between 49% and 90%.

Transect surveys showed high activity during the springtime (144 bat passes), indicating that there are specific nights, with optimal weather conditions and possible high insect occurrence, when bat activity is especially high.

A bat sensitivity map classified areas of no-go, high and medium sensitivity, which is presented in Figure 39 of the main report. It is recommended that no operating turbine components are allowed in the no-go and high sensitivity areas. Supporting infrastructures, such as the laydown area, site sub-station and Battery Energy Storage System (BESS) may infringe on the high sensitivity areas, if necessary, but care must be taken to avoid any possible bat roosts, as per the Environmental Management Programme (EMPr). After specialist input was considered, the developer is proceeding with a buildable area instead of a detailed turbine layout. An updated bat sensitivity map is provided in below.



Updated sensitivity map 1

Although no curtailment is recommended at present, the curtailment schedule below should be used as a starting point of discussion when curtailment during the operational phase is considered. This should appear in the operational bat monitoring programme so that the bat specialist for the operational phase can adapt these recommendations as necessary.

Months	Time period	Temperature (°C)	Wind speed (m/s)	Humidity (%)	Curtailment
Beginning September to end March	3 hours after sunset up to 4 hours before sunrise	Above 15 °C	Below 9 m/s	Between 40% and 75% humidity	Raise cut-in speed to 6 m/s

Although the combined impact during the operational phase, after mitigation, is predicted to be Medium Negative, it should be noted that the bat activity on the project site, according to the bat threshold for Succulent Karoo, is high and the negative impact on bats during the operational phase could thus be high. This must be confirmed during bat monitoring in the operational phase, but the developer should prepare for turbine specific curtailment and/or installing bat deterrents when more information is available.

Summary of impacts on bats from the Karee WEF, using the SiVEST impact significance rating system		
Phase	**Impact before mitigation (negative)**	**Impact after mitigation (negative)**
Construction	29 (5-23) Medium	16 (5-23) Low
Operation	38 (24-42) Medium	29 (24-42) Medium
Decommissioning	16 (5-23) Low	7 (5-23) Low
Cumulative	63 (62-80) Very High	43 (43-61) High
Combined for the site	36 (24-42) Medium	24 (24-42) Medium

Cumulative impacts on bat populations before mitigation are predicted to be Very High Negative. This is due to the combined impact of all the wind farms in the area. Even with mitigation measures, the combined cumulative impact is expected to be High Negative. This has been confirmed by the general estimated mortality (GenEst) based on carcass searches on operating wind farms in the Succulent Karoo. Despite the negative cumulative impact, this is not considered to be a fatal flaw if all the wind farms apply appropriate mitigation measures.

It is recommended that the following mitigation measures be included in the Environmental Authorisation (EA):

- The final layout must be informed by the sensitivity map provided in Section 8 of the main report.
- A bat specialist must be appointed before the commercial operational date. Mitigation measures, as per Section 9 of the main report, must form part of the operational EMPr, and be applied as directed.
- Turbines must be feathered below cut-in speed, and although they need not be at a complete standstill, there should be minimum movement so that bats are not at risk when turbines are not generating power.
- All newly built structures that have bat conducive features must be rehabilitated to discourage bat presence. This includes roofs of new buildings, open quarries and borrow pits.
- A minimum of two year's operational bat monitoring must be conducted after commencement of operations at Karee WEF, as per the guidance of the latest operational South African Bat Assessment Association (SABAA) guidelines.

The Department of Environment, Forestry and Fisheries' Site Sensitivity Verification Report indicates the Karee WEF area has high bat sensitivity. Some of the drainage lines in the south-western and south-eastern areas, with some relatively larger trees and denser bushes, are particularly conducive to bat activity. This is confirmed by the results of the 12-month bat monitoring study.

It should be noted that one year of pre-construction bat monitoring is required by legislation in South Africa. However, the semi-desert Succulent Karoo environment is subject to erratic weather conditions, which vary from year to year. These changes usually result in changes in the bat situation which might not have been observed in this survey. This is not a limitation which would greatly affect the results of this bat monitoring programme, especially seen in the light of relatively good rainfall during the monitoring period.

The overall potential negative impact of the proposed Karee WEF on bats, combined for all the development phases, is predicted to be Medium Negative without mitigation. The combined impact with mitigation remains overall Medium Negative, but the significance rating is lower.

Based on the findings of the one-year pre-construction monitoring undertaken at the proposed Karee WEF project site, the bat specialist is of the opinion that no fatal flaws exist which would prevent the construction and operation of this WEF. EA may thus be granted, subject to the implementation of the recommendations made in this report.

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NATIONAL ENVIRONMENTAL MANAGEMENT ACT, 1998 (ACT NO. 107 OF 1998) AND ENVIRONMENTAL IMPACT REGULATIONS, 2014 (AS AMENDED) - REQUIREMENTS FOR SPECIALIST REPORTS (APPENDIX 6)

Regulation GNR 326 of 4 December 2014, as amended 7 April 2017, Appendix 6	Section of Report
1. (1) A specialist report prepared in terms of these Regulations must contain- a) details of- i. the specialist who prepared the report; and ii. the expertise of that specialist to compile a specialist report including a curriculum vitae;	Section 1.2.
b) a declaration that the specialist is independent in a form as may be specified by the competent authority;	Appendix 4
c) an indication of the scope of, and the purpose for which, the report was prepared;	Section 1.
(cA) an indication of the quality and age of base data used for the specialist report;	Section 1 and 6.1
(cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Section 6.2.
d) the date and season of the site investigation and the relevance of the season to the outcome of the assessment;	Section 6.1
e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	Section 1.3
f) details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternative;	Sections 3.3, 6,7
g) an identification of any areas to be avoided, including buffers;	Section 7
h) a map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	Section 7
i) a description of any assumptions made and any uncertainties or gaps in knowledge;	Section 2
j) a description of the findings and potential implications of such findings on the impact of the proposed activity, (including identified alternatives on the environment) or activities;	Section 10

k) any mitigation measures for inclusion in the EMPr;	Section 9
l) any conditions for inclusion in the environmental authorisation;	Section 9
m) any monitoring requirements for inclusion in the EMPr or environmental authorisation;	Section 9
n) a reasoned opinion- i. (as to) whether the proposed activity, activities or portions thereof should be authorised; (iA) regarding the acceptability of the proposed activity or activities; and ii. if the opinion is that the proposed activity, activities, or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan;	Section 12
o) a description of any consultation process that was undertaken during the course of preparing the specialist report;	Section 1.3
p) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	n.a. No comments relating to bats (including impacts) received to date.
q) any other information requested by the competent authority.	n.a. No specific information requested by the competent authority to date.
2) Where a government notice *gazetted* by the Minister provides for any protocol or minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply.	n.a.

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Glossary of Terms

Definitions	
Bat monitoring systems	Ultrasonic recorders used to record bat calls
Torpor	A state of physical inactivity associated with lower body temperature and metabolism
SM4BAT	Wildlife Acoustics' full spectrum ultrasonic bat monitoring recorder
SMMU2	Wildlife Acoustic's ultrasonic microphones for recording bat sounds
Threshold	Bat activity threshold as provided by SABAA

List of Abbreviations

BA	Basic Assessment
BESS	Battery Energy Storage System
CA	National Competent Authority
COD	Commercial Operation Date
CSIR	Council of Scientific and Industrial Research
CDF	Cumulative Distribution Function
ECO	Environmental Control Officer
DEA	Department of Environmental Affairs
DFFE	Department of Forestry, Fisheries and the Environment
EA	Environmental Authorisation
EIA	Environmental Impact Assessment
EMPr	Environmental Management Programme
IPP	Independent Power Producer
IRP	Integrated Resource Plan
kV	Kilovolt (s)
MET	Meteorological
ms	milliseconds
MTS	Main Transmission Substation
MW	Megawatt(s)
REIPPPP	Renewable Energy Independent Power Producer Procurement Programme
REDZ	Renewable Energy Development Zone
REF	Renewable Energy Facility
PV	Photovoltaic
WEF	Wind Energy Facility
SABAA	South African Bat Assessment Association
SSVR	Site Sensitivity Verification Report

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FINAL REPORT

1. INTRODUCTION

South Africa Mainstream Renewable Power Developments (Pty) Ltd (hereafter referred to as “Mainstream”), has appointed SiVEST SA (Pty) Ltd (hereafter referred to as “SiVEST”) to undertake the required Basic Assessment (BA) Process for the proposed construction of the 200-megawatt (MW) Karee Wind Energy Facility (WEF) and associated grid infrastructure near Touws River in the Western Cape Province. The project site is approximately 11 841 hectares (ha) in extent and is situated in the Komsberg Wind Renewable Energy Development Zone (REDZ) (namely REDZ 2). The planned location of the Karee WEF itself however covers a smaller area of around 1753.1 ha that had been identified inside the project site.

Stephanie Dippenaar Consulting, trading as EkoVler, was appointed to undertake a Bat Impact Assessment, including a 12-month pre-construction bat monitoring programme, to inform the BA process for the proposed WEF. This pre-construction bat monitoring was conducted between 11 June 2021 and 27 June 2022.

The overall objective of the WEF development is to generate electricity by means of renewable energy technology, capturing wind energy to feed into the National Grid. The maximum total energy generation capacity of up to approximately 200 MW. The electricity generated by the proposed WEF development will be fed into the national grid via a 132 kilovolt (kV) overhead power line. For the initial fieldwork undertaken by the specialists, turbines were proposed to be located on the Sadawa 239 land parcel. Due to the associated sensitivities, the applicant will no longer be proceeding with turbines on Sadawa 239 (northernmost land parcel). This property will however remain part of the Development Area / Envelop but not the Development Footprint and hence is included in the mapping for the purpose of this report. In June 2022, the specialists were presented with a final layout of 27 turbines which exclude the turbines originally located on Sadawa 239, down from the original 35. The final layout was assessed accordingly and the impact ratings and conclusions reached in this study as far as the WEF infrastructure is concerned, remain unchanged.

In terms of the Environmental Impact Assessment (EIA) Regulations, which were published on 04 December 2014 [GNR 982, 983, 984 and 985) and amended on 07 April 2017 [promulgated in Government Gazette 40772 and Government Notice (GN) R326, R327, R325 and R324 on 7 April 2017], various aspects of the proposed WEF development are considered listed activities under GNR 327 and GNR 324 which may have an impact on the environment and therefore require authorisation from the National Competent Authority (CA), namely the Department of Forestry, Fisheries and the Environment (DFFE), prior to the commencement of such activities. Considering this, a BA Process is being undertaken to identify and assess the impacts associated with the proposed WEF, including measures to mitigate and/or address potential impacts. Specialist studies have also been commissioned as part of the BA process to assess and verify the project under the new Gazetted specialist protocols.

This bat monitoring report comprises the following sections:

- Section 1: Introduction which contains the Terms of Reference, Specialist Credentials and Assessment Methodology.
- Section 2: Assumptions and Limitations.
- Section 3: Technical description.
- Section 4: Legal requirement and guidelines.
- Section 5: Description of the receiving environment.
- Section 6: Specialist findings/ identification and assessment of impacts.
- Section 7: Bat sensitivity zones.
- Section 8: Cumulative impact.
- Section 9: Proposed mitigation measures.
- Section 10: Description of the project aspects relevant to the bat impact assessment.
- Section 11: Comparative assessment of alternatives.
- Section 12 Conclusion and summary.

1.1 Terms of Reference

The following Terms of Reference (ToR) apply to the bat monitoring on site, as informed by the current pre-construction guidelines, i.e. *The South African Good Practice Guidelines for Surveying Bats in Wind Farm Developments – Pre-Construction* (MacEwan *et al*., 2020).

- Gathering information on bat species that inhabit the project site, noting higher, medium, or lower risk species groups;
- Recording relative frequency of use by different species throughout the monitoring year;
- Monitoring the spatial and temporal distribution of activity for different species;
- Identifying locations of roosts within and close to the project site;
- Collecting details on how the surveys have been designed to determine the presence of rarer species; and
- Describing the type of use of the project site by bats; for example, their relative position from the turbine locations in terms of foraging, commuting, migrating, and roosting, as can be observed through the monitoring data and site visits.

1.2 Assessment Methodology

Acoustic monitoring of the echolocation calls of bats was used to determine the seasonal and diurnal activity patterns of bats at the proposed Karee WEF site. The *South African Good Practice Guidelines for Surveying Bats in Wind Farm Developments – Pre-Construction* (MacEwan *et al.,* 2020) was followed throughout the monitoring process. The following South African Guidelines were used in conjunction with the pre-construction guidelines:

- South African Bat Fatality Threshold Guidelines (MacEwan *et al*., 2018);
- Mitigation Guidance for Bats at Wind Energy facilities in South Africa (Aronson *et al*., 2018); and
- Good Practice Guidelines for Operational Monitoring for Bats at Wind Energy Facilities (Aronson *et al*., 2020).

The following approach was followed, as per the terms of reference provided during the proposal phase of the bat monitoring:

- A desktop study of available literature was conducted to establish which species occur in the area. This includes the surrounding area as well as information from other wind developments in the area, where accessible.
- Background was provided regarding ecosystem services and the impact of a loss of bats on the broader environment.
- The local and global conservation status of all identified bat species was determined.
- Reconnaissance site visits were conducted as part of the initial project screening phase which included the installation of bat detecting equipment.

- Four site visits were conducted, which included seasonal surveys and day-time investigations. These covered all the various biotopes occurring on the project site.
- The monitoring equipment was set up and verified. Data was downloaded throughout the monitoring year and echolocation calls were analysed.
- Interviews were conducted with the landowner(s) of Karee WEF regarding possible bat occurrence on the property and the surroundings.
- Inputs were provided to inform the turbine layout.
- Information was gathered from other wind farm developments in the close vicinity of the proposed Karee WEF site to assess the cumulative impact of each WEF.
- Potential impacts were identified and the potential significance thereof was predicted.
- Mitigation measures are recommended.

The methods of investigation of bats at the proposed wind farm development are described below.

1.2.1 Desktop investigation of the development area as well as the surrounding environment

A desktop study was conducted of the project site itself, which was informed by information provided by the applicant and a literature review. Conservation areas in the vicinity of the study area were investigated and other renewable energy developments, particularly wind farms, were noted for the discussion of cumulative effects.

1.2.2 Passive Acoustic Monitoring Systems

Passive acoustic monitoring were conducted between 11 June 2021 and 27 June 2022. Four seasonal site visits were conducted, during which, amongst others, data were downloaded. The results of the data are discussed in Section 5. The monitoring systems consisted of four Wildlife Acoustics SM4BAT full spectrum bat detectors powered by 12V, 7 Amp-h sealed lead acid batteries replenished by photovoltaic (PV) solar panels (see Table 1). Two SD memory cards, class 10 speed, with a capacity of 64 GB or 128 GB each, were utilised within each detector to ensure substantial memory space with high-quality recordings, even under conditions of multiple false environmental triggers.

Table 1: Summary of Passive Detectors deployed at the proposed Karee WEF site

Detector	Situation	Coordinates	Micro-phone	Division ratio	High pass filter	Gain	Format	Trigger window	Calibration (on chirp) at the microphone
SM4BAT (Met D)	Met mast: mic at 105 m	33°9'7,32" S 19°56'4,02" E	SMM-U2	8	16 kHz	12 dB	FS, WAV@ 384kHz	1 sec	Drop to approximately -7,77 dB at the microphone
SM4BAT (Met E)	Met mast: mic at 55 m	33°9'7,32" S 19°56'4,02" E	SMM-U2	8	16 kHz	12 dB	FS, WAV@ 384kHz	1 sec	Drop to approximately -7,85 dB at the microphone
SM4BAT (Met F)	Met mast: mic at 12 m	33°9'7,32" S 19°56'4,02" E	SMM-U2	8	16 kHz	12 dB	FS, WAV@ 384kHz	1 sec	Drop to approximately -7,81 dB at the microphone
SM4BAT (10 m Mast I)	Temporary 10 m mast: mic at 9 m	33°12'40,7" S 19°57'41,4" E	SMM-U2	8	16 kHz	12 dB	FS, WAV@ 384kHz	1 sec	Drop to approximately -8,6 dB at the microphone

Each detector was set to operate in continuous trigger mode, from dusk each evening until dawn. Times were correlated with latitude and longitude and set to trigger half an hour (30 minutes) before sunset. The trigger mode setting for the bat detectors, which record frequencies exceeding 16 kHz and -18dB, was set to record for the duration of the sound and 1 000 milliseconds (ms) after the sound ceased; this period is known as the trigger window (see Table 1).

The data from these recorders were downloaded every two to four months and analysed to provide an approximation of the bat frequency and species diversity that visit and inhabit the project site.

The position of the Met mast was decided by the developer. When planning the positioning and installation of temporary masts for bat monitoring equipment, different biotopes[1] must be represented and the proximity to possible bat conducive areas was considered. As prescribed by the pre-construction bat monitoring guidelines (MacEwan *et al*., 2020), three bat monitoring systems were placed on the Met mast, with one sampling point at a height of 105 m, one at 55 m and one at 12m (see Table 1). The Met mast position was representative of most of the development area and represented the central and southern sections of the

[1] The region of a habitat associated with a particular ecological community.

wind farm. The systems situated within the future sweep[2] of the turbine blades are deemed the most important, as the data are representative of the bats that will be at high risk when the turbines are turning. The positions of the monitoring stations are depicted in Figure 1.

Note: For the initial fieldwork undertaken by the specialists, proposed turbines were located on the Sadawa 239 property/land parcel. Due to certain environmental sensitivities which have been identified, Mainstream will no longer be proceeding with turbines on the Sadawa 239 property/land parcel(the northernmost land parcel). This property will remain part of the Development Area / Envelope but will not be included in the Development Footprint, and hence is included in the mapping for the purpose of this report.

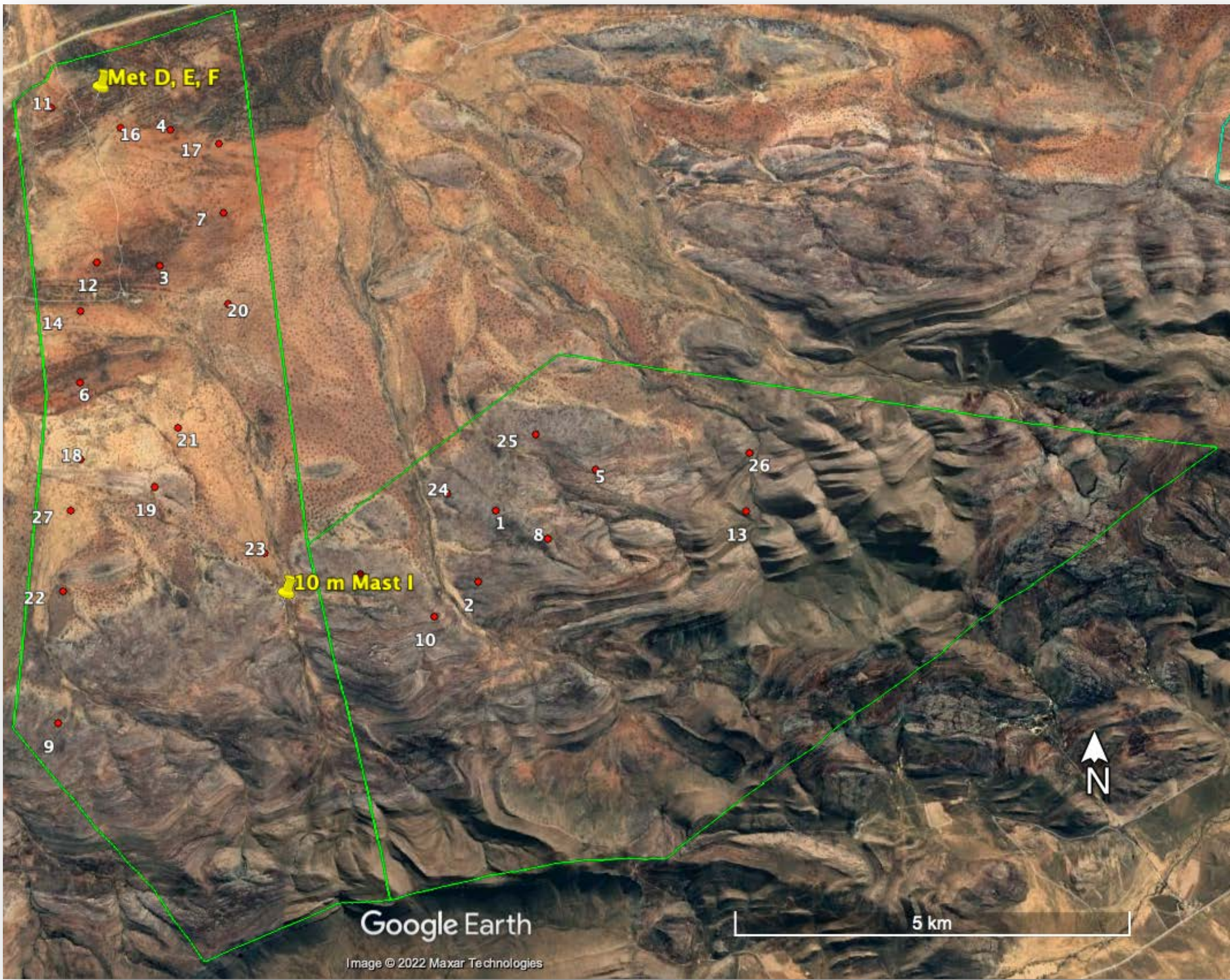


Figure 1. Positions of monitoring stations at Karee WEF, with the original preliminary turbine positions

[2] Area covered as a wind turbine rotates around in a circle.

The positions of the 10 m masts on site are motivated below:

- **10 m Mast I:** See Figure 2. This monitoring station represents the southern mountainous area with deep valleys and rock formations situated south of the monitoring mast. There is a non-perennial river just east of the monitoring station, where standing water collects during rainy spells.

Figure 2: Monitoring Station I, the 10 m Mast on the proposed wind farm site

1.2.3 Roost Surveys

During the respective site visits, roost searches were conducted. Areas where roosts could be situated were investigated, however, it was not always possible to access all roosts in rock crevices or roofs with limited ceiling space. If day roosts were identified, bat counts were done during sunset and if deemed necessary, detectors were installed for short periods, for one or two nights during field visit, sat point sources to monitor roosts. It should be noted that the project site is large and within the period and limitations of the bat monitoring study, searching the whole project site for roosts was not possible; therefore roost searches were concentrated in areas such as rocky outcrops or features which are favourable for bat roosts.

1.2.4 Driven transects

Transects provide a snapshot in time and could confirm bat species or activity for a specific night. A SM4BAT full spectrum recorder with the microphone mounted on a pole was used for transects, see Figure 3. Starting at sunset up to approximately two hours after sunset, the vehicle was driven at a speed between 10 to

20km/h along a set route. All Transect routes are the same, as far as possible, so that seasonal data can be compared. More details about the transects are available in Section 6.

Figure 3: Microphone mounted on a vehicle for transects

1.2.5 Data Analysis

Data were downloaded manually, approximately once every two to three months. Acoustic files downloaded from the detectors were analysed for bat activity concerning the number of bat passes and the bat species, where possible. The latest version of Wildlife Acoustics Kaleidoscope Pro was used for analysing large quantities of data. Data analysed electronically were regularly tested by hand, to establish the accuracy of electronic data analysis. In cases where there was uncertainty about a bat call, the call was classified as "unclear".

1.2.6 Source of Information

1.2.6.1 Information used in the Bat Impact Assessment

The following information sources were used to inform this study.

Bats and environmental information:

- South African Bat guidelines as prescribed by the South African Bat Assessment Association, particularly the South African Good Practice Guidelines for Surveying Bats in Wind Energy Facility Developments – Pre-construction Monitoring of Bats at Wind Energy Facilities. MacEwan *et al.* 2020.
- Bats of Southern and Central Africa: A Biogeographic and Taxonomic Synthesis. University of the Witwatersrand, Johannesburg. Monadjem *et al*. 2010, as well as the 2020 editions.
- Academic references and papers, as per the reference list (Section 13).
- Climate and precipitation data sourced from various websites: AccuWeather; Meteoblue; Climate.org, MSN.com, World Weather Online, Yr.no.

Environmental and other related Legislation:

- Department of Forestry, Fisheries and the Environment: https://egis.environment.gov.za/data_egis/data_download/current South African Energy Integrated Resource Plan 2010-2030 promulgated 3/2011 (www.Energy.gov.za)

Personal conversation:

- Personal conversations during field work sessions were conducted with the landowner of the WEF site, to establish if they are aware of any bat roosts on the properties and whether there are certain times of the year when there is higher bat activity on the proposed site.

Process information sourced from the client:

- Satellite images.
- Google Earth: https://www.google.com/earth/download/html.

Vegetation:

- Red List of South African Plants (SANBI).
- South African National Biodiversity Institute (SANBI), 2012: Vegetation Map of South Africa, Lesotho and Swaziland [vector geospatial dataset] 2012. Available from the Biodiversity GIS website: http://bgis.sanbi.org/SpatialDataset/Detail/18

- The Vegetation of South Africa, Lesotho and Swaziland, Strelitzia 19, South African National Biodiversity Institute, Pretoria. Mucina, L., and Rutherford, M.C., 2006.

1.2.6.2 Importance of Bats

Bats are the second largest group of mammals after rodents (Pennisi, 2020). More or less 62 bat species occur in South Africa (De Villiers, 2022). Bats play important functional roles as insect predators, pollinators, and seed dispersers. For numerous cacti species in the world, fruit bats serve as the main pollinators because these plants open their flowers during the night (National Science Foundation, 2012).

Bats can be classified into three broad functional groups based on their wing morphology and echolocation call structure, namely: clutter, clutter-edge, and open-air foragers. Of these three groups, open-air foragers (i.e., bats that have a wing design and echolocation calls adapted to flying fast and high above the vegetation) are mostly at risk from wind turbine developments. However, all species that migrate over the proposed WEF development will be further at risk regardless of their foraging behaviour.

The major threats faced by bats include habitat destruction and change, mortality and disturbance resulting from wind turbine developments, cave (i.e., roosting) disturbance, and natural disasters (Geda and Balakrishnan, 2013). Bat populations are sensitive to changes in mortality rates and tend to recover slowly from declines. In general, human-caused environment-related concerns include the reduction in the number of food resources, overhunting of bats for bush meat, the maltreatment of bats due to misguided fears, such as those related to Covid-19, and a rise in the usage of pesticides (MacFarland and Rocha, 2020; Geda and Balakrishnan, 2013). According to scientists, bats are one of the most endangered groups of animals on our planet (Bottollier-Depois, *et al*., 2021).

The economic consequences of a widespread loss of bat populations could be substantial, even more so for sensitive semi-desert environments. Although the loss of bats in Southern Africa has not been quantified in economic terms, literature indicates that insectivorous bats play a crucial role in the disruption of population cycles of agricultural pests (Boyles, *et al*., 2011; National Park Service, 2020), resulting in a reduced cost of pesticides. Quantifying the cost of pesticides versus bats controlling pests in the USA, it is believed that more than an estimated $3,7 billion are saved (National Park Service, 2020).

The consumption of insects by insectivorous bats also plays a role in the control of diseases that afflict humans, such as malaria and dengue. Insectivorous bat species consume large numbers of mosquitoes (typically equivalent to their own body weight per night) and flies, the most important vectors in the transmission of these diseases (Monadjem, *et al*., 2010; National Science Foundation, 2012). Malaria afflicts millions of people in Africa and the contribution that bats make to reduce the number of insects that transmit diseases should not be underestimated (Monadjem, *et al*., 2010).

Several distinctive attributes of bats, including the membranes of bat wings and their echolocation, were the inspiration behind some technology-related breakthroughs within the field of engineering, such as drones navigating sonar systems (National Park Service, 2020; National Science Foundation, 2012). Further examples are base jumper wingsuits, sonar navigation for ships and ultrasound.

Studies have revealed that blind people, as well as those that are visually impaired, have the capability of using echolocation to establish the position where an object is located (Science Daily, 2013). Also, scientific researchers have exploited the saliva of vampire bats to see if it could be used as a practicable medication to treat strokes in human beings (ESA, 2011). The same enzyme that prevents blood from coagulating when vampire bats feed, can potentially be used in stroke patients to prevent or break down blood clots. The drug derived is known as “Draculin”.

1.2.6.3 Dominant bat species at Karee WEF

In the Karoo environment, and at the Karee WEF project site, *Tadarida aegyptiaca*, has proven to be the most vulnerable species to date. Bat biologists in South Africa mention that the Egyptian free-tailed bat (*T. aegyptiaca*) might be split into more than one species; at present, it is still considered one species. This bat species is known to forage over a wide variety of habitats (an approximate range of occurrence of 1,340,000km^2) (Eiting, 2020; Monadjem *et al*., 2020). Generally, *T. aegyptiaca* flies effortlessly above the vegetation’s canopy, including agriculture-related fields, grassland, savanna, semi-desert scrub, as well as desert habitats (Monadjem *et al*., 2020). *T. aegyptiaca* consumes insects in the orders Lepidoptera (butterflies and moths) and Hymenoptera (sawflies, wasps, bees and ants), which are considered pests insects in agricultural systems (Eiting, 2020). This bat tends to move away from clutter and is a true open-air forager. Within arid environments, the presence of these bats is associated with water bodies that do not dry up and/or standing water that attracts concentrated densities of insects. *T. aegyptiaca* females only gives birth to a single pup annually.

In previous years, before the increase in WEFs, *T. aegyptiaca* was not perceived to be under threat (MacEwan *et al*., 2016), as their distribution is widely spread over Southern Africa. However, currently there is a serious cumulative threat from WEFs. Furthermore, the possibility that *T. aegyptiaca* could be subdivided into more than one species or sub-species, is at present being debated amongst zoologists and genetics specialists. If this is the case, wind farms concentrating on certain biomes in South Africa, could threaten a species or sub-species that have not been described yet. Of all the South African bat species, preliminary data indicates that *T. aegyptiaca* presents the highest fatality and with a sharp increase in WEFs, one could expect that this trend will continue.

2. ASSUMPTIONS AND LIMITATIONS

The following limitations apply to this study:

- Knowledge of several ecological aspects and behaviours, such as migration distances, flying height, population sizes, temporal movement patterns, etc., of several South African species is limited. Consequently, the impact of WEFs on such bat species is also unknown.
- Monitoring of bats with acoustic detectors is an internationally accepted method to assess bat activity levels and species richness; however, the use of bat detectors has limitations. Acoustic monitoring can only provide an estimate of relative bat activity levels and not provide total population estimates of how many individuals are present on site, as the same individual could pass the detector more than once.
- Due to an overlap of calls, it is not possible to provide an exact number of bats passing the recorder. Therefore, the number of bats passing is not an exact count, but rather indicate activity, and is as close as possible under the given circumstances and within the limitations of the survey technique applied.
- The recording of echolocation calls is dependent on the species being recorded (some species emit 'softer' calls than others) and weather conditions (high humidity and high wind speeds will reduce recording distance as it attenuates call intensity). Therefore, any monitoring based on echolocation calls covers only a limited area, depending on the type and intensity of the call.
- The accuracy of the species identification is also dependent on the quality of the calls. Species identification through echolocation calls is complex. Bats alter the frequencies and durations of their calls based on whether they are feeding, commuting, or migrating. They may also alter call characteristics based on the habitat and surrounding vegetation. There are several species with overlapping frequencies that makes identification challenging. For this study, if the species of a recording is unidentifiable, the species identification of the recording were marked as 'unclear'. Recordings for which the species identification was 'unclear' were still included in the analyses.
- Transects only provide a snapshot in time and do not convey enduring spatial distribution of bat activity across the project site. However, transects are useful in eliciting areas or time periods of high activity for the duration of the site visit.
- It is not possible to search the entire study area as well as the wider terrain for bat roosts; However, the project site was driven and walked through as thoroughly as possible, keeping in mind the time constraints of an environmental assessment.
- The data collected during this study provided a baseline of bat activity across the project site for the relevant monitoring period. Future bat activity patterns and inter-annual variations cannot be accurately inferred from this data, and as such, bat activity in the future could vary substantially from the results presented here.

3. TECHNICAL DESCRIPTION

3.1 Project Location

The proposed WEF and associated grid infrastructure are located approximately 12 km and 20 km north (respectively) of Touws River in the Western Cape Province within the Witzenberg Local Municipality, in the Cape Winelands District Municipality (See Figure 4).

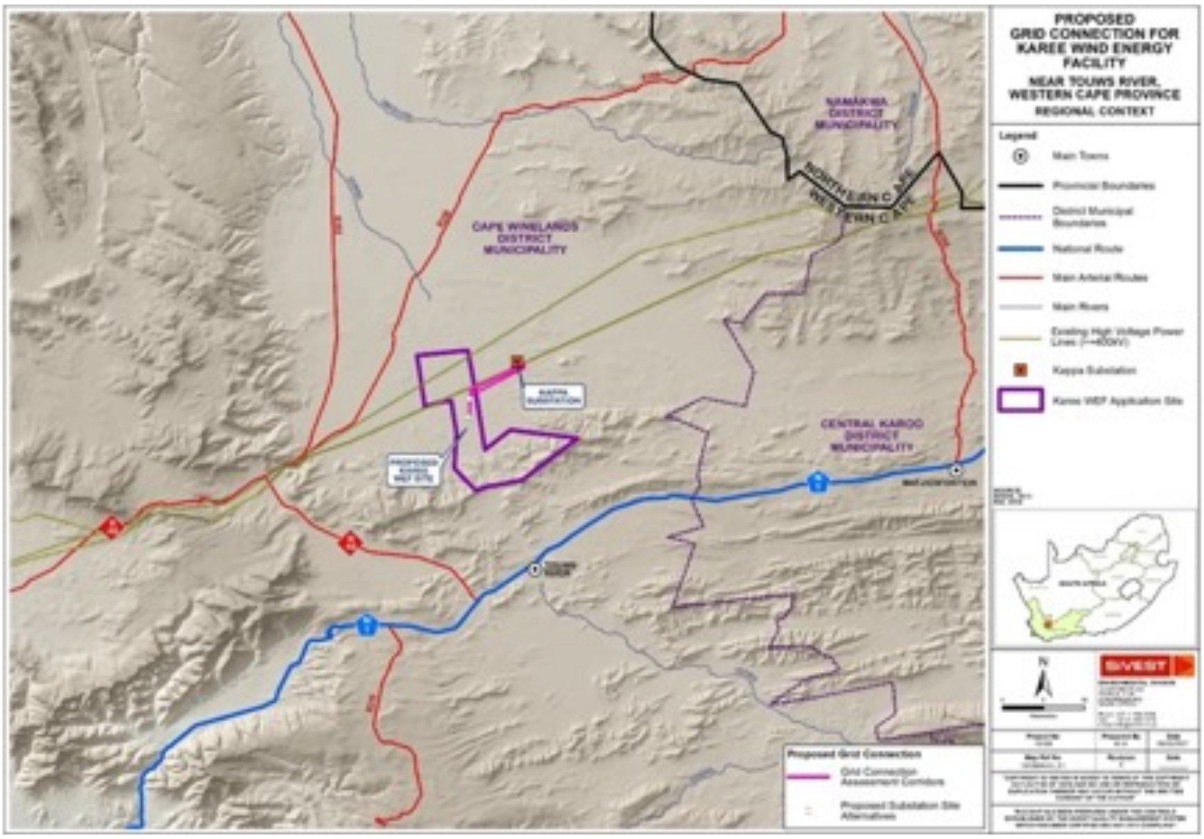


Figure 4: Regional context map

3.1.1 WEF

The WEF application site, as shown on the locality map below (Figure 5), is approximately 11 841 hectares (ha) in extent and incorporates the following farm portions:

- Farm Sadawa No 239[3];

[3] *For the initial fieldwork undertaken by the specialists, turbines were proposed to be located on Sadawa 239. Due to the associated sensitivities, Mainstream will no longer be proceeding with turbines on Sadawa 239 (northernmost land parcel). This property will however will remain part of the Development Area /*

- Farm Tierberg No 258; and
- Farm Voetpads Kloof No 253.

A smaller buildable area (1753.1 ha) has however been identified as a result of a preliminary suitability assessment undertaken by Mainstream, and this area is likely to be further refined with the exclusion of sensitive areas determined through various specialist studies being conducted as part of the EIA process.

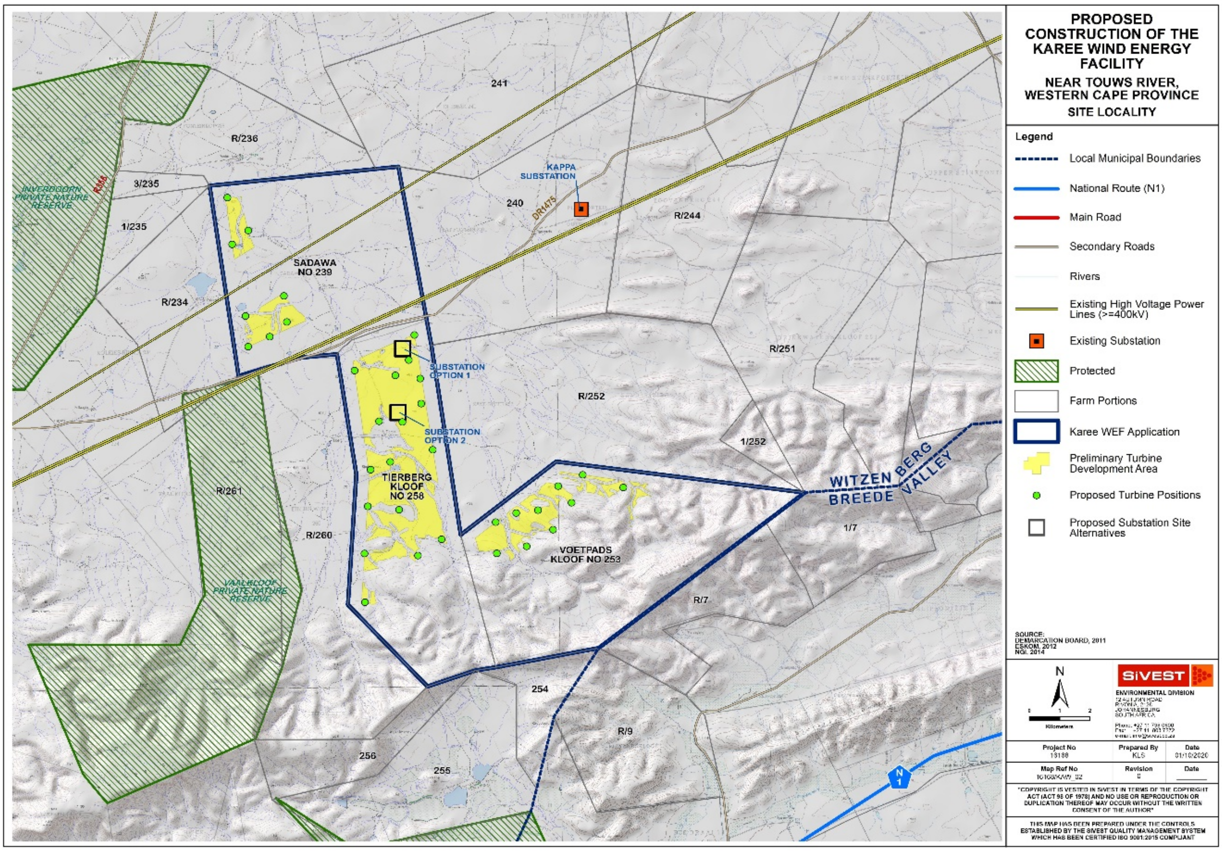


Figure 5: Karee WEF Site Locality

3.1.2 Grid Connection

At this stage, it is proposed that the 132 kV power line will connect the Karee WEF on-site substation to the national grid via the existing Kappa Substation (Figure 6).

Envelop but not the Development Footprint and hence is included in the mapping for the purpose of this report.

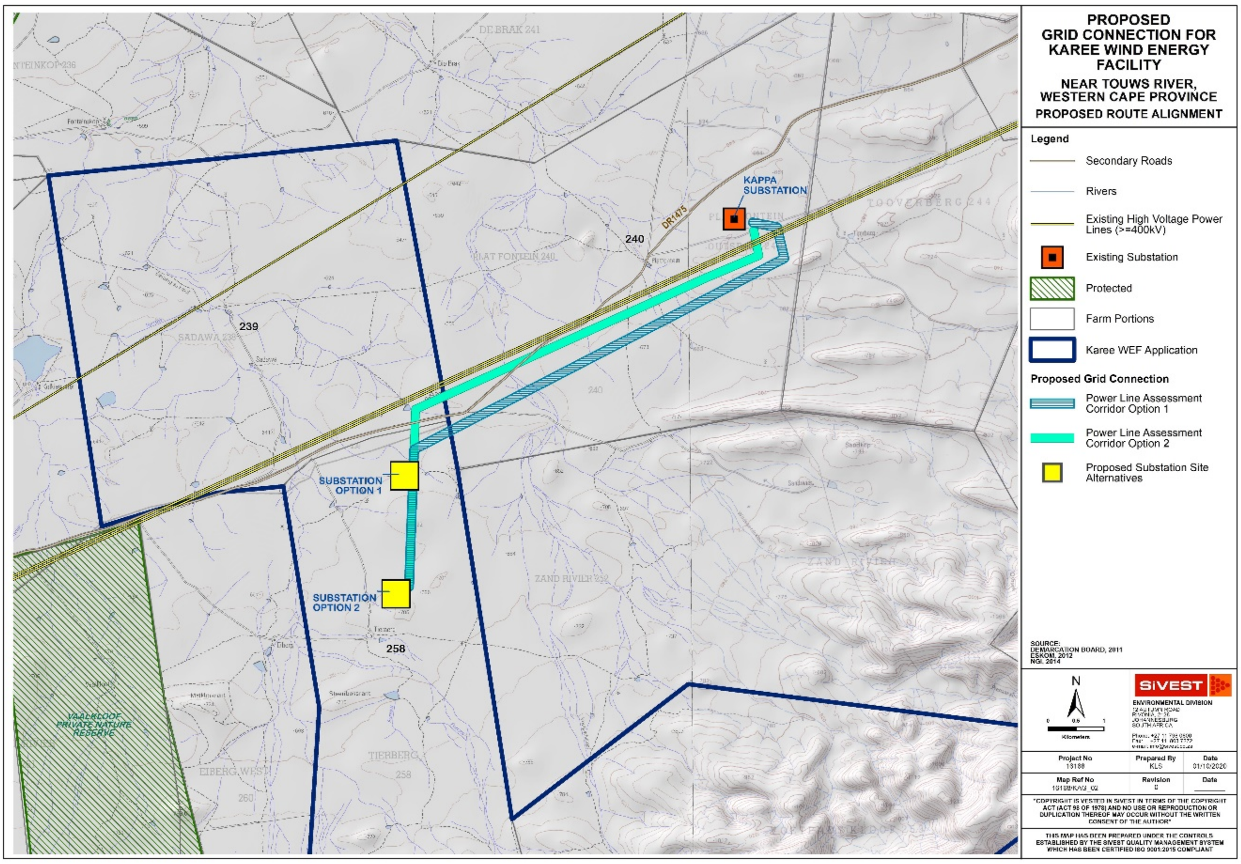


Figure 6: Preliminary Turbine layout and development area

3.2 Project Description

For the initial fieldwork undertaken by the specialists, for the proposed Karee WEF comprised of up to 35 wind turbines with a maximum total energy generation capacity of up to 200 MW. Due to the associated sensitivities, the applicant will no longer be proceeding with turbines on Sadawa 239 (northernmost land parcel), reducing the number of turbines from 35 wind turbines to 27 wind turbines. This property will however remain part of the Development Area / Envelop but not the Development Footprint and hence is included in the mapping for the purpose of this report. The final layout was assessed accordingly, and the impact ratings and conclusions reached in this study as far as the WEF infrastructure is concerned, remain unchanged.

The electricity generated by the proposed WEF development will be fed into the national grid via a 132 kV overhead power line. The 132 kV overhead power line will however require a separate EA and is subject to a separate BA process, which is currently being undertaken in parallel to the WEF BA process.

3.2.1 Wind Farm Components

- Up to 27 wind turbines, with a maximum export capacity of approximately 200 MW. The final number of turbines and layout of the WEF will, however, be dependent on the outcome of the specialist studies conducted during the BA process.
- Each wind turbine will have a hub height of between 120 m and 200 m and rotor diameter of up to approximately 200 m.
- Permanent compacted hard standing areas / platforms (also known as crane pads) of approximately 100 m x 100 m (total footprint of approx. 10000 m^2) per turbine during construction and for on-going maintenance purposes for the lifetime of the proposed development.
- Each wind turbine will consist of a foundation of up to approximately 30 m in diameter. In addition, the foundations will be up to approximately 3 m in depth.
- Electrical transformers (690 V/33 kV) adjacent to each wind turbine (typical footprint of up to approximately 2 m x 2 m) to step up the voltage to between 11 kV and 33 kV.
- One (1) new 11 kV - 33/132 kV on-site substation consisting of two (2) portions: IPP portion / yard (33 kv portion of the shared 33 kv/132 kv portion) and an Eskom portion (132 kv portion of the shared 33 kv/132 kv portion) including associated equipment and infrastructure, occupying a total area of approximately 25 ha (i.e. 250 000 m^2) i.e. 15.5 ha for the IPP Portion and 15.5 ha for the Eskom Portion. The Eskom portion will be ceded over to Eskom once the IPP has constructed the onsite substation. The necessary Transfer of Rights will be lodged with DFFE when required.
- A BESS will be located next to the onsite 33/132 kV substation and included in the 2 ha substation area. The storage capacity and type of technology would be determined at a later stage during the development phase, but most likely comprise an array of containers, outdoor cabinets and/or storage tanks.
- The wind turbines will be connected to the proposed substation via 11 kV to 33 kV underground cabling and overhead power lines.
- A road servitude of 8 m and a 20 m underground cable or overhead line servitude is included.
- Internal roads with a width of up to approximately 5 m wide will provide access to each wind turbine. Existing site roads will be used wherever possible, although new site roads will be constructed where necessary. Turns will have a radius of up to 50 m for abnormal loads (especially turbine blades) to access the various wind turbine positions. It should be noted that the proposed application site will be accessed via the DR1475 District Road and DR1475, MR316 and MR319 WCG provincial roads.
- One construction laydown / staging area of up to approximately 3 ha will be located on the site identified for the substation. It should be noted that no construction camps will be required in order to house workers overnight as all workers will be accommodated in the nearby town.
- Operation and Maintenance buildings, including offices, a guard house, operational control centre, operational and maintenance area / warehouse / workshop and ablution facilities will be located on the site identified for the substation. This will be included in the 2 ha substation area.
- A wind measuring lattice (approximately 120 m in height) mast has already been strategically placed within the wind farm application site in order to collect data on wind conditions.
- No new fencing is envisaged at this stage. Current fencing includes standard farm fencing approximately 1-1.5 m in height. Fencing might be upgraded (if required) to be up to approximately 2 m in height.
- Water will either be sourced from existing boreholes located within the application site or will be trucked in, should the boreholes located within the application site be limited.

- An optic fibre overhead or underground line will be fed from the Adamskraal Substation to the proposed on-site substation.

3.2.2 Grid Components

The proposed grid connection infrastructure to serve the Karee WEF will include the following components:

- One new 11-33/132 kV on-site substation, situated on a site occupying an area of up to approximately 2 ha. The proposed substation will be a step-up substation and will include an Eskom portion and an Independent Power Producer (IPP) portion, hence the substation has been included in both the BA for the WEF and in the BA for the grid infrastructure to allow for handover to Eskom. The applicant will remain in control of the low voltage components (i.e., 33 kV components) of the substation, while the high voltage components (i.e., 132 kV components) of this substation will likely be ceded to Eskom shortly after the completion of construction.
- One new 132 kV overhead power line will connect the on-site substation to Kappa Substation and thereby feed the electricity into the national grid. Power line towers being considered for this development include self-supporting suspension monopole structures for relatively straight sections of the line and angle strain towers where the route alignment bends to a significant degree. Maximum tower height is expected to be approximately 25 m.

3.3 Layout Alternatives

3.3.1 Wind Energy Facility

No other activity or site alternatives are being considered. Renewable Energy development in South Africa is highly desirable from a social, environmental and development point of view and a WEF is considered suitable for this site due to the high wind resource in this area.

The choice of technology selected for the Karee WEF is based on environmental constraints and technical and economic considerations. No other technology alternatives are being considered as WEFs are more suitable for the site than other forms of renewable energy (such as solar) due to the high wind resource.

The size of the wind turbines will depend on the development area and the total generation capacity that can be produced as a result. The choice of turbine to be used will ultimately be determined by technological and economic factors at a later stage.

Design and layout alternatives will be considered and assessed as part of the environmental assessment. These include alternatives for the substation locations and also for the construction / laydown area. The proposed preliminary layout is shown in Figure 7 below.

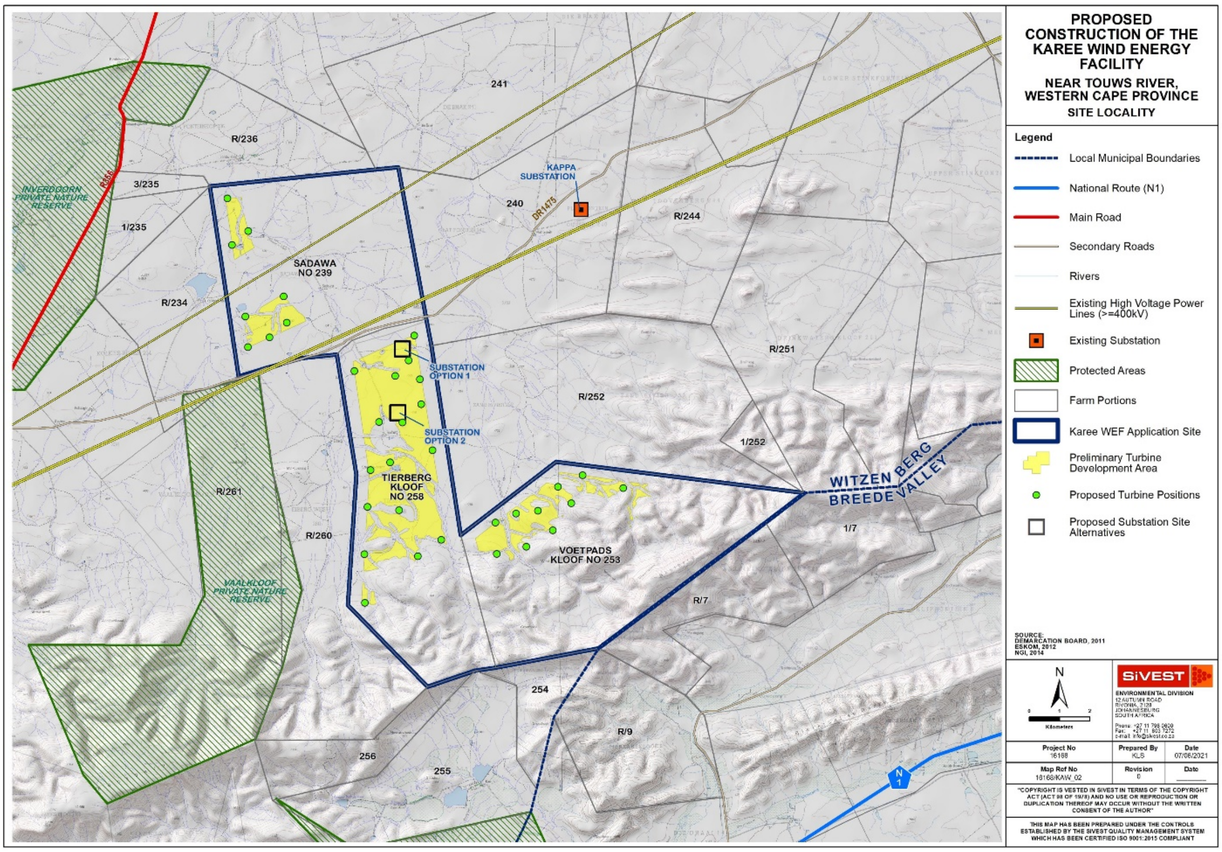


Figure 7: Preliminary Turbine layout and development area

3.3.2 Grid Components

The grid connection infrastructure proposals include two substation site alternatives, each of which is 25 ha in extent, and two (2) power line route alignment alternatives (see Figure 8). These alternatives will be considered and assessed as part of the BA process and will be amended or refined to avoid identified environmental sensitivities.

All power line route alignments will be assessed within a 150 m wide assessment corridor (75 m on either side of power line). These alternatives are described below:

- Power Line Corridor Option 1 is between 8.5 km and 10.5 km in length, linking either Substation Option 1 or Substation Option 2to Kappa Substation: and
- Power Line Corridor Option 2 is between 8.4 km and 11.4 km in length, linking either Substation Option 1 or Substation Option 2 to Kappa Substation.

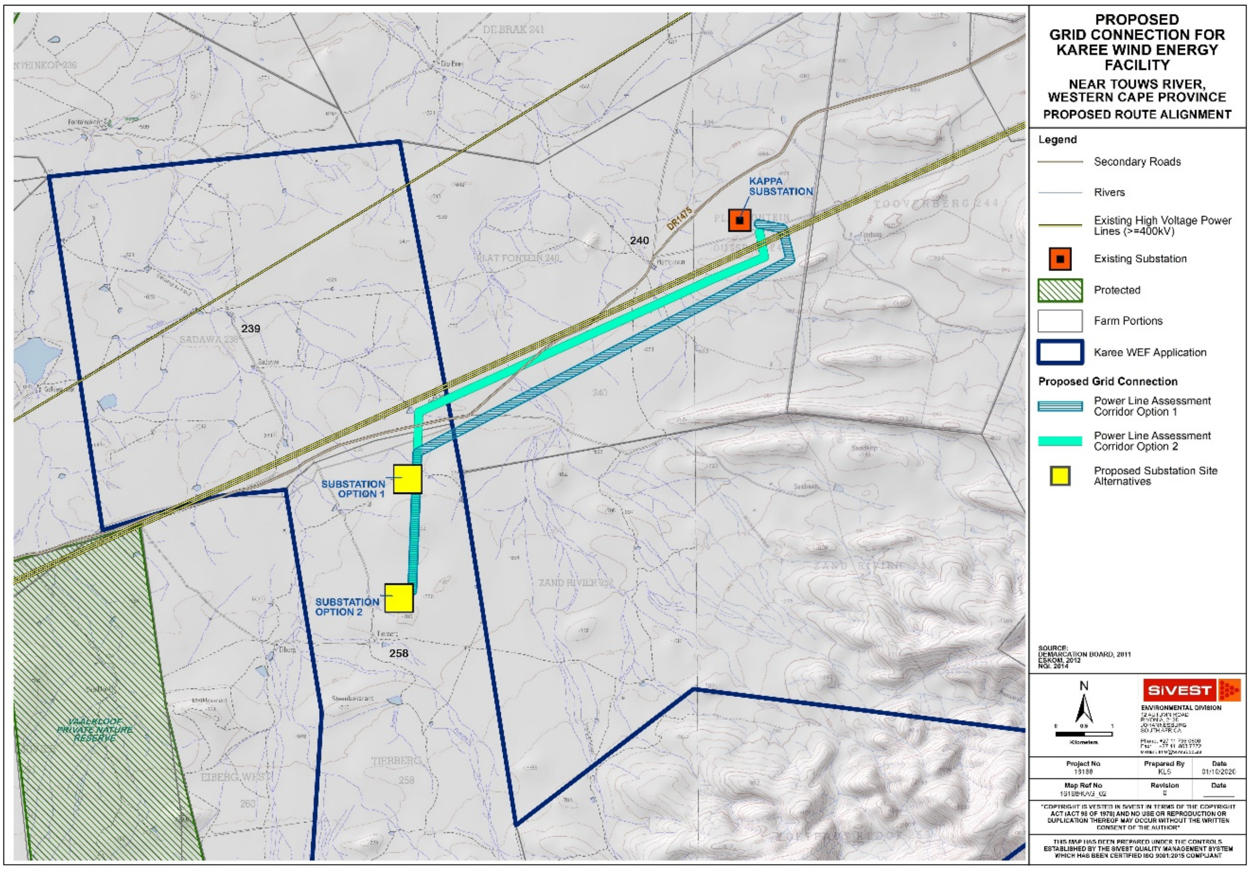


Figure 8: Proposed Substation and Power line options

3.3.3 'No-go' Alternative

The 'no-go' alternative is the option of not undertaking the proposed WEF and grid connection infrastructure projects. Hence, if the 'no-go' option is implemented, there would be no development. This alternative would result in no environmental impacts from the proposed project on the site or surrounding local area. It provides the baseline against which other alternatives are compared and will be considered throughout the report.

The 'no-go' option is a feasible option; however, this would prevent the proposed development from contributing to the environmental, social, and economic benefits associated with the development of the renewable energy sector.

4. LEGAL REQUIREMENT AND GUIDELINES

Environmental law in the form of legislation, policies, regulations, and guidelines guide and manage development practices to ensure informed decision making and sound risk management of current and future projects, i.e., the impact of the proposed development on the ambient bat environment. The applicable legislation is listed below.

- Constitution of the Republic of South Africa, 1996 (Act No. 108 of 1996);
- National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended (NEMA);
- National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004);
- Northern Cape Nature Conservation Act, 2009 (Act No. 9 of 2009);
- Convention on the Conservation of Migratory Species of Wild Animals (1979);
- Convention on Biological Diversity (1993);
- The Equator Principles (2013);
- The Red List of Mammals of South Africa, Swaziland, and Lesotho (2016);
- National Biodiversity Strategy and Action Plan (2005); and
- Aviation Act (Act no 74 of 1962).

In addition to the laws indicated above, guidelines have also been developed by the South African Bat Assessment Association (SABAA) to inform wind energy development:

- The South African Good Practice Guidelines for Surveying Bats in Wind Farm Developments – Pre-Construction (MacEwan *et al.*, 2020);
- Mitigation Guidance for Bats at Wind Energy Facilities in South Africa (Aronson *et al*., 2018);
- South African Bat Fatality Threshold Guidelines (MacEwan *et al*., 2018); and
- Good Practice Guidelines for Operational Monitoring for Bats at Wind Energy Facilities (Aronson *et al*., 2020).

5. DESCRIPTION OF THE RECEIVING ENVIRONMENT

5.1 Background information

A literature review of existing reports, studies and guidelines, legislation and SANBI GIS database, as well as site visits relevant to the study area, were conducted to establish a background study of the site and associated environment. The proposed development follows the South African national, regional, and municipal proposition in the Integrated Resource Plan (IRP) (2010-2030) that 17 800 MW of renewable energy capacity should be secured by 2030 (energy.gov.za). Furthermore, wind energy development is an opportunity for the key priority of job creation for the community of Touws River (Laurie, 2018).

The proposed Karee WEF and associated infrastructure will be developed in the Western Cape, on portions of the original Tierberg and Voetpadskloof. The area selected for the Karee WEF is approximately 15 km, as the crow flies, from Touws River, and is situated in the Komsberg REDZ.

5.2 Regional vegetation and climate

5.2.1 Climate

The town of Touws River, which is situated in the Western Cape, has a local steppe climate with a rainfall of approximately 206 mm per annum (Meteoblue, 2021). Touws River is situated 185 km east of Cape Town and is often referred to as the doorway to the Karoo (Karoo Information Travel Directory, 2021). The region around Touws River has a semi-arid climate and receives its maximum rainfall of 28 mm per annum during April; see Figure 9 below (Meteoblue, 2021). Typical of a semi-arid climate, this area is dry for 259 days a year (Besttimetovisit.co.za, 2021), while the average humidity in Touws River is around 57% (see Figure 9).

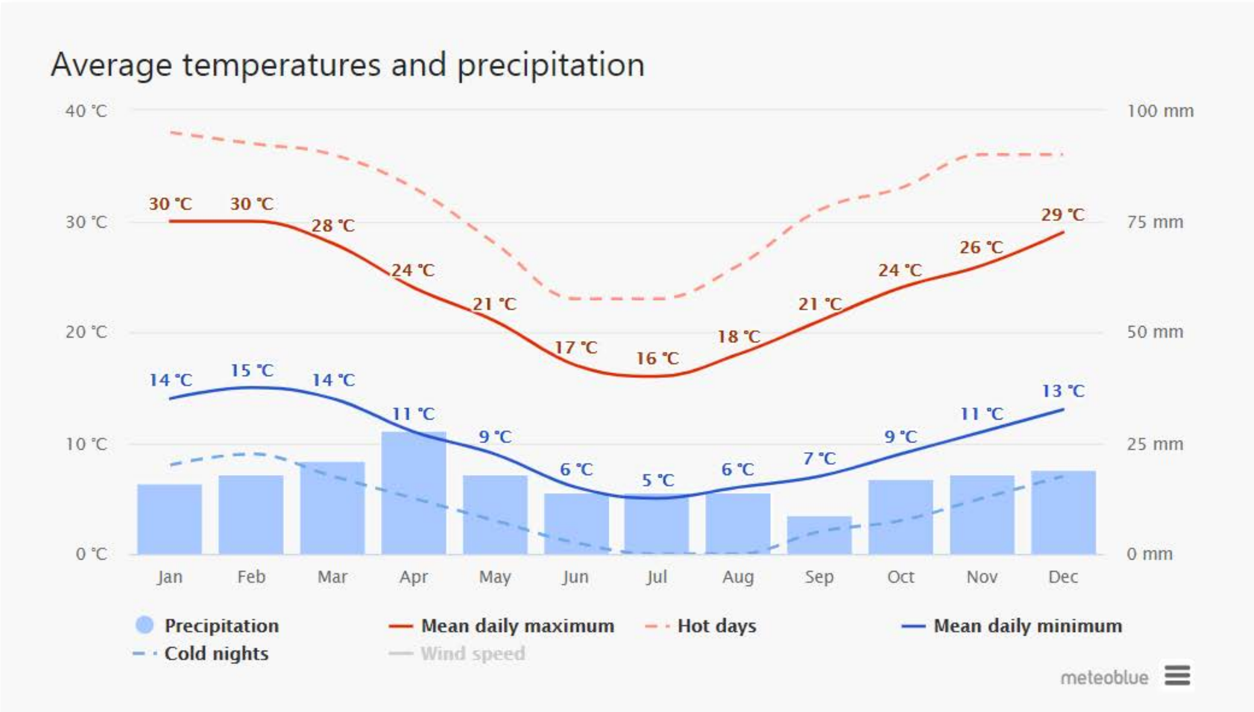


Figure 9: Climate of the Touws River region

Climatic conditions are extreme and vary from cold winters to hot summers. Extreme summer temperatures of 38 ^{0}C and winter temperatures of 0 ^{0}C have been recorded at Touws River. Mean daily maximum summer temperatures from December to March average 29 ^{0}C to 30 ^{0}C, autumn temperatures from March to May average 21 ^{0}C to 28 ^{0}C, winter temperatures from June to August range from 16 to 18 ^{0}C and spring temperatures between September and November average 21 ^{0}C to 26 ^{0}C (Meteoblue, 2021).

5.2.2 Vegetation

The proposed study area falls within the Little Karoo. It comprises vegetation from two different biodiversity hotspots, namely the Fynbos and Succulent Karoo Biome. The fynbos biome vegetation types include Matjiesfontein Shale Renosterveld and Matjiesfontein Quartzite Fynbos. The Fynbos Biome is possibly the most well-known biodiversity hotspot in South Africa and is furthermore identified as a UNESCO World Heritage Site (Poulson ZC, 2020). The Succulent Biome area is covered by Tanqua Karoo. The Succulent Karoo Biome has high levels of plant endemism as earth's only entirely arid hot spot of plant diversity (Van Wyk and Smith, 2001). See Figure 10 for a map of the vegetation zones on site.

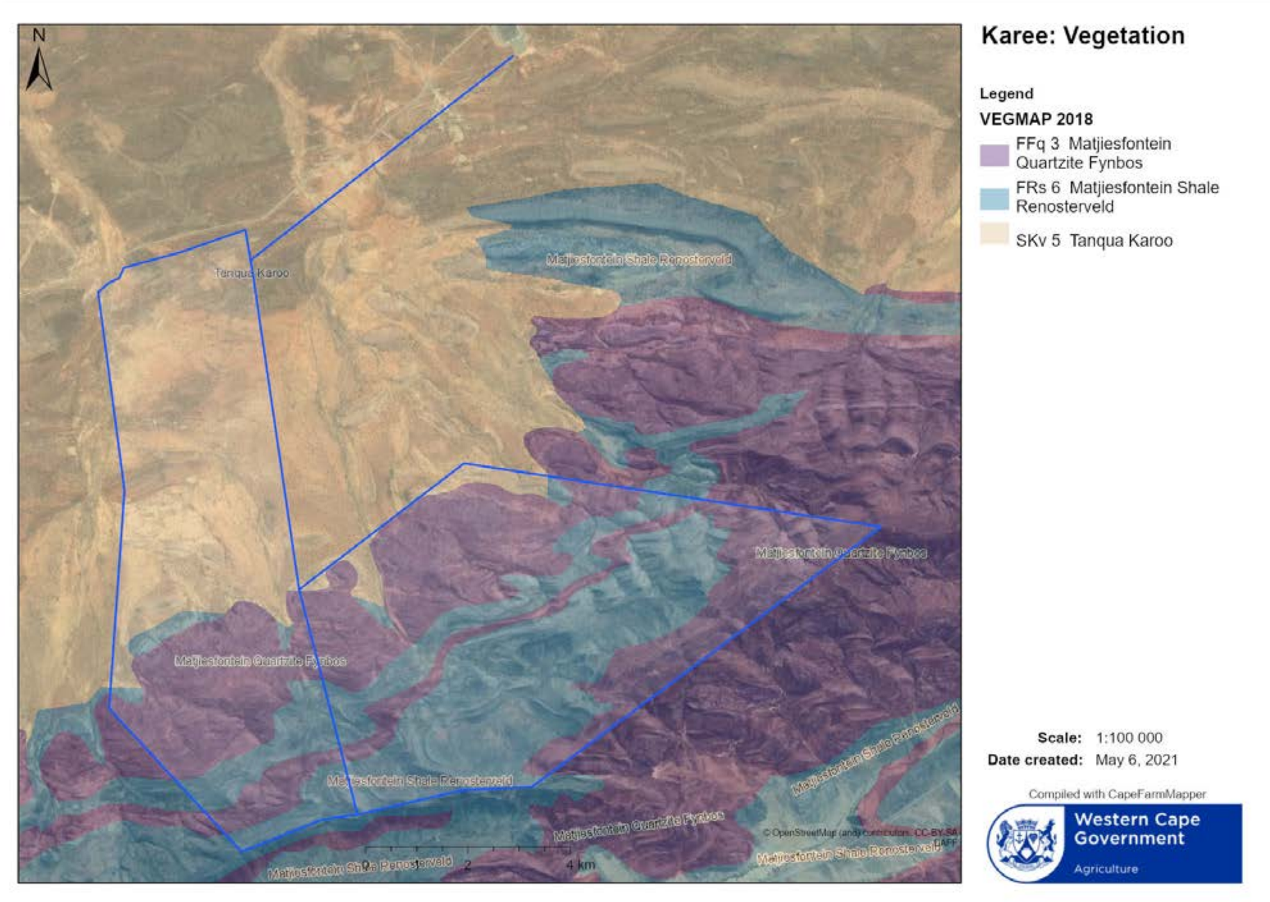


Figure 10: Karee WEF Vegetation Zones (SANBI, 2012)

Regionally the site falls within three Bioregions, namely Inland Saline Vegetation, Rainshadow Valley Karoo Bioregion and Western Fynbos-Renosterveld Bioregion. Bokkeriviere Nature Reserve, the closest provincial nature reserve, is approximately 17 km south-west from the proposed site, with the closest border of Vaalkloof Nature Reserve within 3 km to the west from the proposed Karee WEF (see Figure 11).

Figure 11: Protected areas and private nature reserves in the vicinity of Karee WEF

5.2.3 Land use

As indicated Figure 12 below, land use in the development area is dominated by low shrubland which is utilised for game farming. Some farms in the surrounding area are used for grazing small stock farming. It is not foreseen that the land use will change within the lifespan of the WEF.

The grazing capacity of the area, mostly known as "suurveld", is low and the wider area, being situated in the REDZ, is at present regularly leased to developers for solar and wind energy production.

The only infrastructure on the project site are farm buildings, infrastructure for water points, farm tracks and fences.

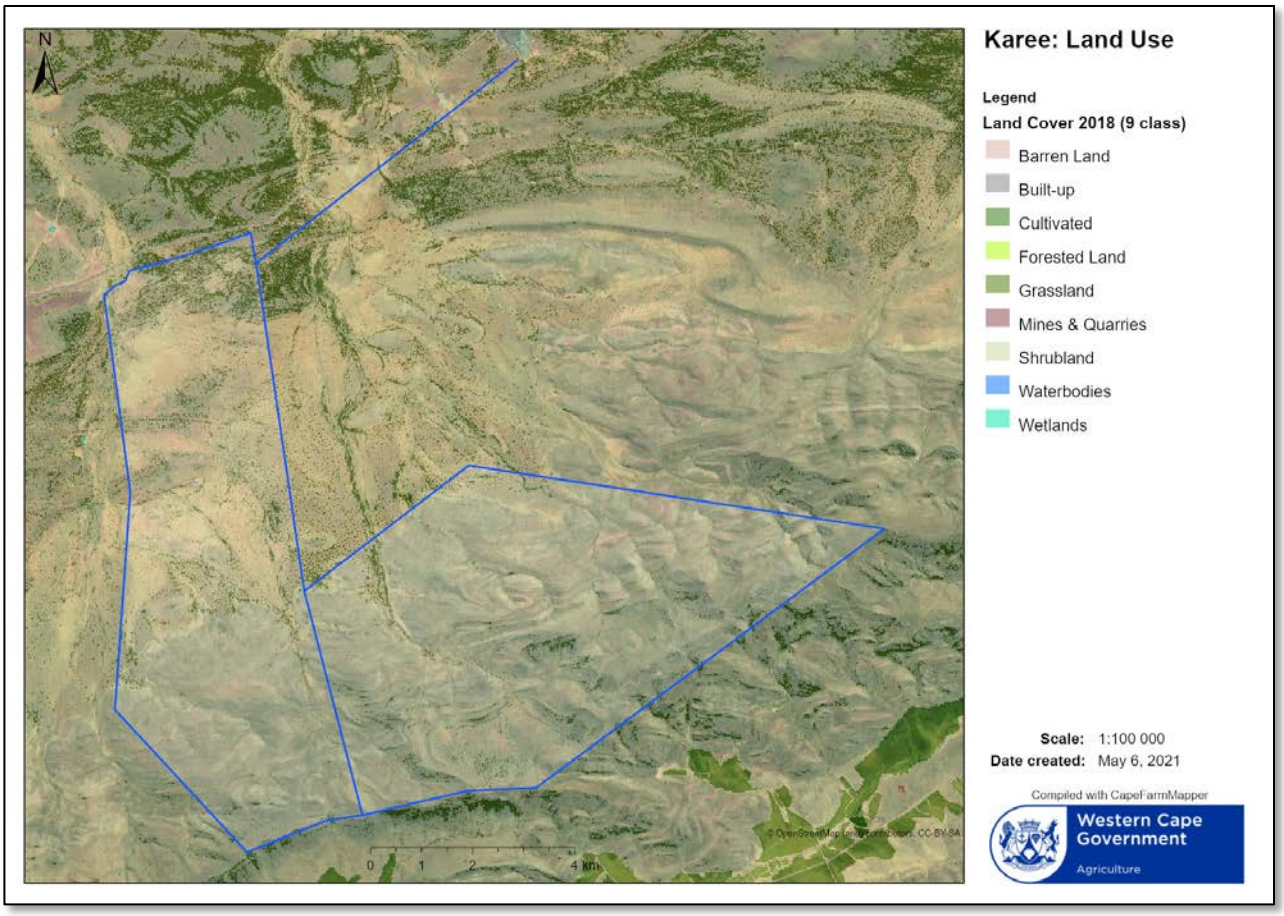


Figure 12: Land use in the Karee WEF area

5.2.4 Geography

The topographical land elevation increases from the main access road in the north, towards the Bonteberg mountain range in the southern and south-eastern parts of the WEF. A large part of the wider development area comprises mountains, with numerous rocky hills and valleys (see Figure 13). Although no prominent non-perennial rivers occur on the project site, various lower order streams and gullies run from south to north along the Bonteberg valleys.

Figure 13: View towards the Bonteberg mountain range in the south, with ample bat roosting opportunities

5.3 Features conducive to bats at the WEF

Bats are dependent on suitable roosting sites provided mainly by human structures, vegetation, exfoliating rock, rocky outcrops, derelict mine and aardvark holes and caves (Monadjem et al., 2020). The foraging utility of a site is further determined by water availability and availability of food. Thus, the vegetation, geomorphology and geology of an area are important predictors of bat species diversity and activity levels.

5.3.1 Vegetation

Typical Karoo vegetation occurs at the wind farm development terrain, with some denser vegetation in the water drainage lines. For those bats that might prefer roosting in vegetation or under the bark of trees, these dense bushes could provide roosting opportunities (see Figures 14 and 15).

Figure 14: Karoo riverine vegetation surrounding the Kolkies Rivier, running from the Bonteberg mountains

Figure 15: Karee WEF view towards the north, with typical Ceres Karoo vegetation

5.3.2 Rock formations and rock faces

Boulders and rock formations in the Bonteberg mountains situated towards the south of the development area, provide ample roosting space for bats (see Figure 16).

Figure 16: Rock formations in the southern section of the Karee WEF

5.3.3 Human dwellings

Where roofs are not sealed off, human dwellings could provide roosting space for some bat species. The human dwelling situated on the Karee WEF site was seasonally searched and no roosts or any bat activity were identified.

5.3.4 Open water sources

Non-perennial rivers and dams provide open water sources for bats throughout the year (see Figure 17). Figure 18 depicts the drainage lines at the Karee WEF site.

Figure 17: Water in the Karee WEF site collected in the riverbed close to the 10 m mast G

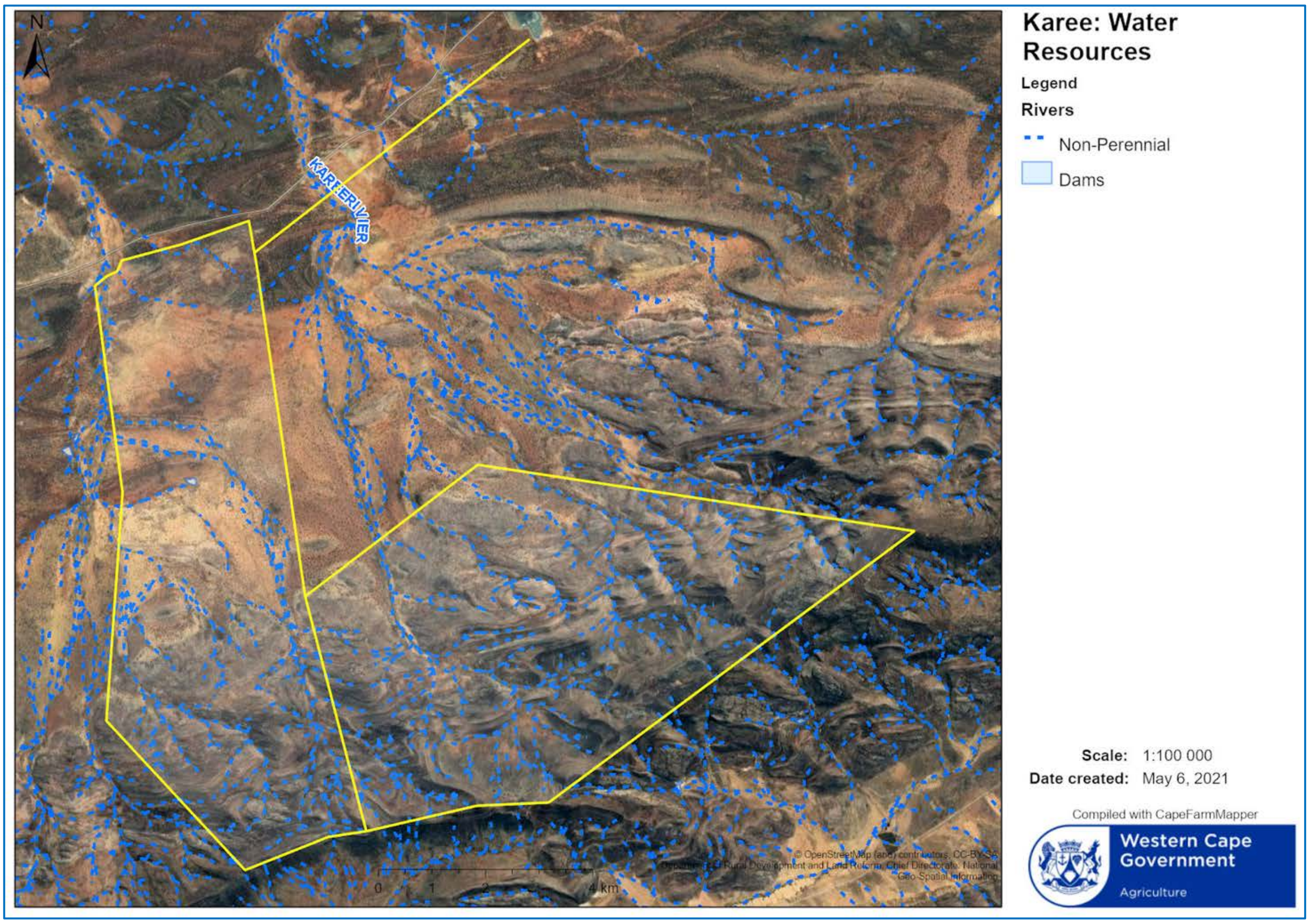


Figure 18: Water Resources in the Karee WEF project area

5.3.5 Food sources

Small amounts of water collected in the riverbed could serve as breeding ground for insects which could serve as food for bats, so that higher insect activity could result in higher bat presence (see Figure 17 and Figure 18).

5.4 Background to bats in the area

The extent to which bats may be affected by the proposed WEF will depend on the extent to which the proposed development area is used as a foraging site or as a flight path by local bats.

5.4.1 Bat Species Diversity of the local Area

A summary of bat species distribution, their feeding behaviour, preferred roosting habitat, and conservation status is presented in Table 2 below. The bats identified in the table below have distribution ranges covering the Karee WEF development area and bats that had been confirmed up to now on the project site itself or other WEFs in the area, are marked as such. The proposed WEF falls within the distributional ranges of six bat families and approximately 12 species. Table 2 follows the most recent distribution maps of Monadjem *et al.* (2010 and 2020). It should be noted that this table will be adapted during the operational monitoring.

As indicated in Table 2, of the 12 species which have distribution maps overlaying the proposed development area, four have a conservation status of Near Threatened in South Africa and one vulnerable, while three have a global conservation status of Near Threatened. *Rhinolophus capensis* (Cape horseshoe bat), *Eptesicus hottentotus* (Long-tailed serotine) and *Cistugo seabrae* (Angolan wing-gland bat) are endemic to Southern Africa, mainly due to agricultural activities and have limited suitable habitat left (Monadjem, 2010).

According to the likelihood of fatality risk, as indicated by the latest pre-construction guidelines (Sowler *et al*., 2017), four species, namely *Miniopterus natalensis* (Natal long-fingered bat), *T. aegyptiaca* (Egyptian free-tailed), *S. petrophilus* (Roberts's flat-headed bat) and *N. capensis* (Cape serotine), have a high risk of fatality. The high risk of fatality for *T. aegyptiaca* and *S. petrophilus* is due to their foraging habitat at high altitudes. *Myotis tricolor* (Temminck's myotis bat) has a medium to high risk of fatality while *E. hottentotus* has a medium risk of fatality.

The two Pteropodidae species, with a medium to high risk of fatality, are not expected to roost on the project site itself, as this environment is not expected to be their preferred habitat, however, they could traverse over the project site during migration and are therefore included.

Table 2: Potential bat species occurrence at the proposed Karee WEF site (Monadjem et al., 2020; IUCN, 2017)

Family	Species	Common Name	SA conserva-tion status	Global conserva-tion status (IUCN)	Roosting habitat	Functional group (type of forager)	Migratory behaviour	Likelihood of fatality risk*	Bats confirmed in vicinity
PTEROPODIDAE	*Eidolon helvum*	African straw-coloured fruit	Not evaluated	Least Concern	Little known about roosting behaviour	Broad wings adapted for clutter. Studies outside of South Africa list fruit and flowers in its diet.	Migrater. Recorded migration up to 2 518 km in 149 days, and 370 km in one night.	Medium-High	
	Rousettus aegyptiacus	Egyptian rousette	Least Concern	Least Concern	Caves	Broad wings adapted for clutter. Fruit, known for eating Ficus species.	Seasonal migration up to 500 km recorded. Daily migration of 24 km recorded.	Medium-High	
MINIOPTERIDAE	*Miniopterus natalensis*	Natal long-fingered bat	Near Threatened	Near Threatened	Caves	Clutter-edge, insectivorous	Seasonal, up to 150 km	High	✓
NYCTERIDAE	*Nycteris thebaica*	Egyptian slit-faced bat	Least Concern	Least Concern	Cave, Aardvark burrows, road culverts, hollow trees. Known to make use of night roosts.	Clutter, insectivorous, Avoid open grassland, but might be found in drainage lines	Not known	Low	
MOLOSSIDAE	*Tadarida aegyptiaca*	Egyptian free-tailed bat	Least Concern	Least Concern	Roofs of houses, caves, rock crevices, under exfoliating	Open-air, insectivorous	Not known	High	✓

Family	Species	Common Name	SA conserva-tion status	Global conserva-tion status (IUCN)	Roosting habitat	Functional group (type of forager)	Migratory behaviour	Likelihood of fatality risk*	Bats confirmed in vicinity
					rocks, hollow trees				
	Sauromys petrophilus	Robert's Flat-headed bat	Least Concern	Least Concern	Narrow cracks, under exfoliating of rocks, crevices.	Open-air, insectivorous		High	✓
RHINOLOPHIDAE	*Rhinolophus capensis*	Cape horseshoe bat (endemic)	Near Threatened	Near Threatened	Caves, old mines. Night roosts used	Clutter, insectivorous	Not known	Low	
	Rhinolophus clivosus	Geoffroy's horseshoe bat	Near Threatened	Least Concern	Caves, old mines. Night roosts used	Clutter, insectivorous		Low	
VESPERTILIO- NIDAE	*Neoromicia capensis*	Cape serotine	Least Concern	Least Concern	Roofs of houses, under bark of trees, at basis of aloes	Clutter-edge, insectivorous	Not known	High	✓
	Myotis tricolor	Temminck's myotis	Near Threatened	Least Concern	Roosts in caves, but also in crevices in rock faces, culverts and	Limited information available	Not known	Medium-High	

Family	Species	Common Name	SA conserva-tion status	Global conserva-tion status (IUCN)	Roosting habitat	Functional group (type of forager)	Migratory behaviour	Likelihood of fatality risk*	Bats confirmed in vicinity
					manmade hollows				
	Eptesicus hottentotus	Long-tailed serotine (endemic)	Least Concern	Least Concern	Caves, rock crevices, rocky outcrops	Clutter-edge, insectivorous	Not known	Medium	✓
	Cistugo seabrae	Angolan wing-gland bat (endemic)	Vulnerable	Near Threatened	Possibly buildings, but no further information	Clutter-edge, insectivorous	Not known	Low	

**Likelihood of fatality risk as indicated by the pre-construction guidelines (MacEwan et al., 2020)*

** Nycteris thebaica has been re-classified in Monadjem et al., (2020) and it is noted that T. aegyptiaca will be split into more than one species in the nearby future, but for the purpose of this study we conclude with the species as mentioned in the above table.*

6. SPECIALIST FINDINGS / IDENTIFICATION AND ASSESSMENT OF IMPACTS

6.1 Results and Discussion

6.1.1 Static Recorders

Passive monitoring data for the period between 11 June 2021 and 27 June 2022 are included in this report. It is important to note that static recordings have limitations, as discussed in Section 2, but do provide a scientifically sound method of assessing the bat situation on site.

6.1.2 Bat Species Diversity

Calls of five of the 12 species that have distribution maps overlaying the proposed development site had been recorded by the static recorders during the 12-month monitoring period (see Table 2 and Figure 19).

The data from the static recordings confirm the species distribution maps of the region. 75% of the calls of all the combined systems represent *T. aegyptiaca*, which is the dominant species on site. *T. aegyptiaca* is a high-risk species, physiologically adapted with a narrow wingspan to fly high, in the vicinity of the turbine blades. Due to this foraging preference, the risk of collision and barotrauma is high. Two more species have a significant presence: *Sauromys petrophilus* (13%) and *N. capensis* (9%). 2% of the activity was for the Near Threatened *Miniopterus natalensis* and 1% for the endemic *E. hottentotus*.

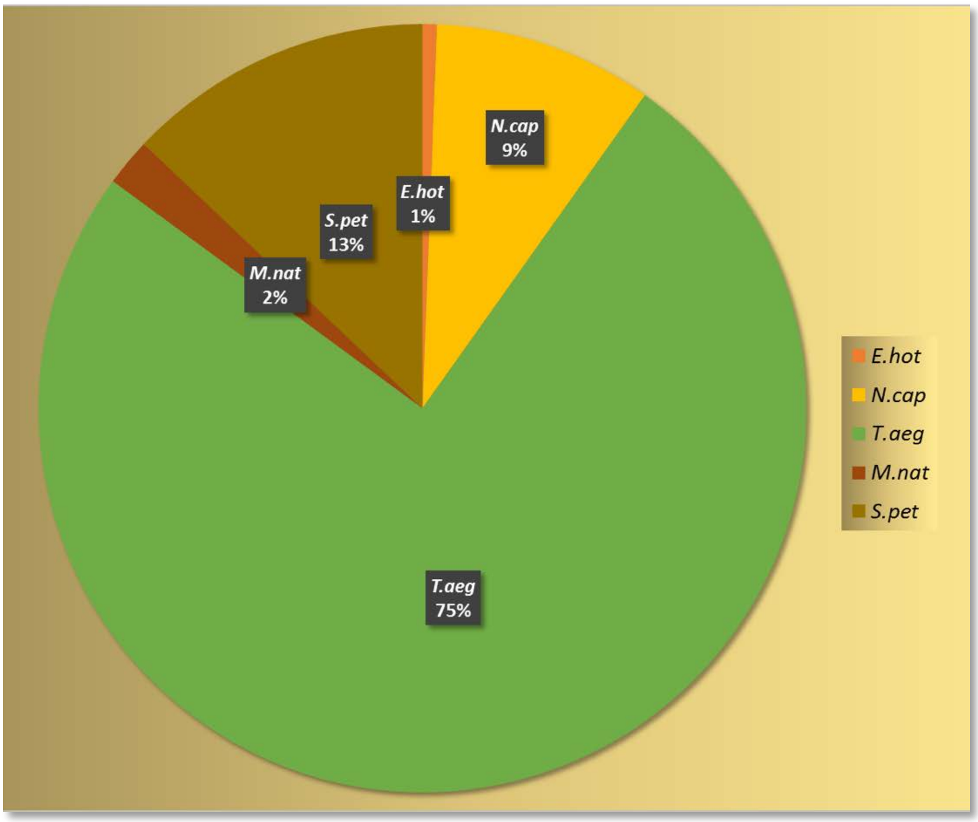


Figure 19: Species diversity at the proposed Karee WEF site

The species diversity is often higher at lower altitudes, which is demonstrated by Figure 20. Although there are a similar number of species recorded at the lower systems, the percentage activity by species other than *T. aegyptiaca* is higher at the near ground systems. At the Karee WEF site, the Molossidae family is more dominant at the high-altitude systems, with the molossids *S. petro*philus and *T. aegyptiaca* nearly comprising 100% of all the activity recorded at height (Systems D and E). Both these species are classified as high-risk species and one could therefore derive that Molossids run the highest risk of being killed by the turbine blades.

The remainder of the calls represent *N. capensis, M. natalensis and E. hottentotus*. Although *T. aegyptiaca* depicts the highest activity at all monitoring stations, the above three species portrays a higher proportion at the near ground masts, particularly close to the mountainous area in the north, represented by System I. It is noteworthy that 3% of the activity recorded at this system was like that of the Near Threatened *M. natalensis* and 1% of the endemic *E. hottentotus.*

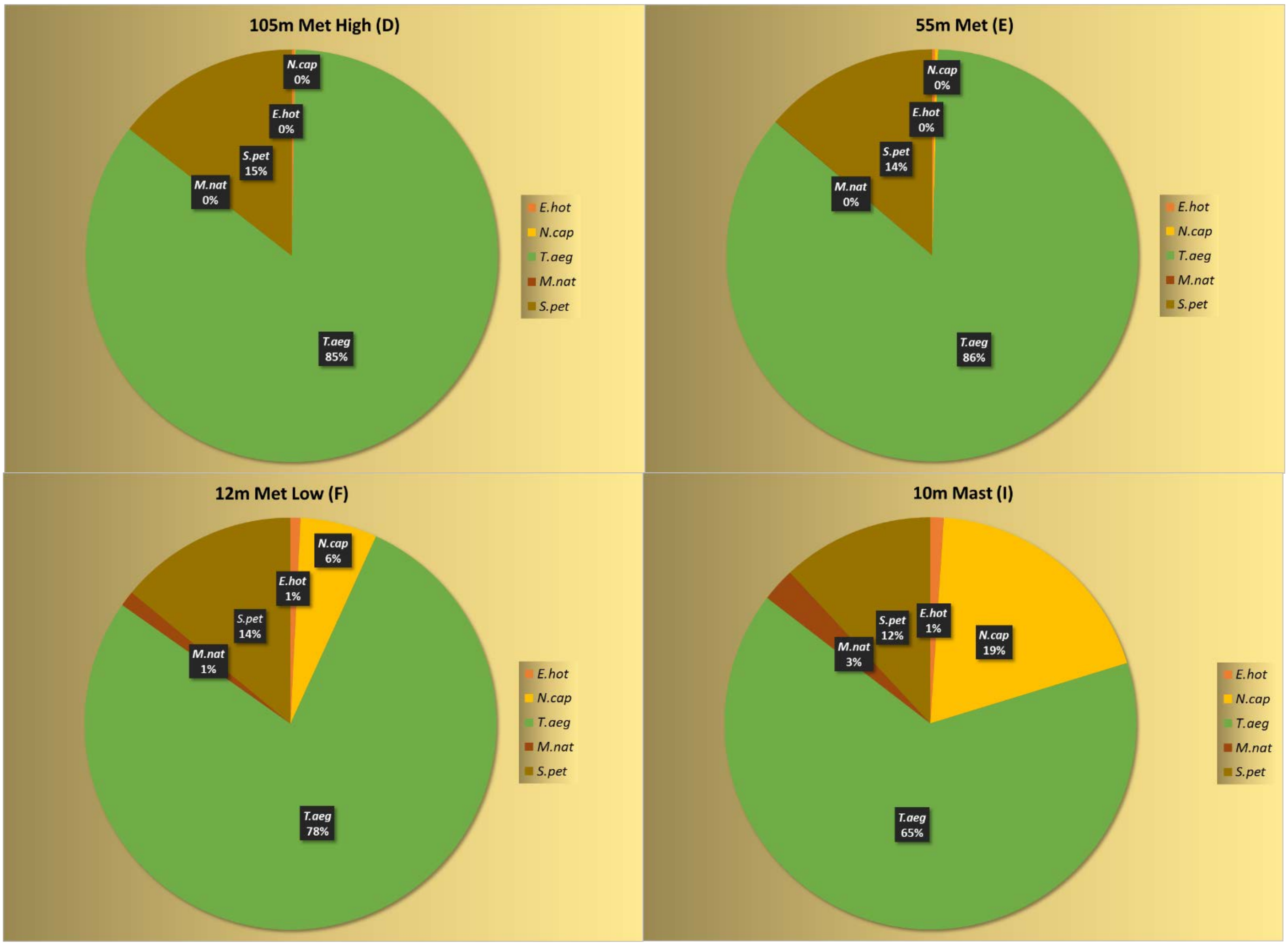


Figure 20: Species diversity at different altitudes at Karee WEF

6.1.3 Species distribution over the monitoring period

Figure 21 below portrays the weekly temporal distribution of bat passes over the 12-month monitoring period. The light blue histogram depicts higher activity, indicating the higher occurrence of *T. aegyptiaca*, especially during springtime up until early autumn, September to March, with a peak early September and a second lower peak around middle February. *S. petrophilus* mimics to a large extent the activity pattern of *T. aegyptiaca*. Very low activity occurs from early April to middle May in autumn, with a slight increase in middle May. In general, bat activity increases during warmer seasons, and according to the present data, it also is the case at the Karee WEF site.

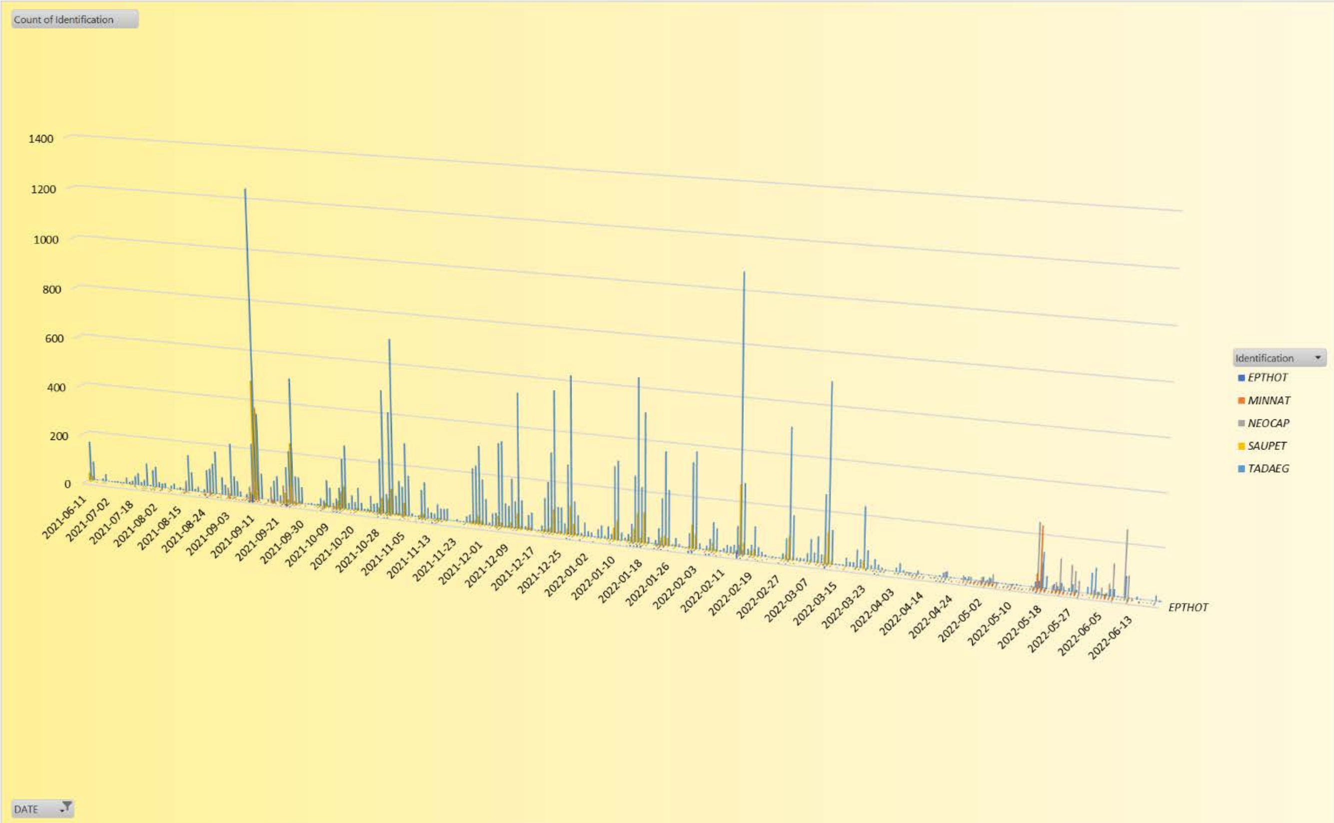


Figure 21: Distribution of bat activity over the monitoring period

Figure 22 below depicts the monthly average hourly bat passes within the sweep of the turbine blades. This mirrors Figure 21, in that it too demonstrates the rapid increase in bat activity in the month of September. From December a gradual decrease is experienced up to April. Figure 22 demonstrates a decline in activity by *T. aegyptiaca* during November. Although there is no published information concerning the breeding of *T. aegyptiaca* in the Succulent Karoo, in other parts of the country, this species usually has their pups around November, and one could speculate that they hunt closer to their roost when the pups are young, therefore there is less activity recorded following the active spring period. Bats also tend to be more active when emerging from the cold winter months, especially if they have to increased food intake before pup season. Then one often experiences an increase in activity again before winter, in autumn, when they need to stock up for the winter months. Although there is not much of an increase in activity before winter, there is a small increased activity seen in May 2022.

Figure 23 below depicts the average bat activity per season, showing the increased activity during spring and autumn.

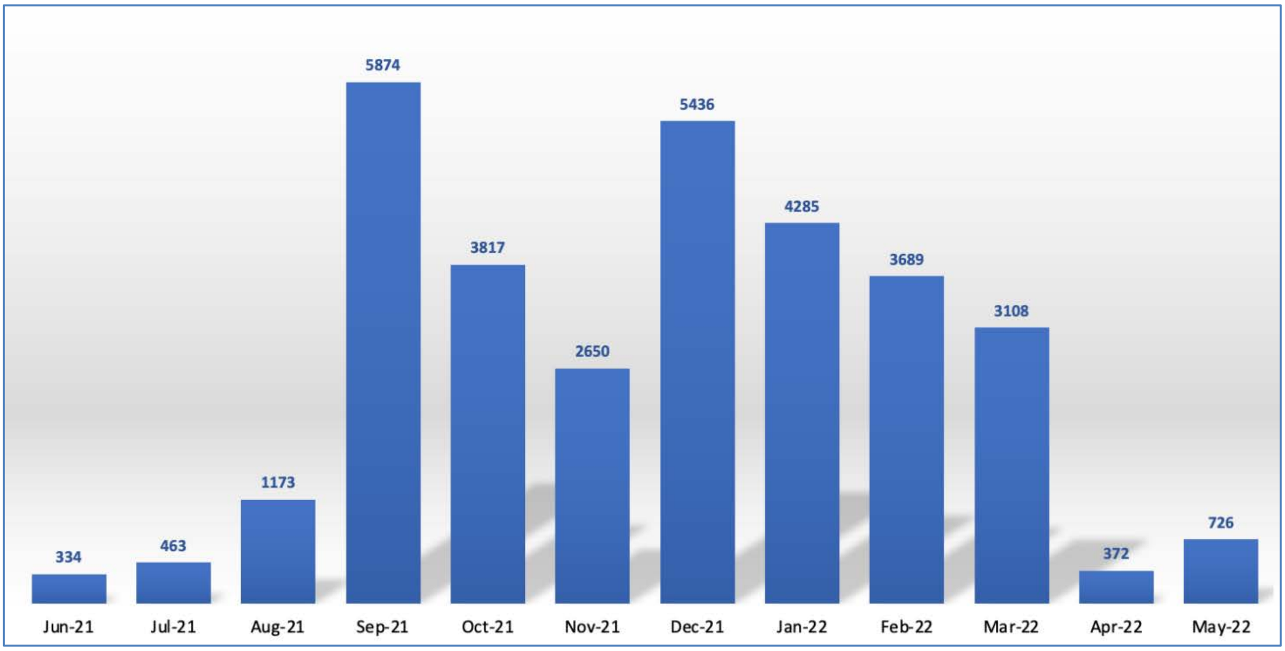


Figure 22: Bat activity at the project site per month

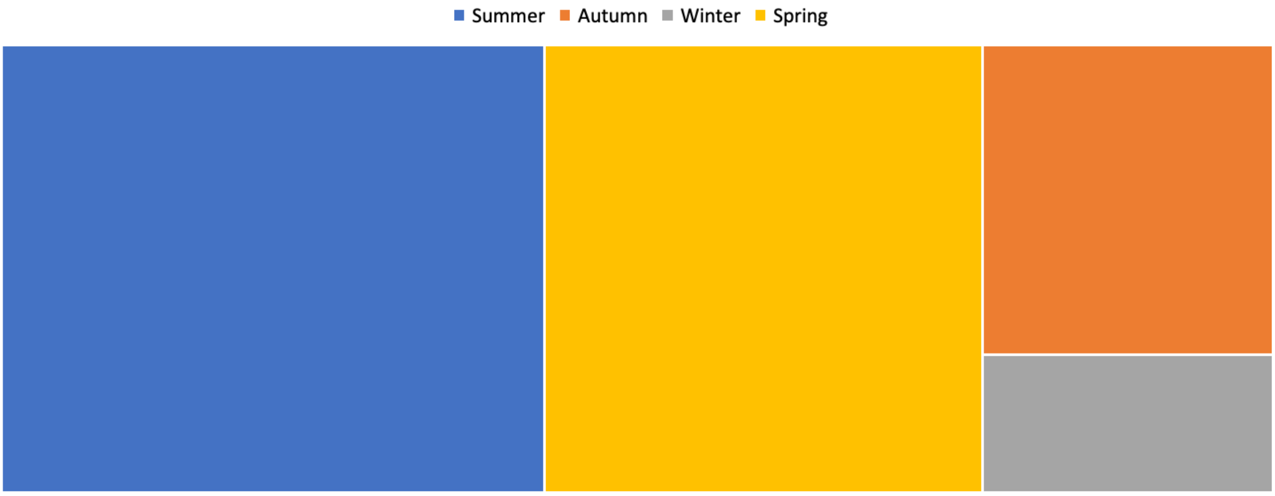


Figure 23: Seasonal proportions of average bat activity

The bat activity over the monitoring year at the two high sampling systems, situated within the sweep of the proposed turbine blades, are depicted in Figure 24 below, confirming the trend of high bat activity during spring and the first two months of summer, from September to March, with the first peak in September. As expected, the 55 m sampling point (System E) recorded significantly higher activity than at 105 m (System D). Therefore, one would expect the lower section of the turbine sweep to be the most dangerous area for bats.

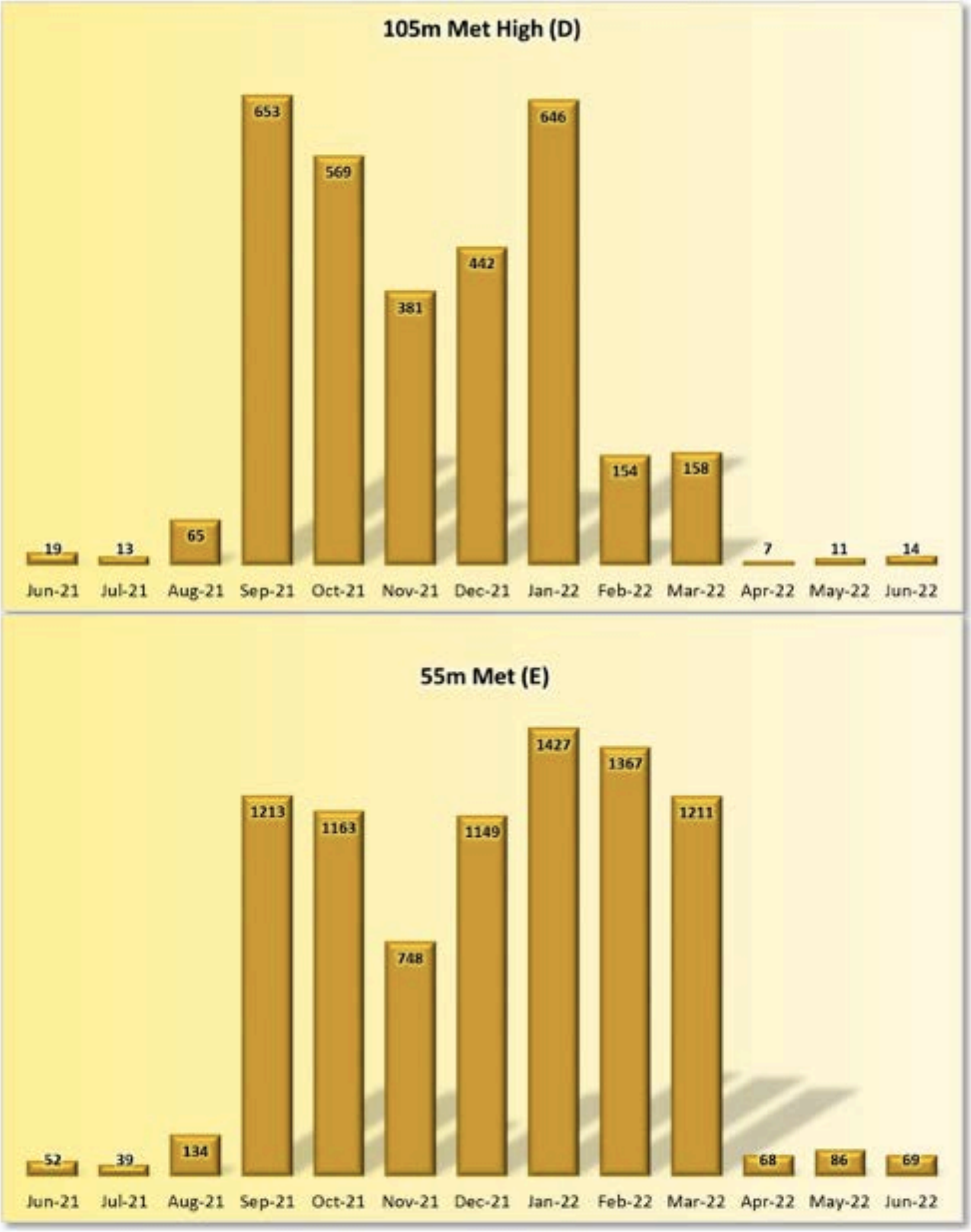


Figure 24: Total bat activity at Met D and E during the monitoring period

6.1.4 Activity per monitoring station

System F, situated at a height of 12 m on the Met mast in the northern part of the project site, recorded the highest bat activity, with significantly higher bat passes than the other systems, as indicated in Figure 25 below.

What is also of note is that the activity is much higher (more than double) at the 55 m system (E), in comparison to the 105 m system (D). Not only is there a greater diversity of bat species at lower levels, but also a higher activity at lower altitudes. 55 m altitude is within the sweep of the expected turbine blades; more so, the SMMU2 microphones have a recording range up to 30 m, so these bats were recorded well in the expected sweep of the turbine blades.

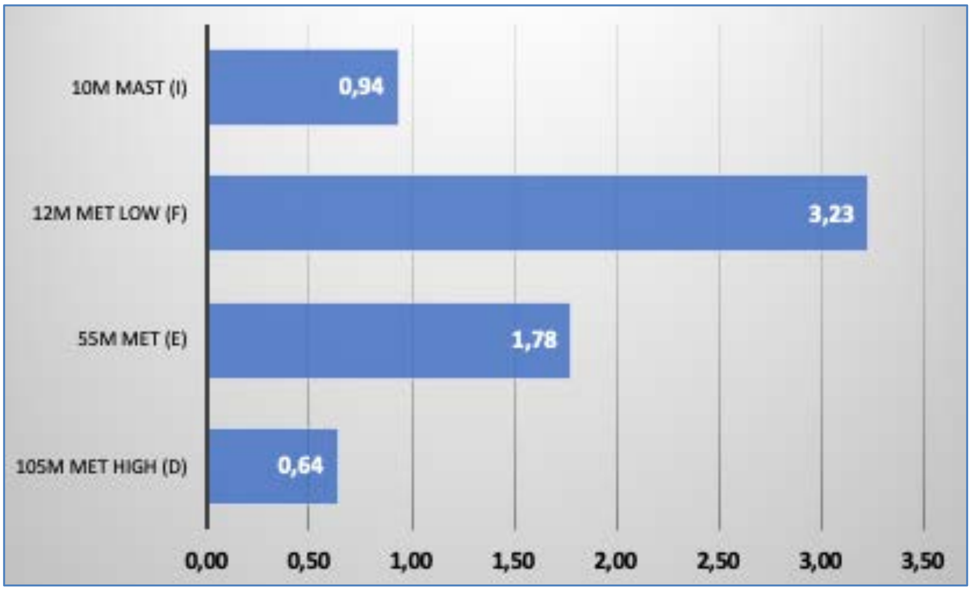


Figure 25: Bat activity per monitoring station during the monitoring period

Figure 26 below depicts the bat activity of each species present over the monitoring period, showing the activity at each monitoring system. The most abundant species, *T. aegyptiaca, S. petrophilus* and *N. capensis* are noted at the 10 m Mast system I and 12 m Met Low mast system F.

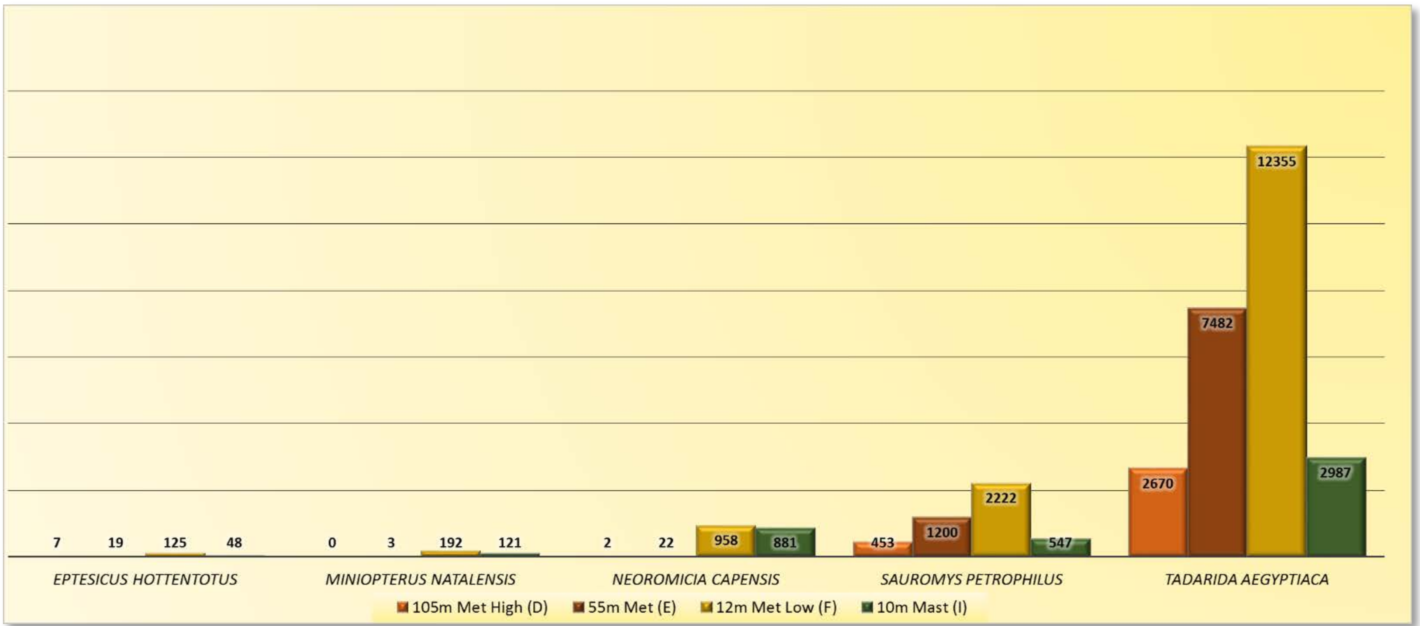


Figure 26: Combined species activity per monitoring station during monitoring period

6.1.5 Species activity on site

Figure 27 depicts the median of hourly activity of the bat species recorded on site over the monitoring period, showing the relatively high activity of *T. aegyptiaca*, followed by *S. petrophilus* and *N. capensis*.

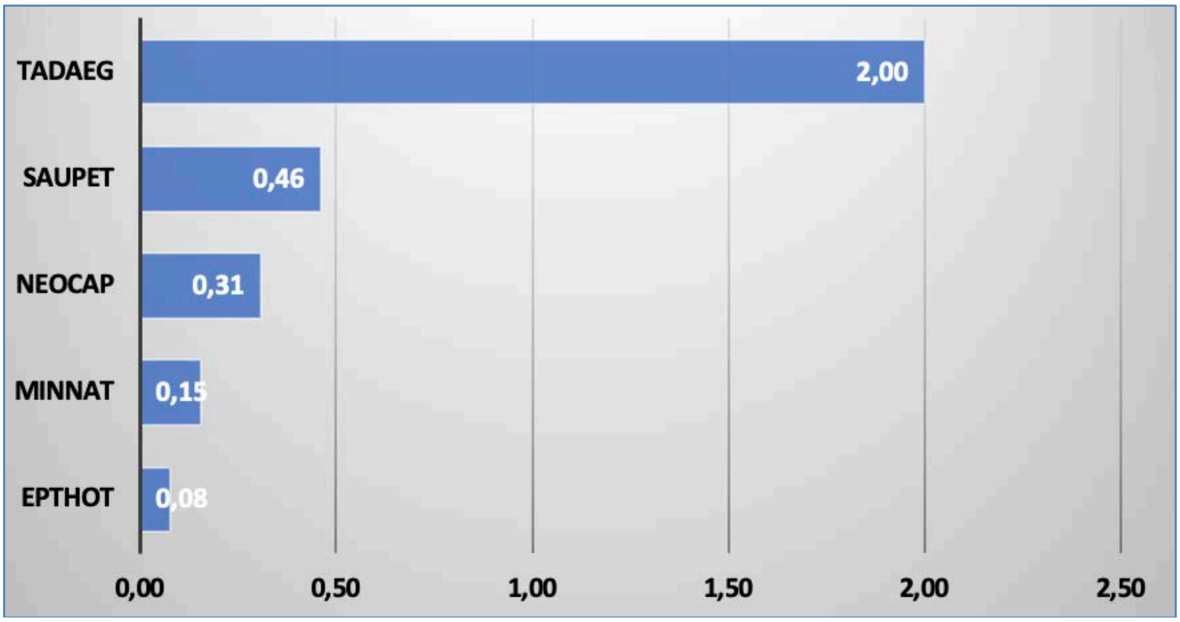


Figure 27: Median of the hourly bat activity on site for recorded bat species during monitoring period

6.1.6 Nightly distribution of bat activity

Total hourly nightly bat passes for the monitoring period are portrayed in Figure 28 below. This figure provides insight into the general distribution of bat activity within the project site during each night, from sunset to sunrise. In general, all the monitoring systems show a sharp increase in activity between 17:00 and 19:00. The monitoring systems D and E tend to follow the same trend where overall there is an increase in bat activity until the peak at 01:00, and then a sharp decrease until sunrise when all activity ceases. What is interesting is with the other three monitoring systems the peak in activity differs for each system before the decrease in activity starts towards sunrise. For system F the peak is at 21:00, for system I at 19:00 and for system J at 18:00. Note that with seasonal changes in sunset and sunrise, this graph will change, but it does provide a picture of the distribution of bats within the project site during night-time. As expected, higher activity is portrayed two to four hours after sunset, when bats emerge from their roost to forage.

These patterns are of importance if mitigation measures are to be developed, as they indicate the most active periods during the night, specifically when the hourly activity at 105 m (D) and 55 m (E), see Figure 29, within the sweep of the proposed turbine blades, are observed. Although activity at E is higher than at D, the trend is the same, with a sharp increase in activity after sunset until 20:00, small fluctuations in activity until midnight, a sudden increase to the peak in activity at around 01:00, followed by a sharp decline in activity until sunrise.

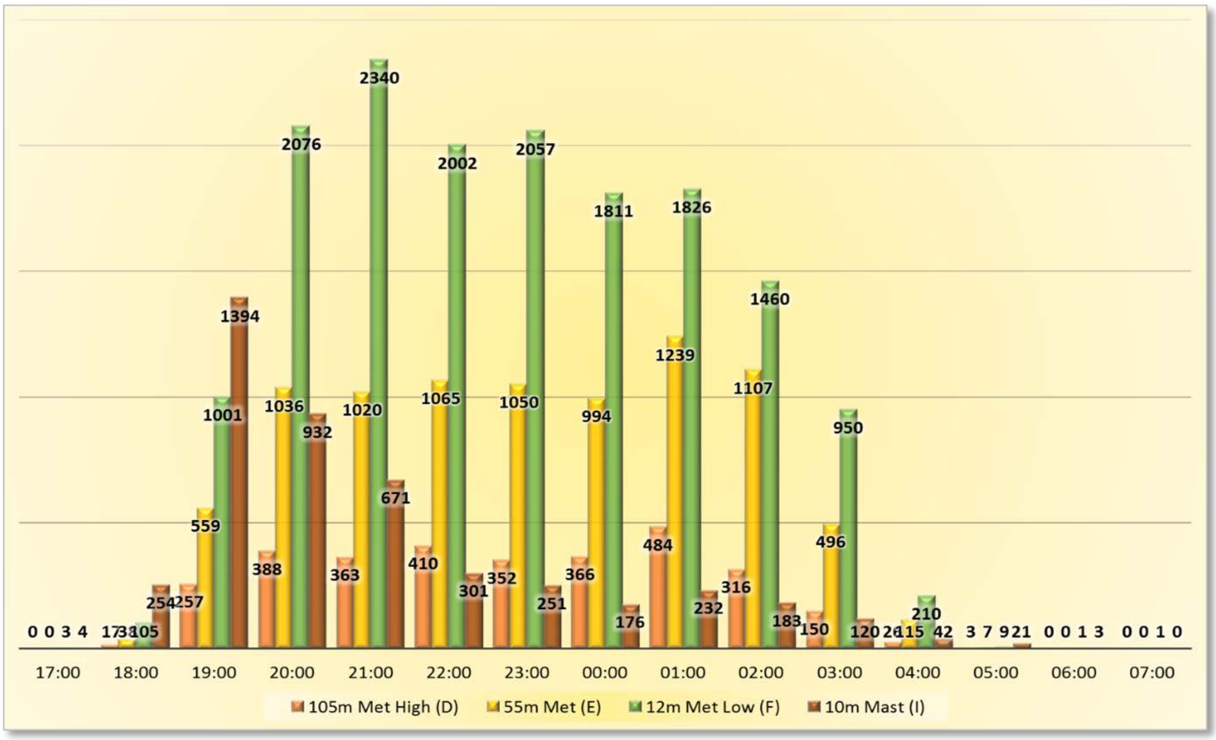


Figure 28: Hourly bat passes per night for all the monitoring systems during the monitoring period

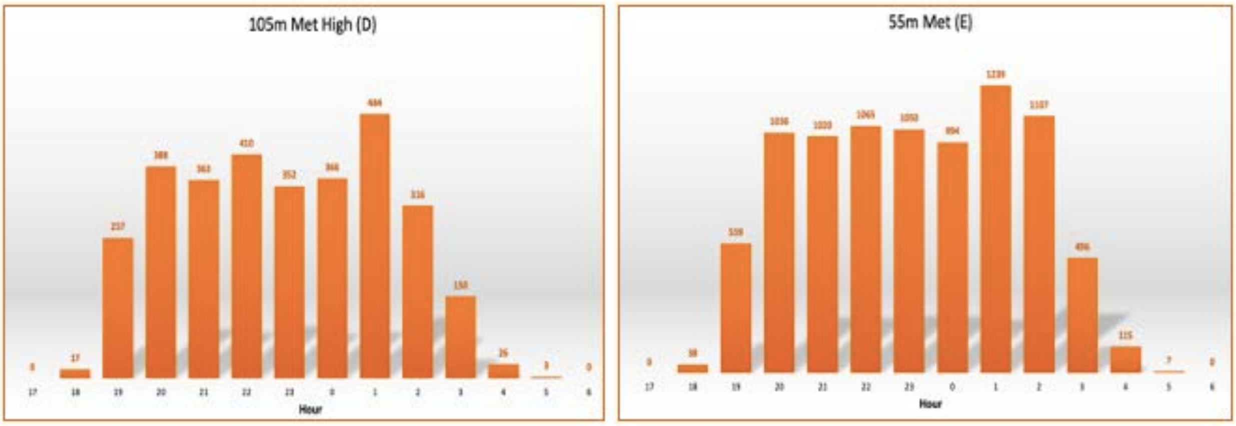


Figure 29: Hourly bat passes per night at systems D and E during the monitoring period

6.1.7 Bat threshold

The South African Bat Fatality Threshold (MacEwan *et al*., 2020) and the South African Bat Best Practice Guidelines (MacEwan *et al*., 2020) report results from early operational facilities in South Africa that show a linear increase in bat fatalities as more turbines are monitored. Threshold guidelines are calculated based on proportional bat occupancy per hectare for each of South Africa's terrestrial ecoregions to predict and assess cumulative impacts on bat fatalities as new WEFs are constructed. These biomes and ecoregions are identified by diverse biodiversity patterns determined by climate, vegetation, geology, and landforms (Dinerstein *et al*., 2017; Olson *et al*., 2001). Threshold calculations add natural population dynamics and bat losses due to anthropogenic pressures to the sum to gauge the number of bat fatalities that may lead to population decline. Table 3 below indicates the height-specific bat activity and fatality risk according to the South African bat threshold guidelines (MacEwan *et al*., 2018) together with the median of hourly bat activity at height over the monitoring period, from systems D and E, and near ground level, from systems F and I. For ground level as well as within the rotor sweep area, the risk category is high. According to the bat threshold guidelines, fatality minimisation measures should be recommended during pre-construction and should be applied from the commencement of turbine rotation.

Table 3: The bat fatality risk threshold for Succulent Karoo with the median from within the sweep of the proposed turbine blades and from lower near ground monitoring systems (MacEwan et al., 2018)

Ecoregion	Height category*	Low Risk (Median bat passes/ hour)	Medium Risk (Median bat passes/ hour)	High Risk (Median bat passes/ hour)
Succulent Karoo	Near ground	0.00	> 0.00 - 0.20	> 0.20
	Rotor sweep	0.00	> 0.00 - 0.03	> 0.03

Height of monitoring systems at Karee WEF site	Median of hourly bat activity for the monitoring period
Combined activity from 105 m (D) and 55 m (E) in the rotor sweep area	**0,35**
Combined activity from 10 m systems (F, I) near ground.	**0,51**

6.1.8 *Weather conditions and bat activity*

The information provided in this section describes the relationship between weather conditions and bat activity, in particular activity within the rotor swept area of the turbine blades. Lower monitoring systems follow to a large extent the same pattern, but as weather monitors are close to the high microphone, and the high microphone is within the rotor swept area of the turbine blades, this system provides more accurate data to plot with the weather data. This data is used to compile a mitigation schedule for sensitive areas to be implemented from the onset of operation of the WEF. This curtailment schedule is used in conjunction with data from the monitoring systems from the adjacent proposed WEFs to refine mitigation strategies. Weather conditions, especially temperature, wind, and humidity, have an influence on bat activity. Literature (Arnett, *et al*. 2008, Baerwald, *et al*. 2009, Kunz, *et al*. 2007), as well as observations from personal experience, indicate that bats tend to be more active at lower wind speeds and higher temperatures. Therefore, bats tend to be more active during warm, quiet nights, combined with elevated humidity; especially when there is an abundance of food, such as termites. Higher activity has also been reported during dark moon.

Weather data from the Met masts D and E were utilised for the statistical analyses below, as these sampling systems are situated in the area of collision. This data was also used to inform the mitigation measures. Statistical analysis between weather and bat activity were also conducted with the combined 10 m systems, thus systems F and I combined. This near ground data will not inform the mitigation measures, as the only available weather data is from the Met mast, and the samples were taken far from the bat monitoring sampling points. This data is only considered to confirm trends on the project site as a whole. See Appendix 1 for weather distribution graphs wherein the number of nights was plotted over wind speed, temperature, and humidity. The following weather data from the Met mast was used:

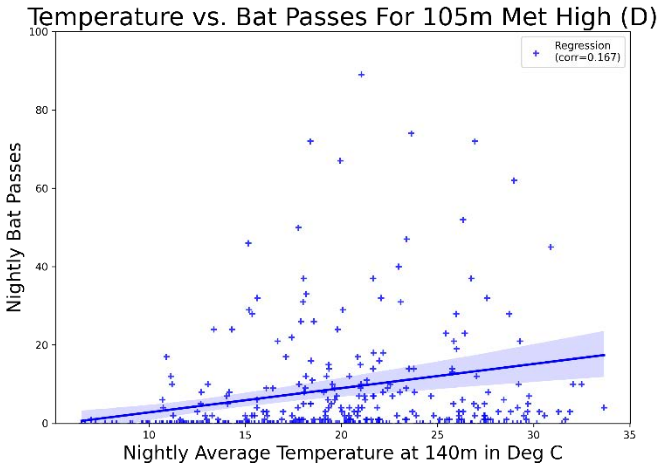
- Temperature data from 140 m and 50 m;
- Wind data from 100 m; and
- Humidity data from 140 m and 50 m.

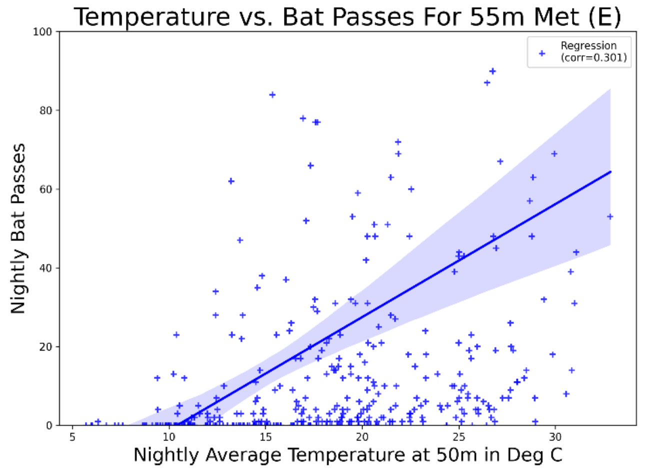
6.1.9 *Linear Regression*

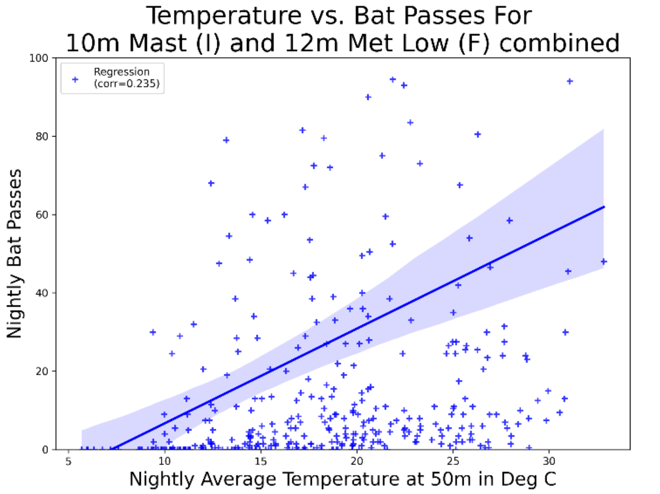
Results of a linear regression between weather conditions and bat activity are provided in Figure 30 below Due to the small sample size of bat data observed from all the monitoring systems (D and E, as well as F and I combined) for 12 months, and bats not necessarily being active during various weather conditions, linear regressions could sometimes result in inadequate variation. It nevertheless provides an indication as to the positive or negative relationship between weather conditions and bat activity. As soon as more data is available during post-construction, linear regression analyses should be applied to the data again.

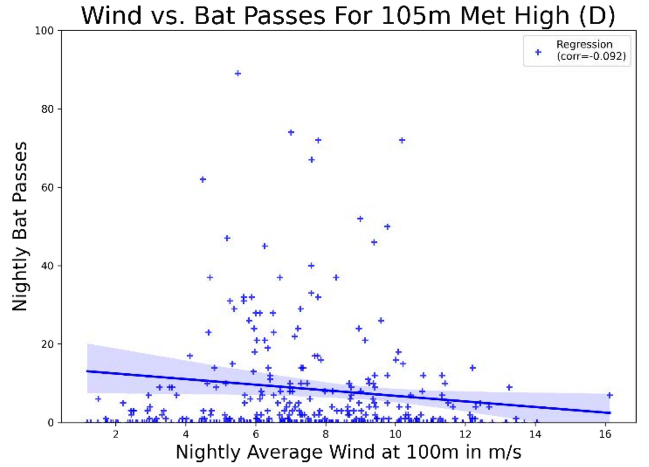
Table 4: Summary of linear regression

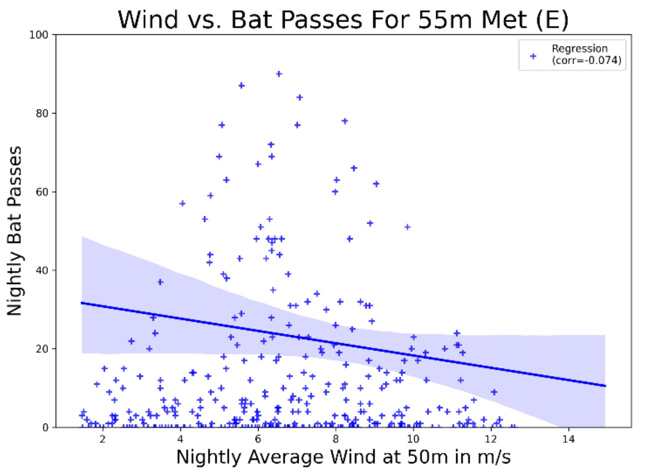
	Correlation Coefficient	
Temperature vs. bat activity for Met High (D)	0.167	A weak positive relationship between temperature and bat activity. As temperature increases so does the bat activity.
Wind vs. bat activity for Met High (D)	-0.092	A very weak negative relationship between wind speed and bat activity. As wind speed increases the bat activity decreases slightly.
Humidity vs. bat activity for Met High (D)	-0.088	A very weak negative relationship between humidity and bat activity. As humidity increases the bat activity decreases slightly.
Temperature vs. bat activity for 55 m Met (E)	0.301	A positive relationship between temperature and bat activity. As temperature increases so does the bat activity.
Wind vs. bat activity for 55 m Met (E)	-0.074	A very weak negative relationship between wind speed and bat activity. As wind speed increases the bat activity decreases slightly.
Humidity vs. Bat passes for 55 m Met (E)	-0.064	Very weak negative relationship between humidity and bat passes. As humidity increases the bat activity decreases slightly.
Temperature vs. bat passes for 10 m Mast (I) and 12 m Met Low (F) combined	-0.115	A weak negative relationship between temperature and bat activity. As temperature increase the bat activity decreases.
Wind vs. bat activity for 10 m Mast (I) and 12 m Met Low (F) combined	-0.157	A weak negative relationship between wind speed and bat passes. As wind speed increases the bat activity decreases.
Humidity vs. bat activity 10 m Mast (I) and 12 m Met Low (F) combined	0.235	A positive relationship between humidity and bat passes. As humidity increases the bat activity also increases.

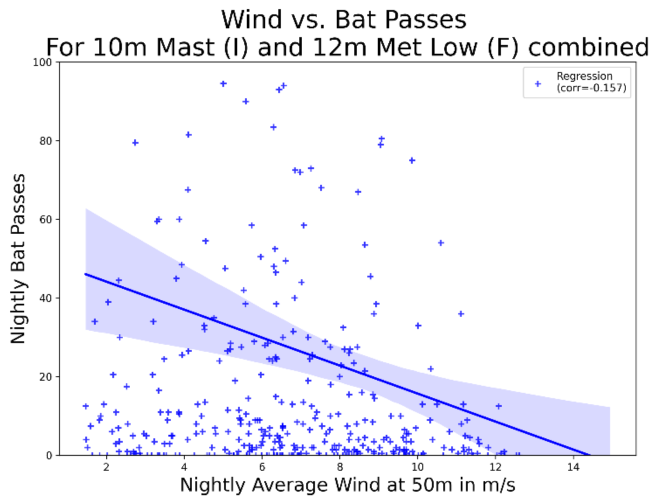

Temperature vs. Bat Passes For 105m Met High (D)
Regression (corr=0.167)
Nightly Bat Passes
Nightly Average Temperature at 140m in Deg C


Temperature vs. Bat Passes For 55m Met (E)
Regression (corr=0.301)
Nightly Bat Passes
Nightly Average Temperature at 50m in Deg C


Temperature vs. Bat Passes For
10m Mast (I) and 12m Met Low (F) combined
Regression (corr=0.235)
Nightly Bat Passes
Nightly Average Temperature at 50m in Deg C


Wind vs. Bat Passes For 105m Met High (D)
Regression (corr=-0.092)
Nightly Bat Passes
Nightly Average Wind at 100m in m/s


Wind vs. Bat Passes For 55m Met (E)
Regression (corr=-0.074)
Nightly Bat Passes
Nightly Average Wind at 50m in m/s


Wind vs. Bat Passes
For 10m Mast (I) and 12m Met Low (F) combined
Regression (corr=-0.157)
Nightly Bat Passes
Nightly Average Wind at 50m in m/s

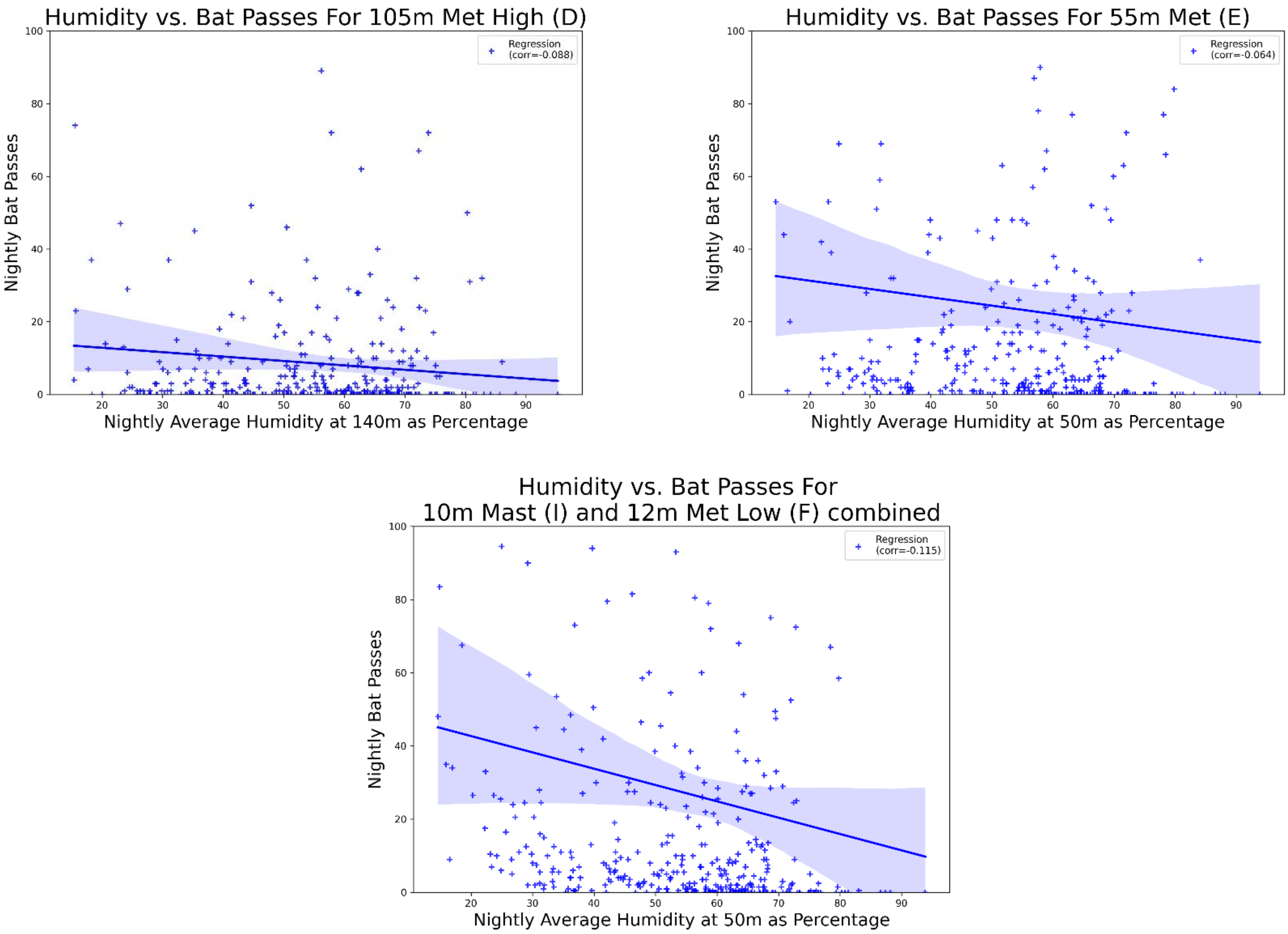


Figure 30: Linear regressions of temperature, wind speed and humidity as predictors of the distribution of bat activity

6.1.10 Cumulative distribution functions (CDF)

Figure 31 below illustrates the cumulative distribution functions, where cumulative means an increased quantity by successive additions, wherein cumulative bat activity recorded are plotted with temperature, wind speed and humidity data. The cumulative percentages at the 105 m Met High (D) indicate the following results:

- Nearly 100% of the bat activity was recorded above 10 ℃.
- Approximately 80% of the bat activity was recorded below 8.2 m/s wind speed, with 90% of the activity occurring below 9.4 m/s.

- Approximately 60% of the bat activity was recorded between 49% and 90% humidity.

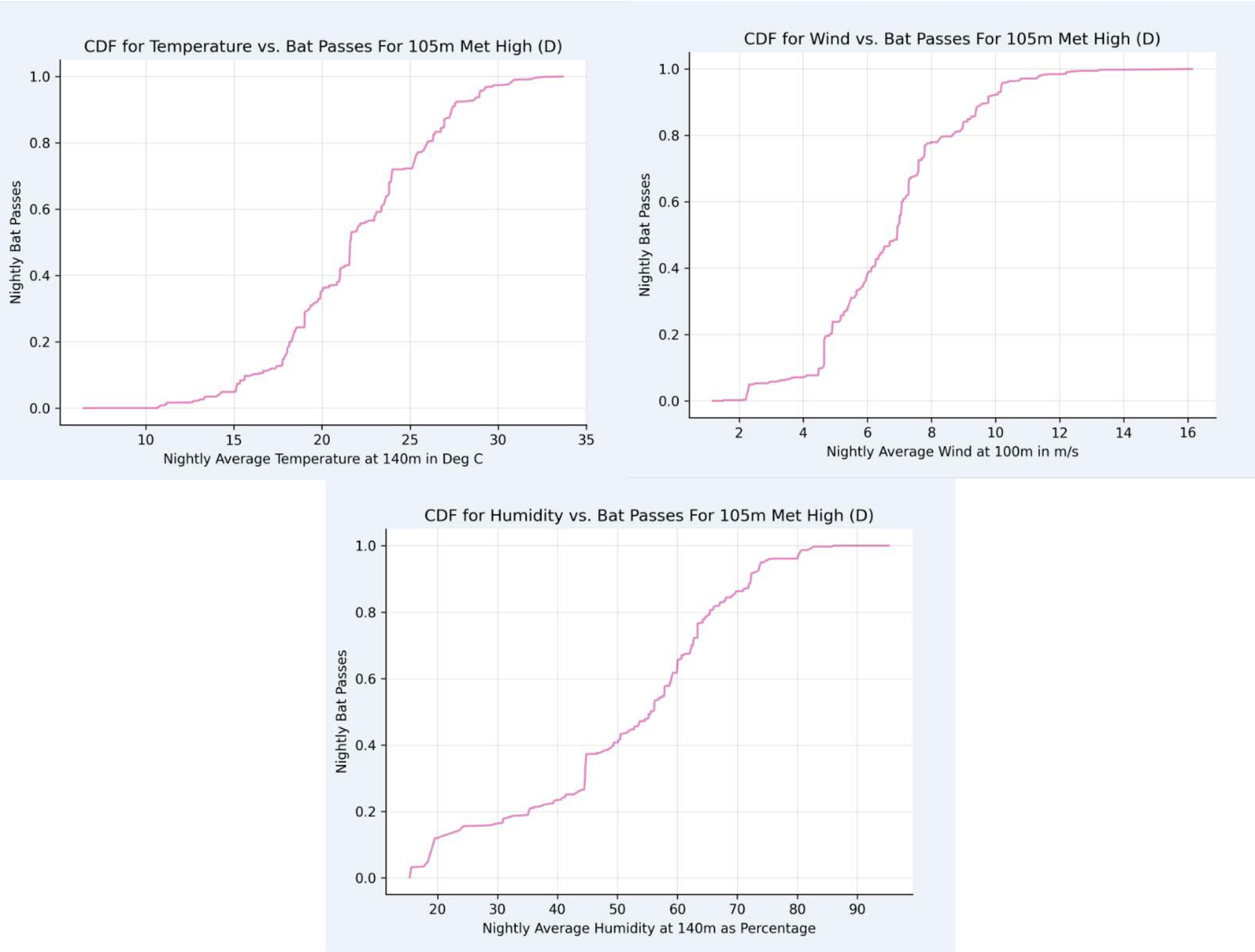


Figure 31: Cumulative distribution functions for weather and bat activity at System D, 105 m on the Met mast

The cumulative percentages depicted at the 55 m Met (E) (Figure 32), indicate the following results:

- Nearly 100% of the bat activity was recorded above 10 ℃;
- Approximately 80% of the bat activity was recorded below 7.5 m/s wind speed, with 90% of the activity occurring below 8.8 m/s; and
- Approximately 60% of the bat activity was recorded between 51% and 90% humidity.

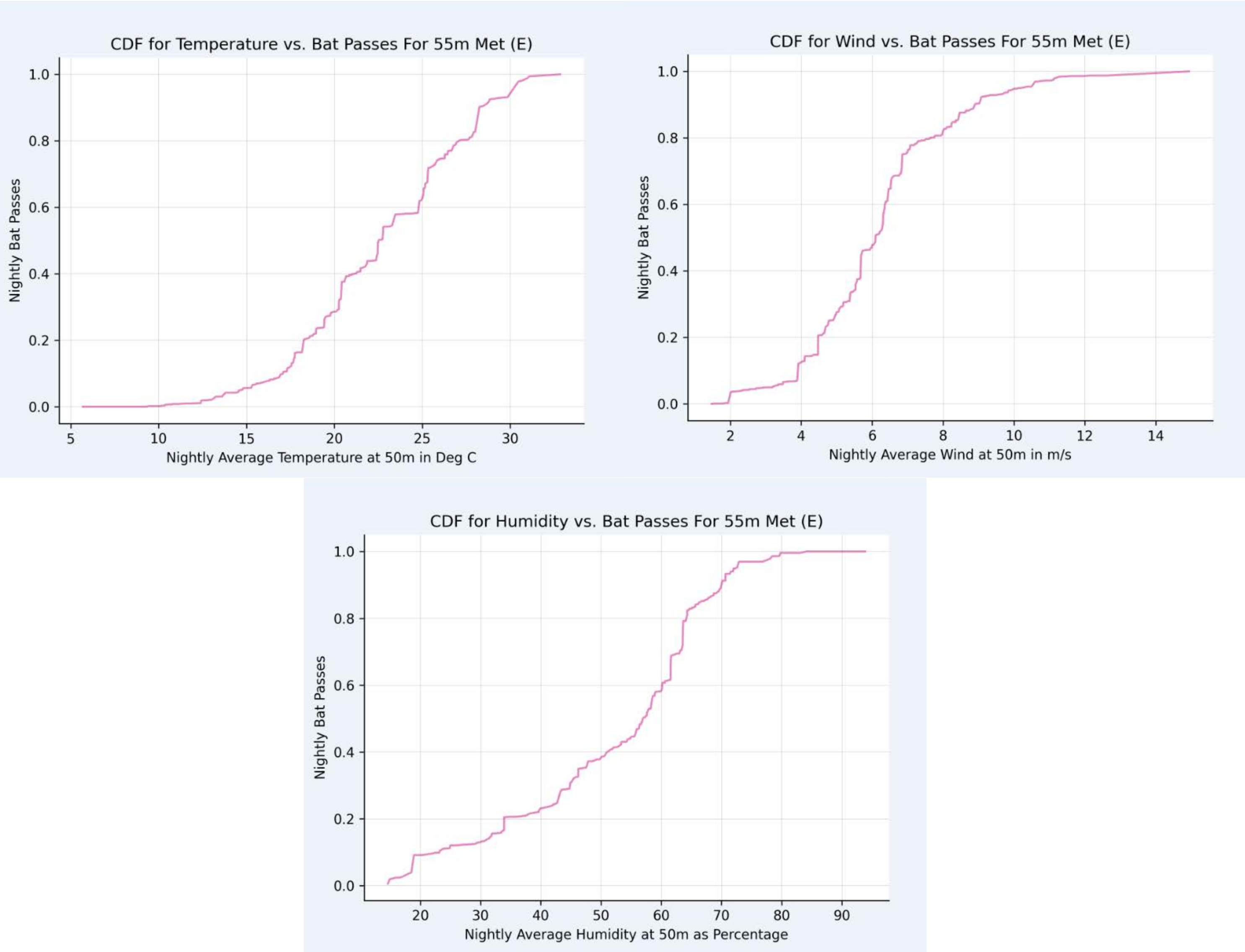


Figure 32: Cumulative distribution functions for weather and bat activity at System A, 55 m on the Met mast

The cumulative percentages at the 10 m Mast (I) and 12 m Met Low (F) combined, as depicted in Figure 33 below, indicate the following results:

- 100% of the bat activity was recorded above 10 ℃.;
- Approximately 80% of the bat activity was recorded below 6.8 m/s wind speed, with 90% of the activity occurring below 8.4 m/s; and
- Approximately 60% of the bat activity was recorded between 46% and 90% humidity.

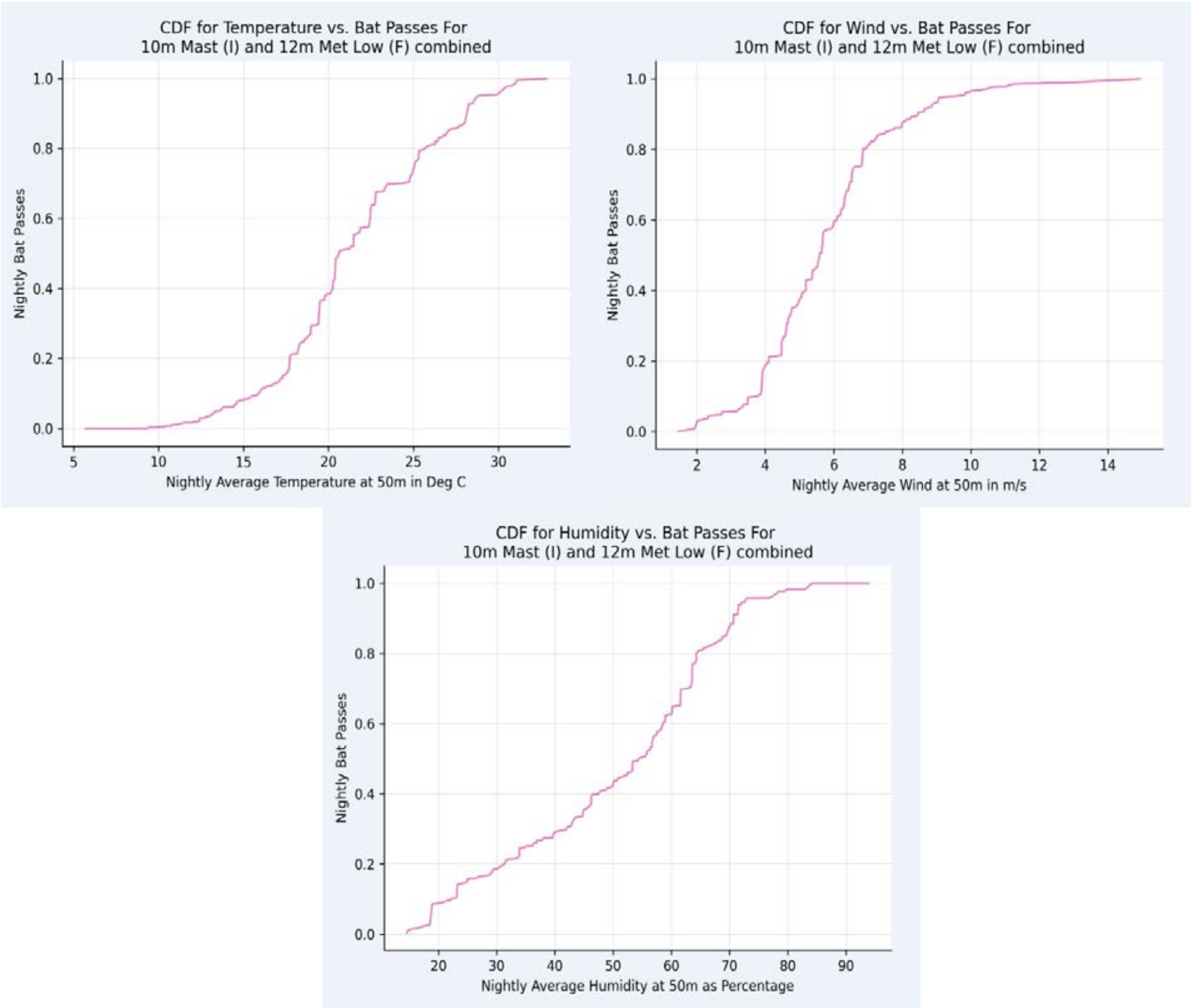


Figure 33: Cumulative distribution functions for weather and bat activity at combined near ground systems F and E

6.1.11 *Cumulative distribution function heat maps*

Cumulative Distribution Function (CDF) heat maps provide a better visualisation of the concentration of bat activity when plotted with weather conditions (see Figure 34) and confirms the results from the previous section (Section 6.1.10). Darker areas indicate a concentration of activity.

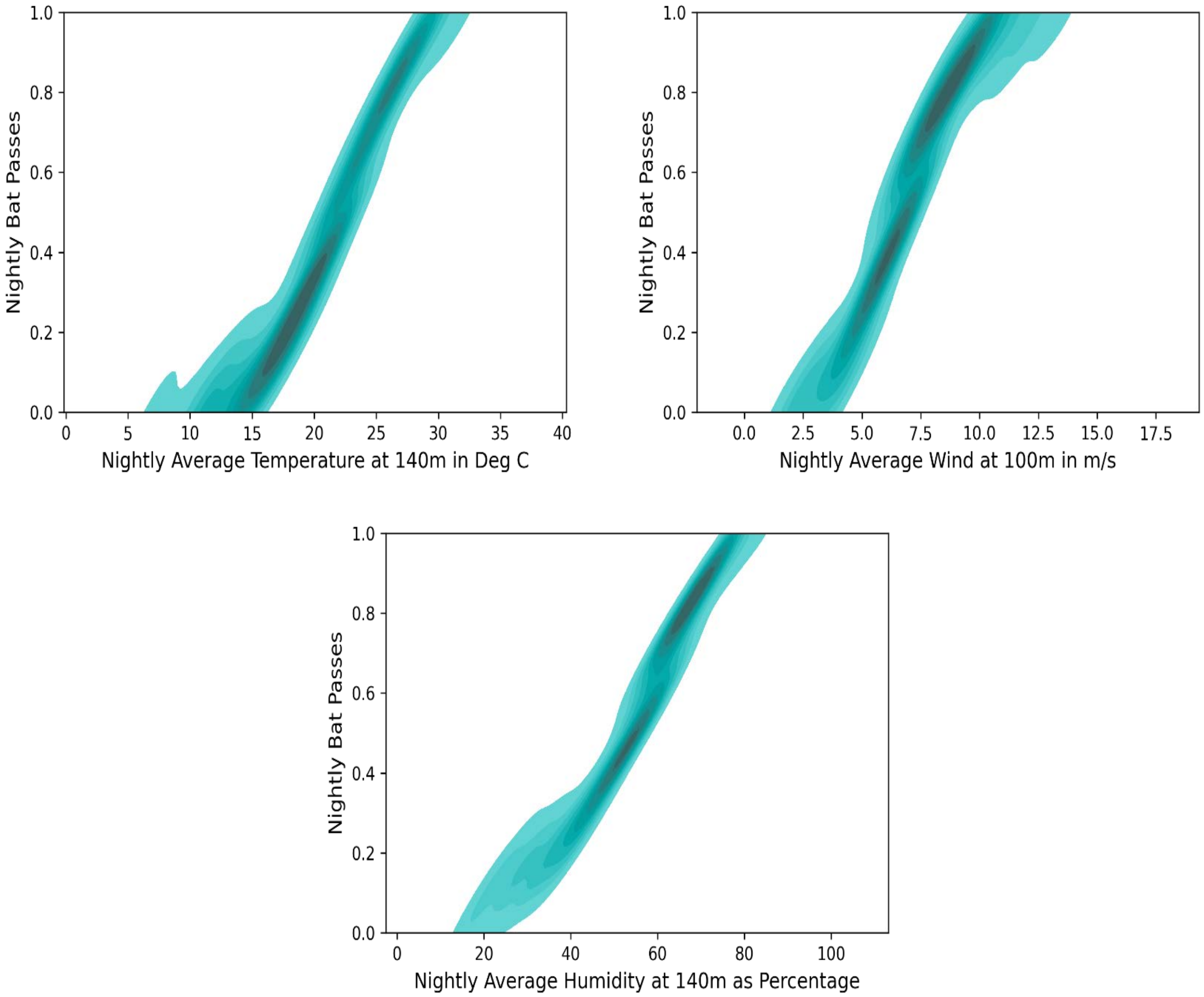


Figure 34: CDF heat maps showing weather and bat activity during the monitoring period at the 105 m system D on the Met mast

The density of bat passes during certain temperatures, wind speed ranges and humidity for the 105 m Met High (D) can be clearly observed when CDF heat maps are plotted, and from Figure 35, the following could be derived:

- <u>Nightly average activity and temperature</u>: A concentration of bat activity occurred between 18.5 °C and 26 °C, but activity density is observed as high as 30 °C;
- <u>Nightly average activity and wind speed</u>: A concentration of bats occur below 8.75 m/s, with most bats being active below 11 m/s; and

- Nightly average activity and humidity: Bat activity at Karee shows pockets of concentration above 44% humidity.

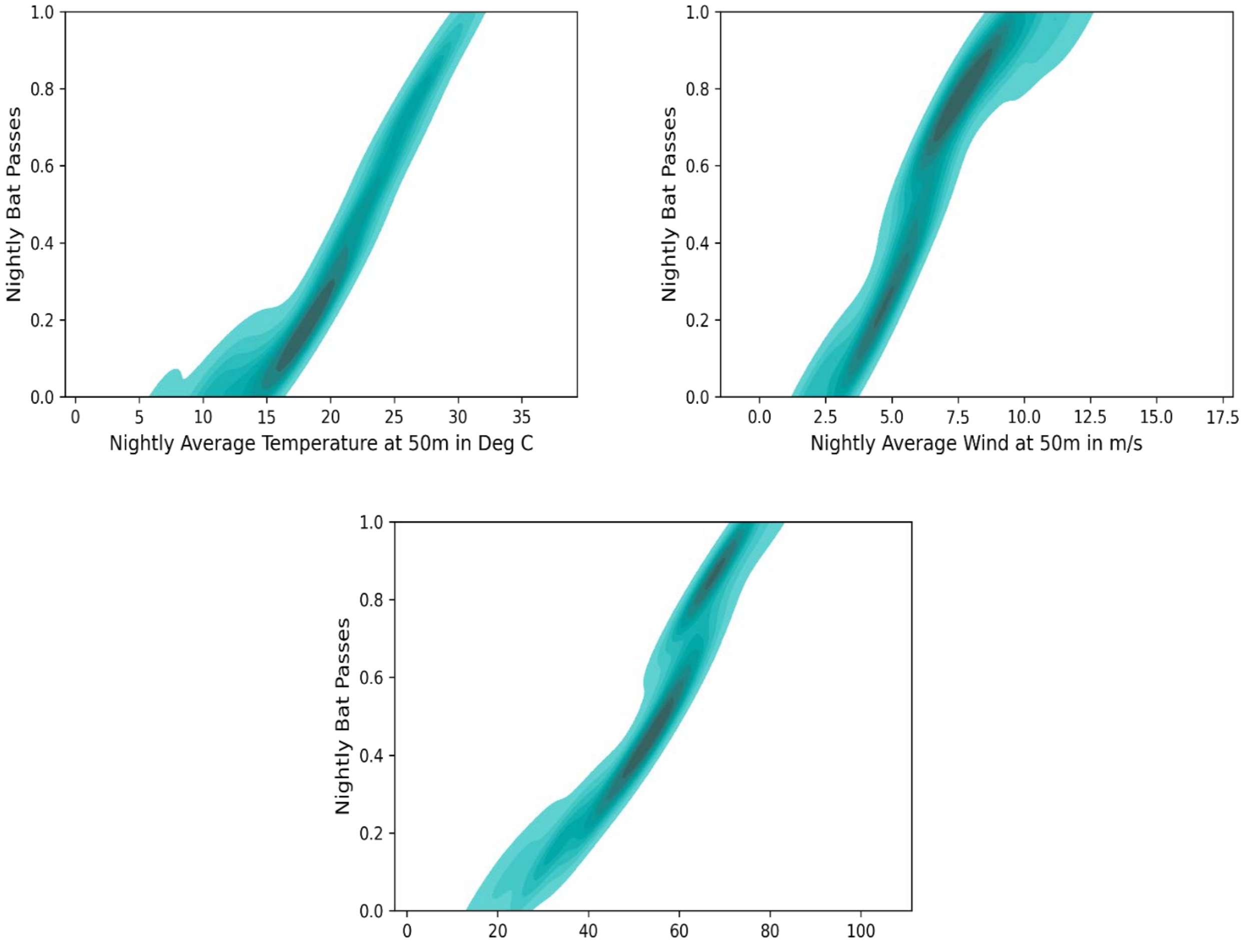


Figure 35: CDF heat maps showing weather and bat activity during the monitoring period at the 55 m system E on the Met mast

The density of bat activity during certain temperatures, wind speed ranges and humidity for the 55 m Met (E) can be clearly observed when CDF heat maps are plotted (Figure 36), and the following could be derived:

- Nightly average activity and temperature: A concentration of bat activity occurred around 18^{o}C, but activity density is observed as high as 24^{o}C;
- Nightly average activity and wind speed: A concentration of bats occur between 4.5 m/s and 7.5 m/s, with most bats being active below 9.5 m/s; and

- Nightly average activity and humidity: Bat activity at Karee shows pockets of concentration above 40% humidity.

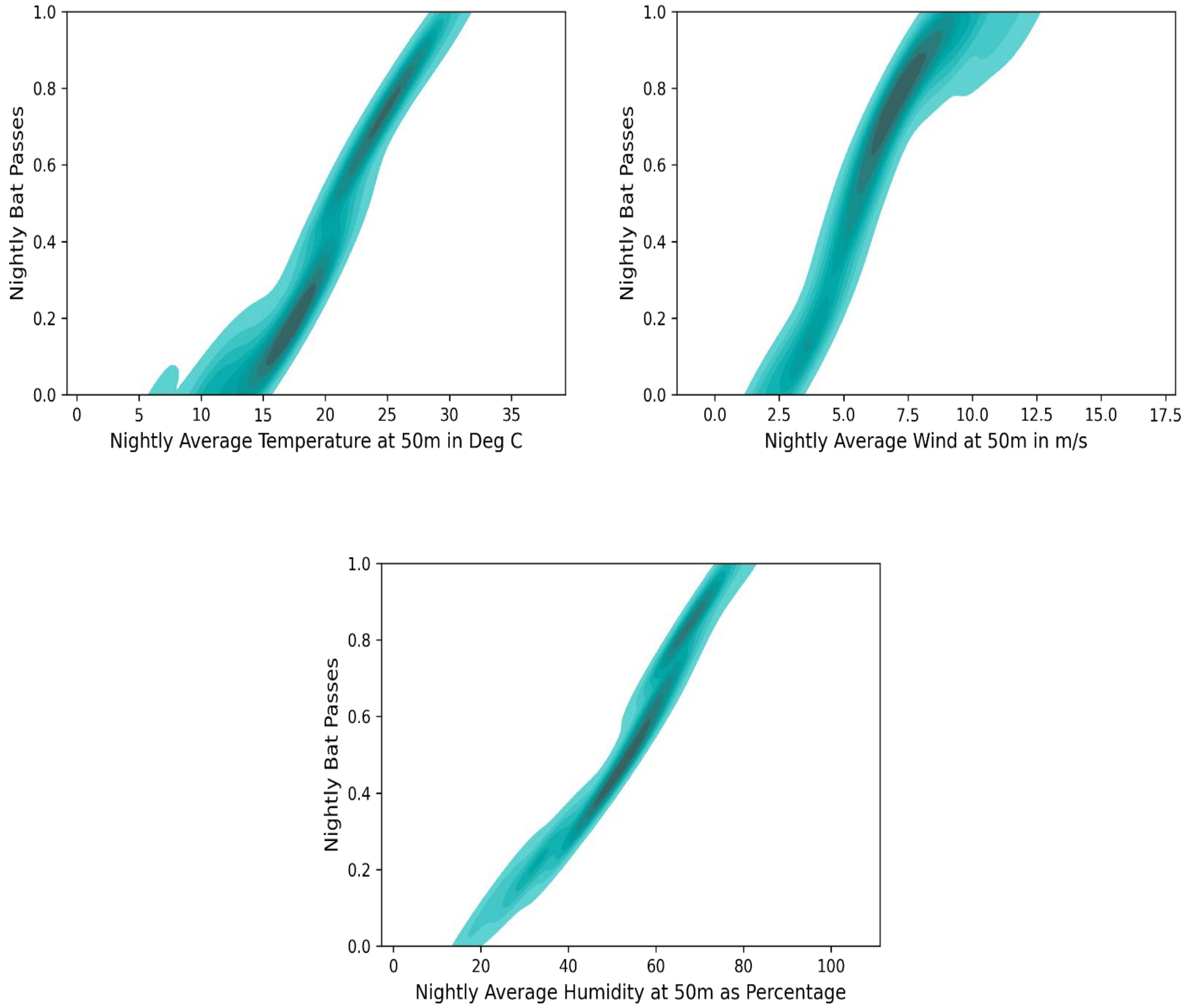


Figure 36: CDF heat maps showing weather and bat activity at the combined near ground systems F and I

The density of bat passes during certain temperatures, wind speed ranges and humidity for the 10 m Mast (I) and 12 m Met Low (F) combined can be clearly observed when CDF heat maps are plotted, and from Figure 36, the following could be derived:

- Nightly average activity and temperature: A concentration of bat activity occurred between 17.5 ^{o}C and 25^{o}C, but activity density is observed as high as 29 ^{o}C;
- Nightly average activity and wind speed: A concentration of bats occur below 7 m/s, with most bats being active below 8.5 m/s; and
- Nightly average activity and humidity: Bat activity at Karee shows pockets of concentration above 40% humidity.

6.1.12 Transects

Transects are a snapshot in time but do confirm species present at the project site. Transects were conducted during seasons when high bat activity was expected, and also when colder conditions prevail. The transects were conducted with a SM4BAT and a SMMU2 microphone mounted on a pole on the vehicle (see Figure 37). The value of transects are debated at present and two seasonal transects were conducted, one during cold weather conditions and one when the weather conditions were already warmer.

During November 2021, the route was adapted (see the red section added in Figure 37). A SM4 GPS was linked to the detector so that the route is recorded while driving. The detector was calibrated each time at the start of each transect and weather conditions were also recorded.

Table 5 below summarises the transect results.

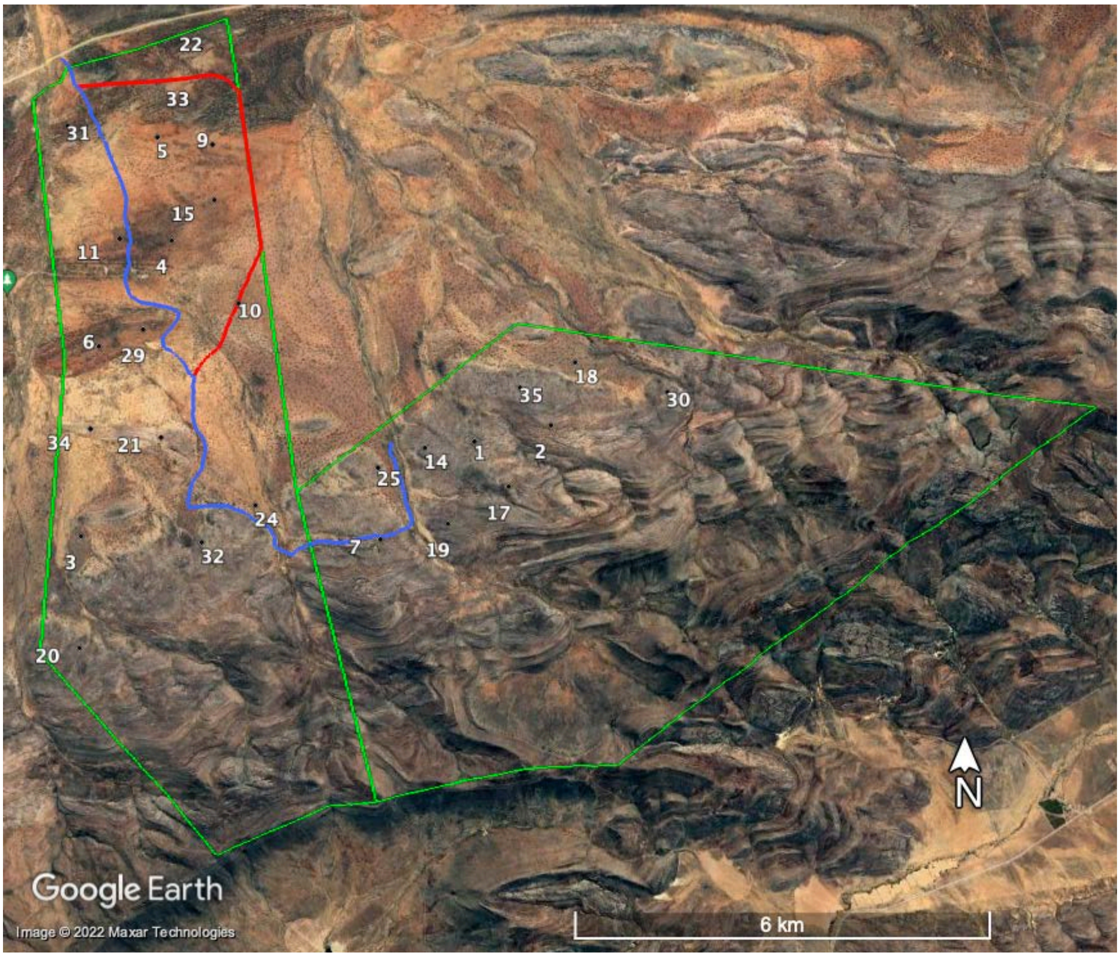


Figure 37: The Transect route at the Karee WEF, with the original preliminary turbine positions

Bat calls were plotted with MayotisSoft to show the positions where bats were recorded on the transect route (Figure 38). Note that when bats were recorded close to one another, individual calls are plotted on top of each other and not clearly displayed. One could nevertheless establish where high bat activity was recorded.

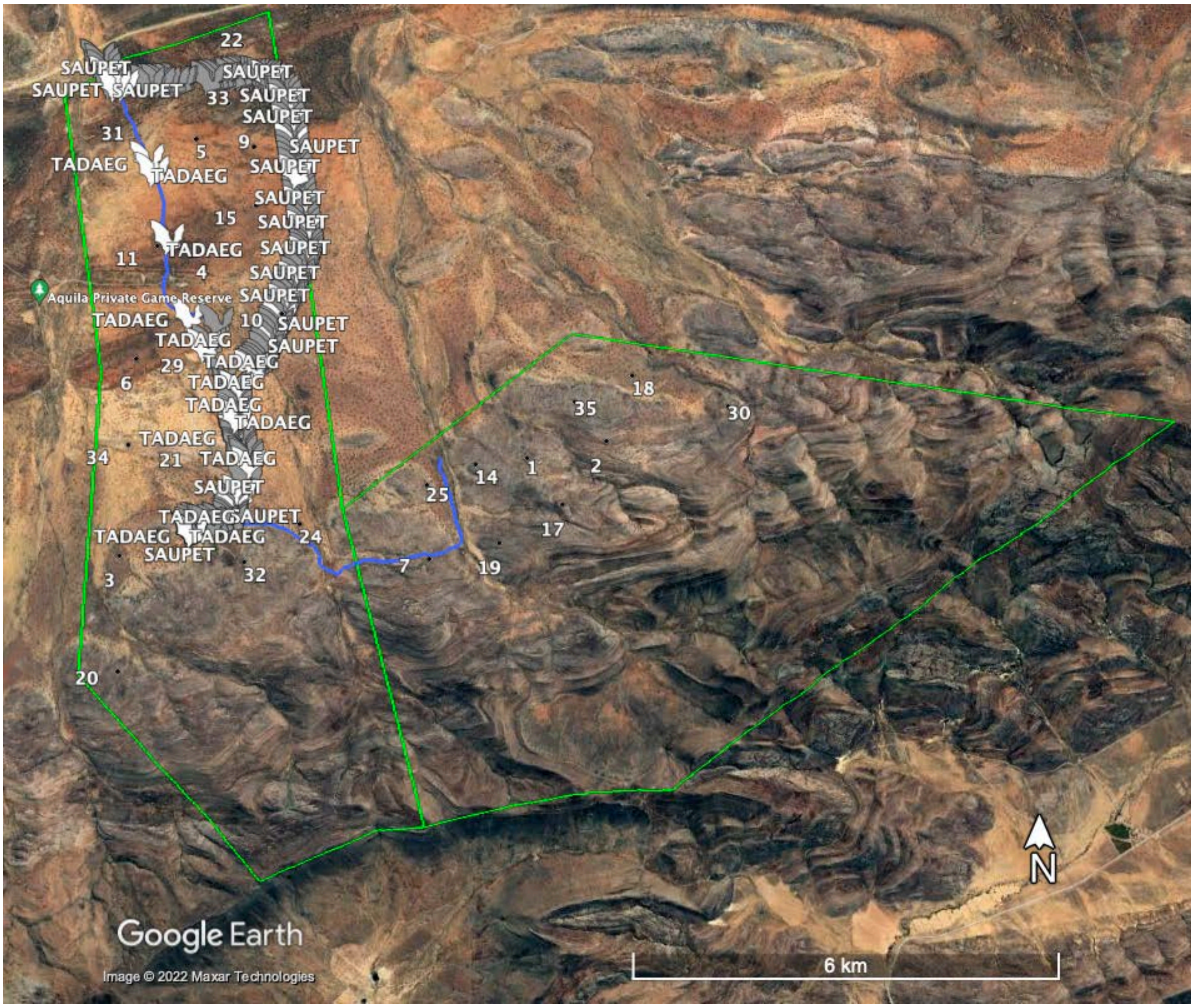


Figure 38: Bats recorded during November 2021 transects

Table 5 (below) depicts transect details. Although September is officially spring, the weather conditions were still cold, and this transect was therefore classified as still in wintertime. No bats were recorded during the two transects in winter, while a total of 144 bats were recorded during the November transect. The latter is an exceptionally high bat activity recorded during a transect. Bats were recorded all along the transect route, showing an even distribution of bat activity all over the site during this transect. The transect mirrors the high activity recorded during springtime at the stationary monitoring systems. Of importance is the high activity of *S. petrophilus* (Robert's flat-headed bat), which was the most recorded species on the transect. This bat species is sometimes relatively more active on site than what was portrayed by the stationary systems.

Table 5: Karee WEF winter and spring transect data

Date	Temperature	Weather	Wind	Results
Winter				
2 September 2021	17 °C	Clear	Between 3,6 m/s and 5,4 m/s	No bat calls
3 September 2021	5 °C	Cloudy	Between 1,8 m/s and 3,1 m/s	No bat calls
Spring				
4 November 2021	Between 18°C and 21 °C		At start of transect between 5 m/s and 7 m/s, decreased to between 0,8 m/s and 1,3 m/s	85 x S. petrophilus 57 X T. aegyptiaca 1 x N. capensis 1 x E. hottentotus

7. BAT SENSITIVITY MAP

Sensitivity zones are based on buffer zones, as indicated by the *South African Good Practice Guidelines for Surveying Bats at Wind Energy Facility Developments – Pre-construction* (MacEwan, *et al*. 2020). These zones are refined through field visits and physically visiting the bat-conducive environments occurring at the development sites, as well as static and active monitoring data.

The minimum buffer recommendation from SABAA is a 200 m buffer around all potentially bat-important features. Figure 39 on page 67 has therefore incorporated 200 m buffers as a minimum. For higher sensitivity zones, larger buffers are incorporated around bat-sensitive areas or bat roosts, at the proposed Karee WEF project site.

Sensitivity zones are relevant to all components of the turbines, including the tips of the turbine blades; therefore, should a turbine be installed within close proximity to a medium sensitivity zone, with the turbine tip within the sensitivity zone, then the mitigation of the medium zone should be applied to that turbine.

In cases of 'No-go' areas, and high bat sensitivity zones, it is recommended that these areas constitute 'no-go' development areas, i.e., where turning turbine components are not allowed, whereas medium sensitivity zones could be developed (turbines and associated infrastructure), but with mitigation. No medium zones have been identified at the terrain.

7.1 'No-go' zones

'No-go' zones are areas which should be avoided at all costs, not only for placing turbine positions, but as far as possible also for laydown areas and other supporting infrastructure, with exception of roads. 'No-go' zones are recommended for the following:

- The northern section of the WEF site, with mountainous areas and a lot of roosting opportunities for bats;
- Dry riverbeds with historical riparian shrub;
- 500 m buffer around human dwellings; and
- 200 m buffer around water sources, including water troughs for livestock, reservoirs, dams, and some clumps of isolated trees. Some of these features could be historic, and might not present riparian shrub at present, but the precautionary principle is valid for periods with increased rainfall, as per the bat guidelines.

7.2 High sensitivity zones

It is recommended that high sensitivity zones should be avoided for turbine development, but components of supporting infrastructure might occur in these areas, if no bat roosts are disturbed. The following are included in high sensitivity zones:

- Clumps of trees which could serve as roosts; and
- Other features conducive to bat roosts.

7.3 Medium sensitivity zones

Note that the medium sensitivity zones have been removed after the developer updated the buildable areas, see Figure 40.

7.4 Low sensitivity zone

The bat activity at the Karee WEF site is high if the threshold for Succulent Karoo is considered, within the sweep of the turbine blades as well as near the ground, so that low sensitivity is seen as relevant to the project site itself. Apart from mitigation measures for the project site, as described above, these areas could be developed without turbine-specific mitigation at this stage of the project. Due to the high bat activity, the developer should budget for mitigation such as bat deterrents or curtailment, so that specific turbines could be targeted for operational mitigation when more data is available.

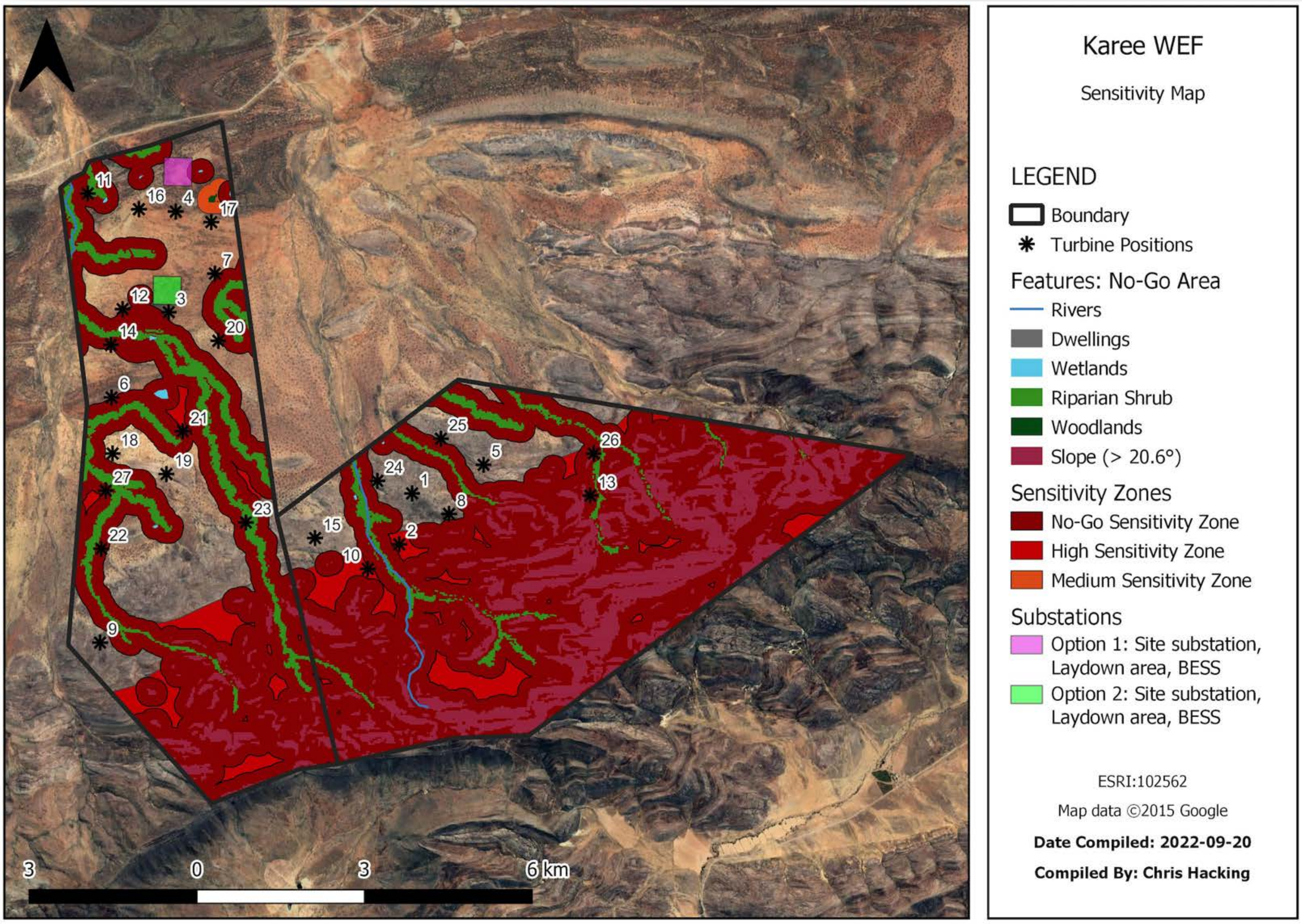


Figure 39: The bat sensitivity map for the proposed Karee WEF site

7.5 Updated bat sensitivity map

After specialist input was considered, the developer is proceeding with a buildable area instead of a detailed turbine layout. An updated bat sensitivity map is provided in Figure 40, with no further infringement of turbine positions.

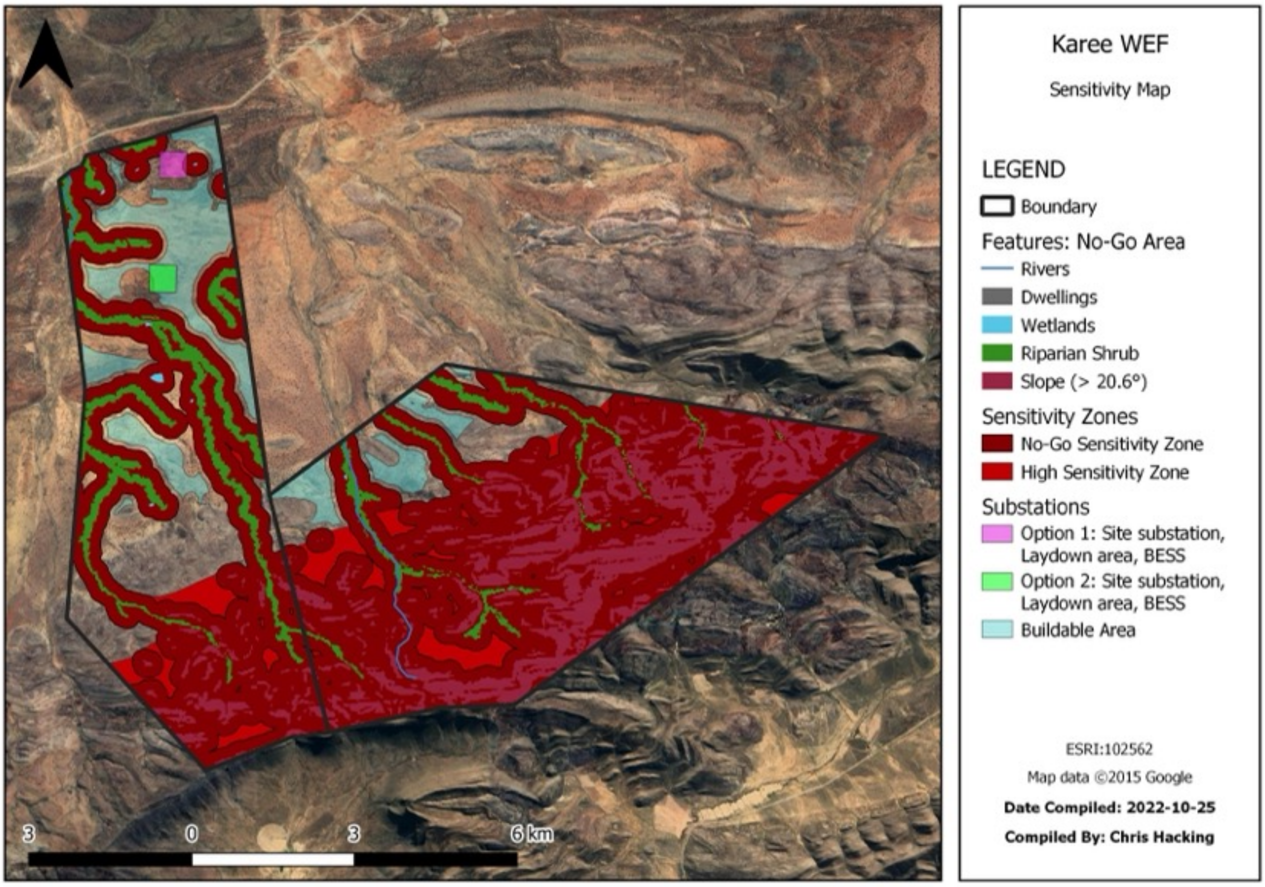


Figure 40: Karee WEF updated bat sensitivity map

8. CUMULATIVE IMPACT

There has been a substantial increase in renewable energy development recently, specifically WEFs, as South African legislation facilitates IPPs and renewable energy into the electricity generation mix. However, the trade-offs of cumulative impacts on the natural environment need to be understood by all involved parties to assess the benefits of renewable energy against the obligation for bat conservation concerns. Cumulative impacts are activities that may not be noteworthy by themselves but may have the risk of becoming significant when added to "existing and potential impacts eventuating from similar or diverse activities or undertakings in the area." NEMA requires an integrated approach for environmental authorisation to develop wind energy (NEMA EIA Regulations, 1998, as amended).

Bats species confirmed on site during the monitoring period display functional roles as agricultural pest control, insect predators, pollinators and seed dispersers. However, they are susceptible to anthropogenic changes due to their low reproductive rate and longevity. The cumulative impact of mismanagement of natural resources by WEF construction and operational activities could limit bat activity and lead to bat habitat destruction and eventual bat population decline. These impacts could lead to an elevation of insect numbers and potential insect outbreaks across project sites and the region. For instance, the ecology of bat caves (where guano is the primary energy source) can be adversely affected by negative impacts on migratory bats (Marais, 2018). Therefore, bat activity at proposed WEFs needs to be assessed to prevent or reduce the cumulation of negative impacts on bat populations potentially caused by wind turbines (Sowler, et al., 2017).

The DFFE requires a regional combined impact assessment of bat fatalities on other renewable energy facilities (REFs) within a 35 km radius of the proposed project site (see Figure 41), as migratory and resident bats could cover distances between 1 km and 15 km, and 2 km and 30 km (Jacobs & Barclay, 2009; MacEwan, 2018 and NEMA Regulations, 2022). SABAA suggests a larger area of up to 100km radius from the proposed WEF for assessing bats and the ecological significance of the total area (MacEwan, et al., 2018).

The proposed Karee WEF forms part of the 8846 km^2 Komsberg REDZ, namely REDZ 2, situated in the Western Cape, north-east of Touws River and further north-eastwards towards Sutherland. REDZ display suitable topography for high wind speed variability to maximise the cumulative wind energy production and minimise the negative impacts (Van Vuuren & Vermeulen 2019). WEFs situated in these zones in South Africa are fast-tracked for approval and more wind energy applications are expected in these zones. The consequence of adding more WEFs will increase the cumulative effect on bats in the area if all developments are either operational or under construction at the same time. One year of pre-construction bat monitoring is thus required.

Table 6 below contains a summary of features specific to the Karee WEF project site and of bats confirmed on site during the monitoring period. Figure 41 below displays a view of the regional wind energy development featuring the Karee WEF site surrounded by REFs within a 35 km radius interval to consider the cumulative impact on local and regional bats. Table 7 below provides a summary of REFs within a 35 km radius of the Karee WEF site, to assess the nature of the cumulative effect on bats, as per the South African Good Practice Guidelines for Pre-Construction Monitoring of Bats (Sowler, et al., 2017) and the South African Bat Fatality Threshold Guidelines (MacEwan, et al., 2018).

Table 6: A summary of site-specific information of the Karee WEF relevant to regional cumulative impacts and of bats confirmed on site.

FEATURES RELEVANT TO BATS	SITE SPECIFIC INFORMATION
REDz	Komsberg 2
Project size	1753 ha
Power Capacity	200MW
Municipality and Province	Cape Winelands Municipality in the Western Cape
Vegetation	Tankwa Karoo and Azonal Tanqua Wash riviere
Biome and Ecoregion	Succulent Karoo biome and Xeric Shrublands ecoregion
Bat conducive features	Permanent & stagnant water features, riverine vegetation, rocky outcrops, human dwellings
Period of high bat activity	Spring: bat activity increases when bats come out of winter torpor and insect emergence
Period of low bat activity	Winter: Bat activity decreases during relative lower temperatures and higher wind speeds
Bat occurrence on site and in the region	5 bat species occur on site out of 12 bat species that occur in the region
Bats at risk of direct impacts and barotrauma	Bats that use the airspace of the rotor swept zone of the turbine
Bat species confirmed on site	*T. aegyptiaca, M. natalensis, N. capensis, S. petrophilus, E. hottentotus*

On a regional scale, the following WEFs within the 35 km radius of Karee are already approved: Tooverberg, Perdekraal and Witberg. Portions of approved Rietkloof, Brandvalley and Roggeberg WEFs also appear within 35km of Karee and are included in the cumulative calculations. Patatskloof WEF, adjacent to Karee WEF, is currently in the application process for approval. The proposed Patatskloof site appears on the map in Figure 41 and is also included in the cumulative calculations. In compliance with SABAA recommendations to consider bats in the larger area, there are several more WEFs within Komsberg REDZ 2 and closer to Sutherland, such as Hidden Valley, Komsberg West, Roggeveld, Kareebosch, Marella, Kudusberg, Rondekop, Isiyago, Eolos, Gunstfontein and Sutherland.

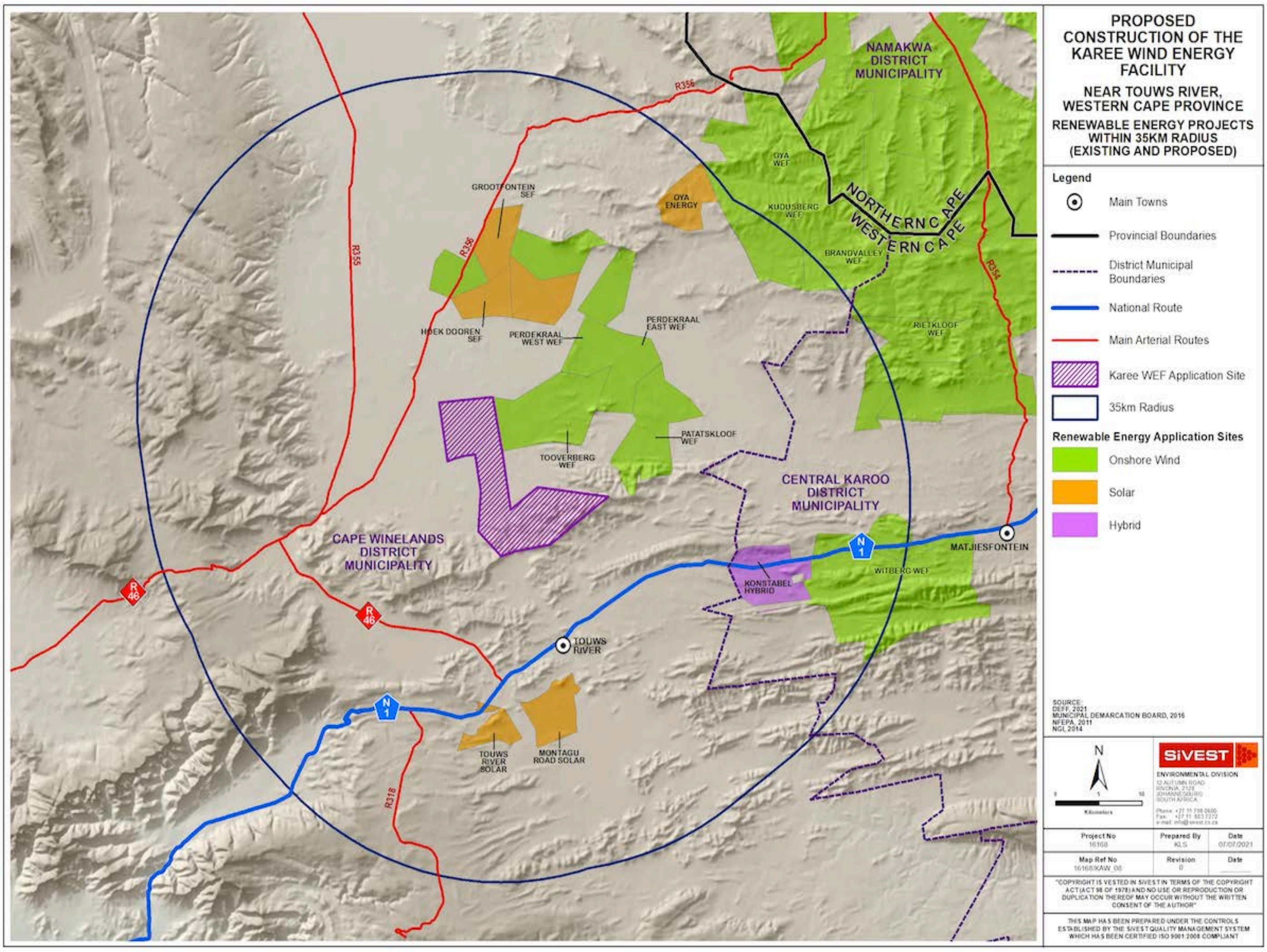


Figure 41: A map of the Karee WEF project site at the midpoint of other REFs, with a circle drawn at a 35 km radius interval from the Karee WEF to show the larger zone of wind energy development in the region and the cumulative impact amplified across the area.

WEFs within the Komsberg REDZ create clusters of wind turbine development, and bats in the wider area would have to create corridors of movement to negotiate around these development zones. Due to the back-to-back nature of the mentioned WEFs, the cumulative sensitivity effect will be amplified across the area and impact the biodiversity and ecological processes related to bat habitat, bat activity, bat mortality and bat population decline.

Other renewable energy facilities such as solar farms are also situated within the 35 km radius of Karee WEF. The negative impact on bats from solar energy development is low. However, large areas of solar PVC panels cause destruction of natural bat habitat. Five solar farms, including Touwsrivier, Montague Road, Oya, Grootfontein and Hoek Doomer Solar cover approximately 1500ha of land within the 35 km radius of Karee WEF.

Table 7: A summary of REFs within a 35 km radius of the Karee WEF project site.

RISK LEVELS AS PER SABAA GUIDELINES (Sowler, et al., 2017 & MacEwan, et al., 2020)							
REFs within 35 km radius of Patatskloof WEF	Energy Ouput MW	Total Project Size (ha)*	Bat Index based on Average Bat passes per hour per year**	Median Bat passes per hour per year**	Bat fatality risk levels based on Succulent Karoo at >40m rotor sweep height***	Bat fatality risk levels based on Median bat activity	Threshold based on ecoregion and total project size (ha): How many bats can be removed before population decline may arise
Proposed Karee WEF	200	1753	1,65	0,43	0.08-0.21	High	15
Proposed Patatskloof WEF	250	6612	1,92	0,37	0.08-0.21	High	55
Proposed Kappa 1 Wind Farm	190	3895	0,27	0,21	0.02-0.23	High	61
Proposed Kappa 2 Wind Farm	250	6612	1,92	0,62	0.02-0.23	High	31
Perdekraal East WEF	110	3055	0,37	0,00	0.02-0.23	High	26
Perdekraal West WEF	140	3220	0,36	0,00	0.02-0.23	High	27
Tooverberg WEF	264	750	0,25	0,00	0.02-0.23	High	6
Brandvalley WEF	140	9299	0,33	0,00	0.02-0.23	High	78
Witberg WEF	80	1260	0,04	0,00	0.02-0.23	Low	11
Roggeveld WEF	140	2652	0,33	0,00	0.02-0.23	High	22
Rietkloof WEF	183	1270	0,48	0,00	0.02-0.23	High	11
Total for all WEFs	1557	34730	0,72	0,40	0.02-0.23	High	342
Total PVC Solar	300	1500					
Total for all REFs	1857	36230	0,72	0,40	0.02-0.23	High	342

As more turbines are monitored, a linear increase in bat fatalities is reported. Cumulative impacts on bat fatalities are predicted and assessed at fatality risk levels, based on proportional bat occupancy per hectare of each of South Africa's Terrestrial Ecoregions to calculate cumulative impact thresholds (MacEwan, et al., 2020; Sowler, et al., 2017).

Occasional inconsistencies exist in the methodologies applied across sites, such as uniform measurements of recording conditions and location of bat detectors as well as the size of the development project. These inconsistencies limit the exactness of calculating thresholds to gauge the extent of the cumulative impact. Due to these inconsistencies, amendments were made in Table 7, to inform the impacts as outlined below:

*Due to historical data measurements, significant variation often exists in the approximate project sizes documented from studies at adjacent and regional WEFs to the proposed study area under investigation. In this case, project sizes range from 750 ha to 9299 ha. The lack of uniformity impacts the exactness of bat fatality thresholds as some studies record a total project size and other studies mention a footprint of buildable and laydown area between 4 to 10% of the total project size. Despite thorough literature reviews of previous documents and attempts to find uniformity in project size measurement, the bat fatality thresholds in Table 7 are calculated on total project size, albeit significant variations in size.

**Bat activity calculations for studies of approved WEFs adjacent to the Karee WEF project site, as well as regional WEFs, are compliant with previous guidelines and differ from current guidelines; therefore, bat activity indices based on average, as well as median calculations, are presented in Table 7. Median calculations for the Karee and Patatskloof WEFs are based on 'near ground' and 'rotor sweep' recordings and the average of the recordings is presented in Table 7. For the Karee WEF, the 'near ground' median is 0.51 and the 'turbine sweep' median is 0.35. The recorded average is 0.43. Although bat indexes based on average bat passes are not required by the current 2020 bat monitoring guidelines for the Karee WEF, it is recorded in Table 7. The bat indices (based on average bat passes per hour per year) for the Karee WEF and Patatskloof WEF were calculated on recordings done in 2021 and are much higher than the bat indices of surrounding WEFs recorded in previous years (between 2015-2019). In previous years of investigation in the region, severe drought prevailed which caused a reduction in bat activity. The region received widespread rain in 2021 and bat activity increased. Bat activity reacts swiftly to weather condition fluctuations in semi-dessert regions and bat specialists investigating regional WEFs with previous lower bat activity are currently monitoring higher bat activity than shown in Table 7.

***The bat fatality risk level calculation for ecoregional Succulent Karoo xeric Shrublands and Fynbos Shrubland ranges from the low level (0.02) for Succulent Karoo xeric Shrublands, to the high level (0.23) for Fynbos Shrubland at rotor sweep. The range used in Table 7 above overlaps to cover the low and high ranges for both ecoregions, and the bat fatality risk levels are rated and recorded accordingly (MacEwan, et., 2020).

Furthermore, the data available from some of the previously recorded studies, recommend that bat activity levels are recorded and reported above 40m height for bat fatality risk rating instead of below 11m and above 50m. Some of these previous studies indicated that between 1.8 and 6.5 fewer bats were recorded at 60m than at 40m height (Marais, 2015). Bat activity recorded at above 40m could potentially be an accurate result for bat activity at rotor sweep.

****Threshold calculations used in this report do not involve the number of turbines or MW. They are based on the number of bats in addition to natural population losses, which can be removed from the area before population declines arise. These threshold calculations can be applied to any development that may result in bat fatalities (MacEwan, et al., 2020).

Based on natural population dynamics and bat occupancy per ecoregion, the threshold calculations for the Karee WEF project site for insectivorous bats should not exceed 15 bats per annum per family or species, based on bat fatality thresholds per ecoregion for Fynbos Shrubland (50%) and Succulent Karoo xeric Shrublands (50%). Values are adjusted for biases such as searcher inefficiency, carcass persistence as well as fatalities of bats targeted for conservation purposes. When 16 or more bat fatalities occur, mitigation should apply. Threshold calculations for cumulative impacts on bat populations at the Karee WEF and surrounding WEFs within a 35km radius within the Komsberg REDZ should not exceed 195 bats per annum. This calculation is based on bat fatality thresholds per ecoregion for Fynbos Shrubland 50% (182 bats per annum) and Succulent Karoo xeric Shrublands 50% (12 bats per annum), utilising SABAA Cumulative Threshold calculations (MacEwan, et al., 2020).

Mitigation measures are implemented where site-specific (15 bats per annum) and regional thresholds (194 bats per annum) are exceeded. If bat fatalities for a total area exceed the threshold, collective mitigation and other conservation efforts should be applied. The developer and operator are responsible for the specific site;

whereas, the collective of government, developers and operators for the region are responsible for complying with the implementation of mitigation measures to reduce the impact of negative cumulative impacts (MacEwan, et al., 2020).

Mitigation measures are recommended according to impact ratings to help reduce the possibility of population-level declines and should be implemented if annual adjusted fatalities per ha exceed the thresholds. Mitigation is triggered by exceeding an overall annual threshold per species or family group of bats and mitigation measures put in place. Thereafter, the type, intensity, turbine identification and periods of mitigation are refined based on actual fatality data per turbine.

Unless mitigation is implemented, there is a risk of infringing the NEMA: Biodiversity Act 10 of 2004. Although the developer of the Karee WEF has no control over the management of other WEFs, it remains the responsibility of each WEF to apply mitigation to lower their risk levels and estimated impacts below acceptable sustainability thresholds. Applying thresholds and adhering to effective mitigation measures in practice will reduce residual impacts at the Karee WEF and consequently lower the overall cumulative impact of all WEFs in the area.

9. PROPOSED MITIGATION MEASURES

9.1 Turbine positions

The first step in mitigating the potential negative impacts of a proposed WEF on bats is to site turbines outside of sensitive areas. The sensitive southern parts of the project site have already been avoided during the planning of the area for development. Figure 39 on page 67 furthermore indicates the sensitivity zones within the development area and it is recommended that the applicant shift the turbine positions out of the 'no-go' and high sensitivity areas. After specialist input was considered, the developer is proceeding with a buildable area instead of a detailed turbine layout. An updated bat sensitivity map is provided in Figure 40, with no further infringement of turbine positions.

9.2 Feathering of all turbines below cut-in speed

Normally, operating turbine blades are at right angles to the wind. To avoid bat fatality when turbines are not generating power, feathering as a mitigation measure is applied and the angle of the blades is pitched parallel with the wind direction so that the blades only spin at very low rotation and that there is no risk to bats. The turbines will not come to a complete standstill, but the movement of the turbines would be minimal.

The cut-in speed is the lowest wind speed at which turbines generate power. Freewheeling occurs when turbine blades are allowed to rotate below the cut-in speed and thereby increase the risk of collision in areas already sensitive to bat activity. As bats are more active at low wind speeds, mortality during freewheeling should be prevented as much as possible, and to an extent that bat mortality is avoided below cut-in speed. It is recommended that this mitigation measure commences immediately after the installation of turbines, after the necessary tests on turbines have been concluded, but before the commercial operation date, and for the duration of the project. Turbine blades are usually feathered around 90 degrees to prevent freewheeling, but the angle will depend on the turbine make and model.

9.3 Turbine specific recommendations during the operational phase

Currently, the most reliable and effective mitigation is curtailment (Arnett and May, 2016; Hayes, 2019). Curtailment entails locking or feathering the turbine blades during high bat activity periods to reduce the risk of bat mortality via collision with blades and barotrauma. This results in a reduction of the power generation during conditions when electricity would usually be supplied. Curtailment regimes are developed by examining the relationship between relative bat activity levels and weather conditions. Bat activity is typically reduced at higher wind speeds, lower temperatures, and a site-specific range of humidity. Unfortunately, personal experience and unpublished data in South Africa indicate that *Molossidae* bats in Southern Africa fly at higher wind speeds than originally expected. Nevertheless, lower wind speeds and warmer temperatures typically correlate with higher bat activity levels, as seen in Section 6, and a percentage of bats could be saved by using weather conditions to predict bat activity.

This relationship between bats and weather conditions as well as seasonal activity is used to inform curtailment schedules that should be applied when bat activity is high, to reduce potential encounters of bats with wind turbine blades. These relations are presented in Section 6 of this report and were used to compile the below curtailment schedule.

Close observation during the bat monitoring to be conducted during the post-construction phase, should inform, and refine the curtailment schedule, and apply it to specific turbines, as necessary. If curtailed turbines show consistent low activity through static recordings as well as mortality in the low threshold range, the bat specialist could adapt curtailment again.

It is recommended that curtailment is applied during the specified time periods when the relevant temperatures, wind speeds and humidity prevail, see Table 8. Fatality risk at the high mast indicates curtailment is required from September to March.

Table 8: Curtailment schedule to apply as necessary during the operational phase

Months	Time period	Temperature (°C)	Wind speed (m/s)	Humidity (%)	Curtailment
Beginning September to end March	3 hours after sunset, up to 4 hours before sunrise	Above 15°C	Below 9 m/s	Between 40% and 75% humidity	Raise cut-in speed to 6 m/s

9.4 Bat deterrents

Bat deterrent suppliers indicate that *Molossidae* bats react well to deterrents. Urland (2021) refers to research done by NRG Systems in the USA, where pairing pioneering ultrasonic acoustic deterrent systems with curtailment reduced bat fatalities by 54% at a wind plant (farm) in Texas and by 67% in Illinois. This could be an option for mitigation but will have to be discussed with a bat specialist and the applicant. It is believed that the new supplier of bat deterrents in South Africa will be able to not only drive the research in deterrents and South African bat species, but also make deterrents more readily available to developers.

9.5 Avoid creating bat conducive areas

The aim of mitigation recommendations is to try to protect the current bat population, while avoiding creating any features that might attract bats to the development site. It is therefore recommended that:

- The roofs of all new buildings are sealed, keeping in mind that a small bat could enter a hole of one square centimetre. If no bats are residing in the current building on site, the developer could discuss the situation with the land owner and propose to also seal the corrugated roof of this building to avoid any bat roosts in future.
- Rehabilitate any new quarries or burrow pits which could collect standing water.
- No roosts were found during the 12-month bat monitoring study, but if any roost are found during the construction or operational phase, a bat specialist should be consulted immediately.

9.6 Operational bat monitoring

Operational bat monitoring should be conducted for at least two years, as per the latest SABAA operational bat guidelines of the time. Bat monitoring, including carcass searches, will have to start at the turn of the turbine blades, after testing on turbines have been completed, as the highest mortality is often experienced in the first year of a WEF. It is therefore important that the bat specialist is appointed before COD.

10. DESCRIPTION OF PROJECT ASPECTS RELEVANT TO BAT IMPACT

10.1 Components of the project which could impact bats

Components of the proposed Karee WEF which could negatively impact bats, directly through mortality during the operational phase, and indirectly, through the loss of foraging habitat, are the following:

- The noise of construction activities;
- Clearance of natural vegetation for electrical connections, upgrading of access roads, creating hard standing areas or laydown areas;
- Demolition of existing buildings;
- New buildings, such as the substation and BESS complex;
- Excavating areas or creating borrow pits (if required);
- Operational wind turbines;
- Artificial lighting; and
- Decommissioning activities.

10.2 Potential Impact on Bats

Bats are long-lived mammals and females often produce only one pup per year, resulting in a life strategy characterised by slow reproduction (Barclay and Harder, 2003). Because of this, bat populations are sensitive to changes in mortality rates and their populations tend to recover slowly from declines.

The potential impact on bats includes the following:

Construction phase:

- <u>Loss of existing roosts and/or potential roosts</u>: Some of the bat species that occur on the proposed site are known to roost in the rock formations, crevices, derelict aardvark holes and under the bark of trees (see Table 2). Any disturbance of these natural roosting opportunities might have a negative impact on bats. Demolition of the few existing buildings will destroy bat roosts in those buildings.
- <u>Attracting bats by artificially creating new roosting areas</u>: The presence of new buildings within the study area may provide additional roost sites for those species making use of man-made structures.

Operational phase:

- <u>Direct collisions with rotating turbine blades</u>: The most important aspect of the project that affects bats adversely are the wind turbines, and in particular, direct collisions from the operational rotating blades.

- Fatalities from barotrauma: As the air moves over the turning turbine blades, an area of low pressure is created. Barotrauma occurs when bats experience a sharp decrease in atmospheric pressure near rotating turbine blades. This pressure drop causes a rapid expansion of the lungs, which is unable to be remedied through proper exhalation (Baerwald et al., 2008), thus resulting in the haemorrhage of the lungs and ultimately mortality.
- Loss of foraging habitat: The turbines, during operation, will influence the natural foraging space of bats. Disturbance resulting from construction activities, such as noise after sunset from engines or generators, might also deter bats, resulting in loss of feeding habitat.

Throughout the lifespan of the project, the ideal bat situation is to maintain bat populations as they occur on-site, and to avoid attracting more bats to the area of a potential collision.

10.3 Construction

Table 9: Rating of impacts that could potentially occur during the construction phase

Environmental Parameter	Issue / Impact / Environmental Effect/ Nature	Environmental Significance Before Mitigation									Environmental Significance After Mitigation								
		E	P	R	L	D	I/M	Total	Status (+/ -)	S	E	P	R	L	D	I/M	Total	Status (+/ -)	S
CONSTRUCTION PHASE																			
Clearing and excavation of natural habitat	The destruction of features that could serve as potential roosts, such as rock formations and the removal of trees on site. The destruction of derelict holes, such as aardvark holes, and any fragmentation of woody habitat which include dense bushes. The removal of limited trees and bushes would have an impact on all bats that could potentially roost in and on the foraging habitat of clutter and clutter-edge species.	1	4	3	3	4	3	42	-	Medium	1	4	2	2	2	2	22	-	Low

MITIGATION MEASURES:

- Apart from access roads, construction activities to be kept out of all ‘no-go’ and high bat sensitive areas.
- Rock formations occurring along the ridge lines should be avoided during construction, as these serve as roosting space for bats.
- Destruction of trees should be avoided during construction.
- Care should be taken if any dense bushes are destroyed.
- Aardvark holes or any large derelict holes or excavations should not be destroyed before careful examination for bats. The Environmental Control Officer (ECO), or a responsible appointed person or site manager, should contact a bat specialist before construction commences so that they know what to look out for during construction.

<table>
<tr><th rowspan="2">Environmental Parameter</th><th rowspan="2">Issue / Impact / Environmental Effect/ Nature</th><th colspan="9">Environmental Significance Before Mitigation</th><th colspan="9">Environmental Significance After Mitigation</th></tr>
<tr><th>E</th><th>P</th><th>R</th><th>L</th><th>D</th><th>I/M</th><th>Total</th><th>Status (+/ -)</th><th>S</th><th>E</th><th>P</th><th>R</th><th>L</th><th>D</th><th>I/M</th><th>Total</th><th>Status (+/ -)</th><th>S</th></tr>
<tr><td colspan="20">CONSTRUCTION PHASE</td></tr>
<tr><td>Excavation and building new structures</td><td>Creating new habitat amongst the turbines which might attract bats. This includes buildings with roofs that could serve as roosting space or open water sources from quarries or excavation where water could accumulate.</td><td>1</td><td>4</td><td>2</td><td>2</td><td>3</td><td>2</td><td>24</td><td>-</td><td>Low</td><td>1</td><td>4</td><td>1</td><td>1</td><td>2</td><td>2</td><td>18</td><td>-</td><td>Low</td></tr>
<tr><td colspan="20">MITIGATION MEASURES:
▪ Completely seal off roofs of new buildings (e.g., substations and site buildings). Note, a small bat species could enter a hole the size of 1 cm^2.
▪ Roofs need to be regularly inspected during the lifetime of the WEF, and any new holes need to be sealed.
▪ Excavation areas, quarries or any other artificial depressions should be filled and rehabilitated to avoid creating new areas of open water sources which could attract bats during rainy spells.</td></tr>
<tr><td>Noise and light disturbance</td><td>Construction noise, especially during night-time, as well as lighting disturbance.</td><td>1</td><td>3</td><td>2</td><td>3</td><td>2</td><td>2</td><td>22</td><td>-</td><td>Low</td><td>1</td><td>3</td><td>1</td><td>1</td><td>1</td><td>1</td><td>7</td><td>-</td><td>Low</td></tr>
<tr><td colspan="20">MITIGATION MEASURES:
▪ Nightly construction activities should be avoided, or if necessary, minimised to the shortest period possible.
▪ With the exception of compulsory civil aviation lighting, artificial lighting during construction should be minimised, especially bright lights or spotlights.
▪ Lights should avoid skyward illumination. Turbine tower lights should be switched off when not in operation, where possible.</td></tr>
</table>

10.4 Operation

Table 10: Rating of impacts that could potentially occur during the operational phase.

Environmental Parameter	Issue / Impact / Environmental Effect/ Nature	Environmental Significance Before Mitigation									Environmental Significance After Mitigation								
		E	P	R	L	D	I/M	Total	Status (+ /-)	S	E	P	R	L	D	I/M	Total	Status (+/-)	S
OPERATIONAL PHASE																			
Direct collision or barotrauma	Fatality through direct collision or barotrauma of resident bats occupying the airspace amongst the turbines. The turning blades of the turbines during operation are the most important aspect of the project that would impact negatively on bats. High flying species have predominantly been confirmed at the proposed Karee WEF site.	3	4	3	4	3	3	51	-	High	2	4	3	3	3	3	45	-	High

MITIGATION MEASURES:

- All turbines and turbine components, including the rotor swept zone, should be kept out of all 'no-go' and high sensitivity zones.
- Mitigation, as proposed in Section 9, should be applied as soon as the test period of turbines are completed and turbines start turning.
- Mitigation, as proposed for medium sensitivity zones proposed in Section 9, Table 8, should be applied after testing, as soon as turbines start to turn.
- A bat specialist should be appointed **before** the turbines start to turn, and operational bat monitoring should start when all the turbines start to turn, for a minimum of two years, or described by the latest South African bat guidelines.
- At least two years of post-construction bat monitoring is to be conducted and must be performed according to the South Africa Good Practice Guidelines for Operational Monitoring for Bats at Wind Energy facilities (Aronson, et.al., 2020), or later versions of the guidelines valid at the time of monitoring, as well as other relevant South African guidelines as applicable during the monitoring period.
- Mitigation should be discussed between the bat specialist and developer during the operational phase. Mitigation should be adapted and implemented without delay. Where high bat mortality occurs, turbine specific mitigation measures should be applied, using Section 9 as a starting point for discussions.

Environmental Parameter	Issue / Impact / Environmental Effect/ Nature	Environmental Significance Before Mitigation									Environmental Significance After Mitigation								
		E	P	R	L	D	I/M	Total	Status (+ /-)	S	E	P	R	L	D	I/M	Total	Status (+/-)	S
OPERATIONAL PHASE																			
▪ Except for compulsory lighting required in terms of civil aviation, artificial lighting should be minimised, especially bright lights. Lights should rather be turned downwards. Turbine tower lights should be switched off when not in operation, if possible. ▪ It is understood that static bat monitoring equipment on turbines has a cost implication. Although it is not a requirement at this stage, as it depends on whether the Met mast will be deployed for the life span of the turbines, but having more refined static data from sampling points at height, would aid in interpreting future bat fatality records of the Karee WEF. Therefore, the installation of more than one monitoring system at height, is important.																			
Bat migrations	Bat fatality during migration. A limited number of calls like *Miniopterus natalensis* (Natal Long-fingered bat), a Near Threatened migration species, have been recorded. Not much research has been conducted on migration of bats in South Africa, and some of the other species occurring on site could also migrate.	3	2	3	3	3	2	28	-	Medium	2	2	2	2	3	2	22	-	Low

MITIGATION MEASURES:

- Care should be taken during post construction monitoring to verify the activity of *M. natalensis*, especially within the rotor swept area of the turbine blades. Carcasses should be identified so as to establish the fatality of this species.
- All turbines and turbine components, including the rotor swept zone, should be kept out of all ‘no-go’ and high sensitivity zones.
- Mitigation, as proposed in Section 9, should be applied as soon as the test period of turbines are completed and turbines start turning.
- Mitigation, as proposed for medium sensitivity zones proposed in Section 9, Table 8, should be applied after testing, as soon as turbines start to turn.
- A bat specialist should be appointed **before** the turbines start to turn, and operational bat monitoring should start when all the turbines start to turn, for a minimum of two years, or described by the latest South African bat guidelines.

Environmental Parameter	Issue / Impact / Environmental Effect/ Nature	Environmental Significance Before Mitigation									Environmental Significance After Mitigation								
		E	P	R	L	D	I/M	Total	Status (+ /-)	S	E	P	R	L	D	I/M	Total	Status (+/-)	S
OPERATIONAL PHASE																			
▪ At least two years of post-construction bat monitoring is to be conducted and must be performed according to the South Africa Good Practice Guidelines for Operational Monitoring for Bats at Wind Energy facilities (Aronson, et.al., 2020), or later versions of the guidelines valid at the time of monitoring, as well as other relevant South African guidelines as applicable during the monitoring period. ▪ Mitigation should be discussed between the bat specialist and developer during the operational phase. Mitigation should be adapted and implemented without delay. Where high bat mortality occurs, turbine specific mitigation measures should be applied, using Section 9 as a starting point for discussions. ▪ Except for compulsory lighting required in terms of civil aviation, artificial lighting should be minimised, especially bright lights. Lights should rather be turned downwards. Turbine tower lights should be switched off when not in operation, if possible. ▪ It is understood that static bat monitoring equipment on turbines has a cost implication. Although it is not a requirement at this stage, as it depends on whether the Met mast will be deployed for the life span of the turbines, but having more refined static data from sampling points at height, would aid in interpreting future bat fatality records of the Karee WEF. Therefore, the installation of more than one monitoring system at height, is important.																			
Loss of bats of conservation value	Some calls like the red *data Miniopterus natalensis* have been recorded, as well as the endemic *Eptesicus hottentotus.*	2	3	2	3	3	2	30	-	Medium	2	2	1	2	2	2	18	-	Low
MITIGATION MEASURES: ▪ Loss of bats of conservation value. A limited number of calls like the red *data Miniopterus natalensis* have been recorded, as well as the endemic *E. hottentotus.* Proven mitigation measures, such as curtailment, should be timeously applied if high activity of bats of conservation value is recorded, or if high numbers of carcasses are collected, during post-construction. ▪ All turbines and turbine components, including the rotor swept zone, should be kept out of all 'no-go' and high sensitivity zones. ▪ Mitigation, as proposed in Section 9, should be applied as soon as the test period of turbines are completed and turbines start turning. ▪ Mitigation, as proposed for medium sensitivity zones proposed in Section 9, Table 8, should be applied after testing, as soon as turbines start to turn.																			

Environmental Parameter	Issue / Impact / Environmental Effect/ Nature	Environmental Significance Before Mitigation									Environmental Significance After Mitigation								
		E	P	R	L	D	I/M	Total	Status (+ /-)	S	E	P	R	L	D	I/M	Total	Status (+/-)	S
OPERATIONAL PHASE																			

- A bat specialist should be appointed **before** the turbines start to turn and operational bat monitoring should start when all the turbines start to turn, for a minimum of two years, or described by the latest South African bat guidelines.
- At least two years of post-construction bat monitoring is to be conducted and must be performed according to the South Africa Good Practice Guidelines for Operational Monitoring for Bats at Wind Energy facilities (Aronson, et.al., 2020), or later versions of the guidelines valid at the time of monitoring, as well as other relevant South African guidelines as applicable during the monitoring period.
- Mitigation should be discussed between the bat specialist and developer during the operational phase. Mitigation should be adapted and implemented without delay. Where high bat mortality occurs, turbine specific mitigation measures should be applied, using Section 9 as a starting point for discussions.
- Except for compulsory lighting required in terms of civil aviation, artificial lighting should be minimised, especially bright lights. Lights should rather be turned downwards. Turbine tower lights should be switched off when not in operation, if possible.
- It is understood that static bat monitoring equipment on turbines has a cost implication. Although it is not a requirement at this stage, as it depends on whether the Met mast will be deployed for the life span of the turbines, but having more refined static data from sampling points at height, would aid in interpreting future bat fatality records of the Karee WEF. Therefore, the installation of more than one monitoring system at height, is important.

		E	P	R	L	D	I/M	Total	Status (+ /-)	S	E	P	R	L	D	I/M	Total	Status (+/-)	S
Fatal curiosity	Bat mortality due to the attraction of bats to wind turbines (Horn, et al., 2008). Bats have been shown to sometimes be attracted to wind turbines out of curiosity or reasons still under investigation.	1	3	2	2	3	2	26	-	Medium	1	2	2	3	2	2	20	-	Low

MITIGATION MEASURES:

- Bat mortality due to the attraction of bats to wind turbines (Horn, et al., 2008). Bats have been shown to sometimes be attracted to wind turbines out of curiosity or reasons still under investigation.
- Except for compulsory lighting required in terms of civil aviation, artificial lighting should be minimised, especially bright lights. Lights should rather be turned downwards. Turbine tower lights should be switched off when not in operation, if possible.

Environmental Parameter	Issue / Impact / Environmental Effect/ Nature	Environmental Significance Before Mitigation									Environmental Significance After Mitigation								
		E	P	R	L	D	I/M	Total	Status (+ /-)	S	E	P	R	L	D	I/M	Total	Status (+/-)	S
OPERATIONAL PHASE																			
▪ Little is known about this impact, and mitigation could be adapted if more research becomes available.																			
Foraging space lost due to the turning of turbine blades	Loss of habitat and foraging space during operation of the wind turbines.	2	4	2	3	3	3	42	-	Medium	2	4	2	3	3	2	28	-	Medium

MITIGATION MEASURES:

- All turbines and turbine components, including the rotor swept zone, should be kept out of all 'no-go' and high sensitivity zones.
- Mitigation, as proposed in Section 9, should be applied as soon as the test period of turbines are completed and turbines start turning.
- Mitigation, as proposed for medium sensitivity zones proposed in Section 9, Table 8, should be applied after testing, as soon as turbines start to turn.
- A bat specialist should be appointed **before** the turbines start to turn, and operational bat monitoring should start when all the turbines start to turn, for a minimum of two years, or described by the latest South African bat guidelines.
- At least two years of post-construction bat monitoring is to be conducted and must be performed according to the South Africa Good Practice Guidelines for Operational Monitoring for Bats at Wind Energy facilities (Aronson, et.al., 2020), or later versions of the guidelines valid at the time of monitoring, as well as other relevant South African guidelines as applicable during the monitoring period.
- Mitigation should be discussed between the bat specialist and developer during the operational phase. Mitigation should be adapted and implemented without delay. Where high bat mortality occurs, turbine specific mitigation measures should be applied, using Section 9 as a starting point for discussions.
- Except for compulsory lighting required in terms of civil aviation, artificial lighting should be minimised, especially bright lights. Lights should rather be turned downwards. Turbine tower lights should be switched off when not in operation, if possible.
- It is understood that static bat monitoring equipment on turbines has a cost implication. Although it is not a requirement at this stage, as it depends on whether the Met mast will be deployed for the life span of the turbines, but having more refined static data from sampling points at height, would aid in interpreting future bat fatality records of the Karee WEF. Therefore, the installation of more than one monitoring system at height, is important.

Environmental Parameter	Issue / Impact / Environmental Effect/ Nature	Environmental Significance Before Mitigation									Environmental Significance After Mitigation								
		E	P	R	L	D	I/M	Total	Status (+ /-)	S	E	P	R	L	D	I/M	Total	Status (+/-)	S
OPERATIONAL PHASE																			
Smaller genetic pool	Reduction in the size, genetic diversity, resilience and persistence of bat populations. Bats have low reproductive rates and populations are susceptible to reduction by fatalities other than natural death. Furthermore, smaller bat populations are more susceptible to genetic inbreeding.	3	4	3	3	3	3	51	-	High	3	3	2	3	3	3	42	-	Medium

MITIGATION MEASURES:

- Proven mitigation measures, such as curtailment, should be applied if high activity of bats of conservation value is recorded, or if high numbers of carcasses are collected, during post-construction.
- All turbines and turbine components, including the rotor swept zone, should be kept out of all 'no-go' and high sensitivity zones.
- Mitigation, as proposed in Section 9, should be applied as soon as the test period of turbines are completed and turbines start turning.
- Mitigation, as proposed for medium sensitivity zones proposed in Section 9, Table 8, should be applied after testing, as soon as turbines start to turn.
- A bat specialist should be appointed **before** the turbines start to turn, and operational bat monitoring should start when all the turbines start to turn, for a minimum of two years, or described by the latest South African bat guidelines.
- At least two years of post-construction bat monitoring is to be conducted and must be performed according to the South Africa Good Practice Guidelines for Operational Monitoring for Bats at Wind Energy facilities (Aronson, et.al., 2020), or later versions of the guidelines valid at the time of monitoring, as well as other relevant South African guidelines as applicable during the monitoring period.
- Mitigation should be discussed between the bat specialist and developer during the operational phase. Mitigation should be adapted and implemented without delay. Where high bat mortality occurs, turbine specific mitigation measures should be applied, using Section 9 as a starting point for discussions.
- Except for compulsory lighting required in terms of civil aviation, artificial lighting should be minimised, especially bright lights. Lights should rather be turned downwards. Turbine tower lights should be switched off when not in operation, if possible.

Environmental Parameter	Issue / Impact / Environmental Effect/ Nature	Environmental Significance Before Mitigation									Environmental Significance After Mitigation								
		E	P	R	L	D	I/M	Total	Status (+ /-)	S	E	P	R	L	D	I/M	Total	Status (+/-)	S
OPERATIONAL PHASE																			
▪ It is understood that static bat monitoring equipment on turbines has a cost implication. Although it is not a requirement at this stage, as it depends on whether the Met mast will be deployed for the life span of the turbines, but having more refined static data from sampling points at height, would aid in interpreting future bat fatality records of the Karee WEF. Therefore, the installation of more than one monitoring system at height, is important.																			

10.5 Decommissioning

Table 11: Rating of impacts that could potentially occur during the decommissioning phase.

ENVIRONMENTAL PARAMETER	ISSUE / IMPACT / ENVIRONMENTAL EFFECT/ NATURE	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION									ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION								
		E	P	R	L	D	I/M	Total	Status (+/ -)	S	E	P	R	L	D	I/M	Total	Status (+ /-)	S
DECOMISSIONING PHASE																			
Removal of turbines	Bat disturbance due to decommissioning activities and associated noise, especially during night-time.	1	4	1	2	1	2	17	-	Low	1	3	1	1	1	1	7	-	Low
MITIGATION MEASURES: ▪ Except for compulsory lighting required in terms of civil aviation, artificial lighting during construction should be minimised, especially bright lights or spotlights. ▪ Lights should avoid skyward illumination.																			

- Night-time decommissioning activities should be avoided as far as possible.

10.6 'No-go' Impact

Should the proposed WEF development not go ahead, none of the identified potential impacts would occur and the status quo would be maintained.

10.7 Cumulative Impacts

See Section 6 for a discussion of the cumulative effect. The significance of the identified cumulative impacts are rated in Table 12 below, with mitigation measures also provided.

Table 12: Rating of cumulative impacts

ENVIRONMENTAL PARAMETER	ISSUE / IMPACT / ENVIRONMENTAL EFFECT/ NATURE	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION									ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION								
		E	P	R	L	D	I/M	Total	Status (+/-)	S	E	P	R	L	D	I/M	Total	Status (+/-)	S
CUMULATIVE IMPACTS																			
Destruction of active roosts on several WEFs.	Cumulative effect of destruction of active roost of several WEFs as well as features that could serve as potential roosts.	3	4	3	3	3	3	48	-	High	3	2	2	2	2	2	22	-	Low

MITIGATION MEASURES:

- Although the developer does not have any control over other wind energy development, project specific mitigation, as included in the BA or in the respective Bat Impact Assessments of the projects in the surrounding area, should be adhered to for each renewable energy project. This can however only be enforced by the regulating authority.

ENVIRONMENTAL PARAMETER	ISSUE / IMPACT / ENVIRONMENTAL EFFECT/ NATURE	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION									ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION								
		E	P	R	L	D	I/M	Total	Status (+/-)	S	E	P	R	L	D	I/M	Total	Status (+/-)	S
▪ Post construction monitoring as per the relevant South African guidelines.																			
Direct collision and barotrauma of several WEFs.	Cumulative bat mortality due to direct collision with the blades or barotrauma during foraging of resident bats at several WEF sites.	3	4	4	3	4	4	88	-	High	3	4	4	3	3	3	51	-	High
MITIGATION MEASURES: ▪ Although not enforceable by the Karee applicant, all REFs must adhere to their project specific mitigation measures, especially buffer zones and sensitivity areas and recommended mitigation, for each renewable energy project. ▪ Post construction monitoring, as per the relevant South African Bat Guidelines applicable at the time, is of crucial importance.																			
Mortality of several WEFs on migrating bats.	Cumulative bat mortality of migrating bats due to direct blade impact or barotrauma during foraging of migrating bats on several WEFs	3	3	3	3	3	3	45	-	High	3	3	2	3	3	3	42	-	Medium
MITIGATION MEASURES: ▪ Although not enforceable by the Karee applicant, all REFs must adhere to their project specific mitigation measures, especially buffer zones and sensitivity areas and recommended mitigation, for each renewable energy project. ▪ Post construction monitoring, as per the relevant South African Bat Guidelines applicable at the time, is of crucial importance.																			
Several WEFs stretching over thousands of hectares.	Habitat loss over several WEFs	3	4	3	3	3	4	64	-	High	3	4	3	3	3	3	48	-	High
MITIGATION MEASURES: ▪ Although not enforceable by the Karee applicant, all REFs must adhere to their project specific mitigation measures, especially buffer zones and sensitivity areas and recommended mitigation, for each renewable energy project. ▪ Post construction monitoring, as per the relevant South African Bat Guidelines applicable at the time, is of crucial importance.																			

ENVIRONMENTAL PARAMETER	ISSUE / IMPACT / ENVIRONMENTAL EFFECT/ NATURE	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION									ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION								
		E	P	R	L	D	I/M	Total	Status (+/-)	S	E	P	R	L	D	I/M	Total	Status (+/-)	S
Several WEFs with the associated bat mortality over the lifespan of WEFs.	Cumulative reduction in the size, genetic diversity, resilience, and persistence of bat populations	3	4	3	3	4	4	68	-	High	3	4	3	3	3	3	54	-	High

MITIGATION MEASURES:

- Although not enforceable by the Karee applicant, all REFs must adhere to their project specific mitigation measures, especially buffer zones and sensitivity areas and recommended mitigation, for each renewable energy project.
- Post construction monitoring, as per the relevant South African Bat Guidelines applicable at the time, is of crucial importance.

10.8 Overall Impact Rating

Although the combined impact during the operational phase, after mitigation, is predicted to be Medium Negative, it should be noted that the bat activity on the project site, according to the bat threshold for Succulent Karoo, is high and the negative impact on bats during the operational phase could thus be high. This must however be confirmed during operational bat monitoring.

Despite the negative high impact, there are no fatal flaws from a bat perspective and if the client adheres to mitigation measures, the impact on bats from the proposed Karee WEF project site is predicted to be **Negative Medium,** with a combined significance rating of 36 before mitigation and 24 after mitigation (see Table 13).

Table 13: Summary table of expected impacts associated with Karee WEF

Summary of impacts on bats by the Karee WEF according to the SiVEST impact significance rating		
Phase	*Impact before mitigation (negative)*	*Impact after mitigation (negative)*
Construction	29 (5-23) Medium	16 (5-23) Low
Operation	38 (24-42) Medium	29 (24-42) Medium
Decommissioning	16 (5-23) Low	7 (5-23) Low
Cumulative	63 (62-80) Very High	43 (43-61) High
Combined for the site	36 (24-42) Medium	24 (24-42) Medium

11. COMPARATIVE ASSESSMENT OF ALTERNATIVES

11.1 'No-Go' Alternative

The landowners indicated that should the WEF development not take place, the same land-use activities would prevail; thus, the status quo would be maintained. No negative impact is expected on bats should the WEF development not take place.

11.2 Layout Alternatives

No layout alternatives for the Karee WEF have been proposed or assessed as the position of the wind turbines and overall layout of the WEF have been informed by the identified sensitive and/or 'no-go' areas and their relevant buffers (where required). However, two site alternatives for the substation and two construction laydown area alternatives were proposed and have been comparatively assessed.

Table 14 below provides the results of the comparative assessment of the substation site and construction laydown area alternatives from a bat perspective.

Table 14: Comparative assessment of substation and laydown areas

Alternative	Preference	Reasons (incl. potential issues)
SUBSTATION SITE ALTERNATIVES		
Substation Option 1	Least preferred	A small percentage of the area overlays with the 'no-go' sensitivity zones.
Substation Option 2	Favourable	The area is situated outside the 'no-go' and high sensitivity zones
CONSTRUCTION LAYDOWN AREA SITE ALTERNATIVES		
Construction Laydown Area Option 1	Least preferred	A small percentage of the area overlays with the 'no-go' sensitivity zones.
Construction Laydown Area Option 2	Favourable	The area is situated outside the no-go and high sensitivity zones

Based on the results of the comparative assessment of alternatives, Substation Option 2 and Construction Laydown Area Option 2 are the preferred project alternatives.

Although Substation Option 2 and Construction Laydown Area Option 2 are the most preferable alternatives from a bat perspective, the impact of the position of the substation and laydown areas is not expected to be high and therefore there are no fatal flaws associated with either of the alternatives.

12. CONCLUSION AND SUMMARY

12.1 Summary of Findings and Recommendations

75% of the bat activity was by *Tadarida aegyptiaca* (Egyptian free-tailed bat) which is a high-risk species, physiologically adapted to fly at high altitudes within the vicinity of the turbine blades. Due to this foraging preference, the risk of collision and barotrauma is high. Two more species, *Sauromys Petrophilus* (Roberts' flat-headed bat) (13%) and *Neoromicia Capensis* (Cape serotine bat) (9%) also showed a significant presence, while 2% of the activity was for the Near Threatened species *Miniopterus natalensis* (Natal long-fingered bat) and 1% was for the endemic species *Eptesicus hottentotus* (Long-tailed house bat). At the Karee WEF, the Molossidae family (namely Free-tailed bats) is more dominant at the high-altitude systems, with *S. petrophilus* and *T. aegyptiaca* comprising nearly 100% of all the activity recorded at height (Systems D and E).

A rapid increase in bat activity was recorded in spring (September), when warmer temperatures were experienced. A gradual decrease in activity was recorded from December to April, with bats generally being less active during the colder months between April and August.

System F, situated at a height of 12 m on the Meteorological (i.e., Met) mast in the northern part of the terrain, recorded the highest bat activity, with significantly higher bat passes than the other systems. Within the sweep of the turbine blades, System E at a height of 55 m, recorded higher activity in comparison to System D at a height 105 m. One would therefore suspect that the highest mortality may be experienced in the lower parts of the turbine sweep.

The general distribution of bat activity during each night, from sunset to sunrise, indicates a sharp increase in activity approximately two hours after sunset up to approximately 01:00 am at all systems. Thereafter, a sharp decrease in bat activity is experienced until two to three hours before sunrise.

According to the South African bat threshold guidelines (MacEwan *et al*., 2018), bat activity at near ground level, as well as within the rotor sweep area, falls in the highest risk category, with a combined hourly bat activity median of 0,51 near-ground and 0,35 in the rotor sweep. Due to the high bat activity on site, fatality minimisation measures are recommended for implementation during pre-construction as recommended in Section 9 of this report.

Data from the high systems D and E on the Met mast were statistically analysed for correlations between weather conditions and bat activity. Optimal conditions for bat activity on the terrain include temperatures above 10 ℃, wind speeds below 9 m/s and humidity levels between 49% and 90%.

Transect surveys showed a very high number of 144 bat passes during springtime, indicating that there are some nights, with optimal weather conditions and possible high insect occurrence, when bat activity is high.

A bat sensitivity map classified no-go, high and medium sensitivity zones (Figure 39). It is recommended that no operating turbine components are allowed in the no-go and high sensitivity areas, whereas medium sensitivity zones could be developed with mitigation. Supporting infrastructures, such as the laydown area, site sub-station and Battery Energy Storage System (BESS) may infringe on the sensitivity areas, if necessary, but care must be taken to avoid any possible bat roosts, as per the Environmental Management Programme (EMPr). After specialist input was considered, the developer is proceeding with a buildable area instead of a detailed turbine layout. An updated bat sensitivity map is provided in Figure 40, with no further infringement of turbine positions.

Although no curtailment is recommended at present, the curtailment below should be used as a starting point of discussion when curtailment during the operational phase is considered. This should appear in the operational bat monitoring programme so that the operational bat specialist can adapt these recommendations as necessary.

Months	Time period	Temperature (°C)	Wind speed (m/s)	Humidity (%)	Curtailment
Beginning September to end March	3 hours after sunset up to 4 hours before sunrise	Above 15°C	Below 9 m/s	Between 40% and 75% humidity	Raise cut-in speed to 6 m/s

Although the combined impact during the operational phase, namely after mitigation, is predicted to be Medium Negative, it should be noted that the bat activity on the project site, according to the bat threshold for Succulent Karoo, is high and the negative impact on bats during the operational phase could thus be high. This must be confirmed during operational bat monitoring, but the developer should prepare for turbine specific curtailment and/or installing bat deterrents if more information is available.

Summary impacts on bats by Karee WEF according to the SiVEST impact significance rating		
Phase	*Impact before mitigation (negative)*	*Impact after mitigation (negative)*
Construction	29 (5-23) Medium	16 (5-23) Low
Operation	38 (24-42) Medium	29 (24-42) Medium
Decommissioning	16 (5-23) Low	7 (5-23) Low
Cumulative	63 (62-80) Very High	43 (43-61) High
Combined for the site	36 (24-42) Medium	24 (24-42) Medium

Cumulative impacts on bat populations before mitigation are predicted to be Very High Negative. This is due to the combined impact of all the wind farms in the area. Even with mitigation measures, the combined cumulative impact is expected to be High Negative. This has been confirmed by the general estimated mortality (GenEst) through carcass searches on operating wind farms in the Succulent Karoo. Despite the negative cumulative impact, this is not considered to be a fatal flaw if all the wind farms apply appropriate mitigation measures.

It is recommended that the following mitigation measures be included in the Environmental Authorisation (EA):

- The final layout must be informed by the sensitivity map provided in Section 8.
- A bat specialist must be appointed before the COD. Mitigation measures, as per Section 9 in the main report, must form part of the operational EMPr, and be applied as necessary.
- Turbines must be feathered below cut-in speed, and although they need not be at a complete standstill, there should be minimum movement so that bats are not at risk when turbines are not generating power.
- All newly built structures that have bat conducive features must be rehabilitated to discourage bat presence. This includes roofs of new buildings, open quarries and borrow pits.
- A minimum of two year's operational bat monitoring must be conducted after commencement of operations at the WEF, as per the guidance of the latest operational South African Bat Assessment Association (SABAA) guidelines.

The Department of Environment, Forestry and Fisheries' Site Sensitivity Verification Report indicates that the Karee WEF area has high bat sensitivity. Some of drainage lines in the south-western and south-eastern areas, with some relative larger trees and denser bushes, are particularly conducive to bat activity. This is confirmed by the results of the 12-month bat monitoring study.

It should be noted that one year pre-construction bat monitoring is required by legislation in South Africa. However, the semi-desert Succulent Karoo environment is subject to erratic weather conditions, which vary from year to year. These changes usually result in changes in the bat situation which might not have been observed in this survey. This is not a limitation which would greatly affect the results of this bat monitoring programme, especially seen in the light of relatively good rainfall during the monitoring period.

The overall potential negative impact of the proposed Karee WEF on bats, combined for all the development phases, is predicted to be Medium Negative without mitigation. The combined impact remains overall Medium Negative with mitigation, but the significance rating is lower.

Based on the findings of the one-year pre-construction monitoring undertaken at the proposed Karee WEF project site, the bat specialist is of the opinion that no fatal flaws exist which would prevent the construction and operation of this WEF. EA may thus be granted, subject to the implementation of the recommendations made in this report.

12.2 Conclusion and Impact Statement

The Site Sensitivity Verification Report indicates the Karee WEF area as having high bat sensitivity. Some drainage lines in the southwestern and southeastern areas, with some relatively larger trees and denser bushes, are particularly conducive to bat activity. This is confirmed by the 12-month bat monitoring study.

It should be noted that one year of pre-construction bat monitoring is required by legislation in South Africa. However, the semi-desert Succulent Karoo environment is subject to erratic weather conditions, which vary from year to year. These changes usually result in changes in the bat situation which might not have been observed in this survey. This is not a limitation which would greatly affect the results of this bat monitoring programme, especially seen in the light of relatively good rainfall during the monitoring period.

The overall potential negative impact of the proposed Karee WEF on bats, combined for all the development phases, is predicted to be Medium Negative without mitigation. The combined impact remains overall Medium Negative with mitigation, but the significance rating is lower.

Based on the findings of the one-year pre-construction monitoring undertaken at the proposed Karee WEF project site, the bat specialist is of the opinion that no fatal flaws exist which would prevent the construction and operation of the WEF. EA may thus be granted, subject to the implementation of the recommendations made in this report.

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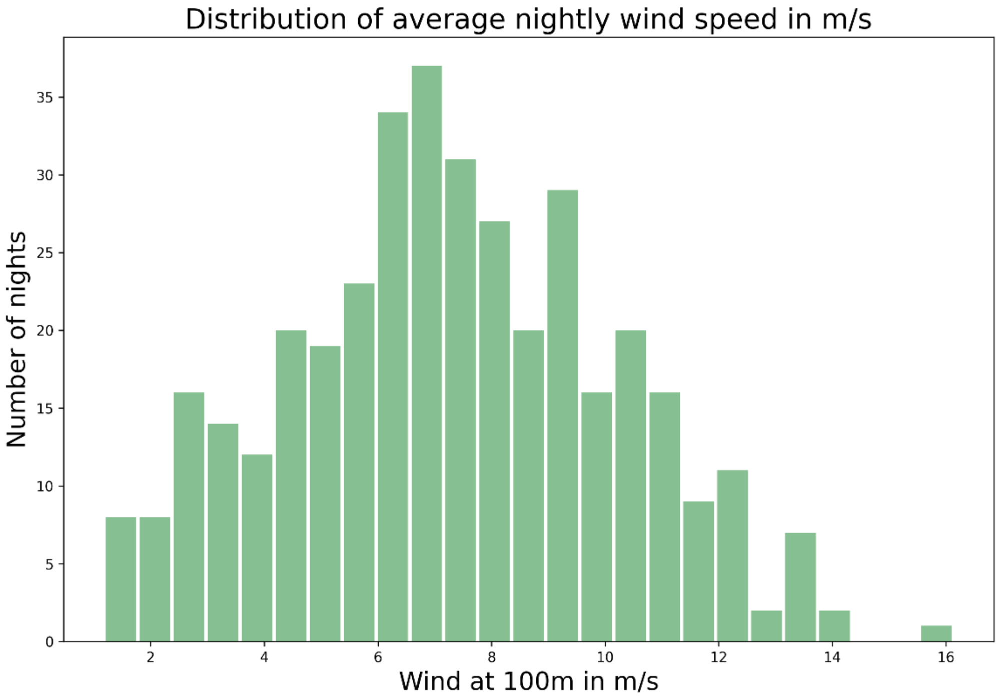
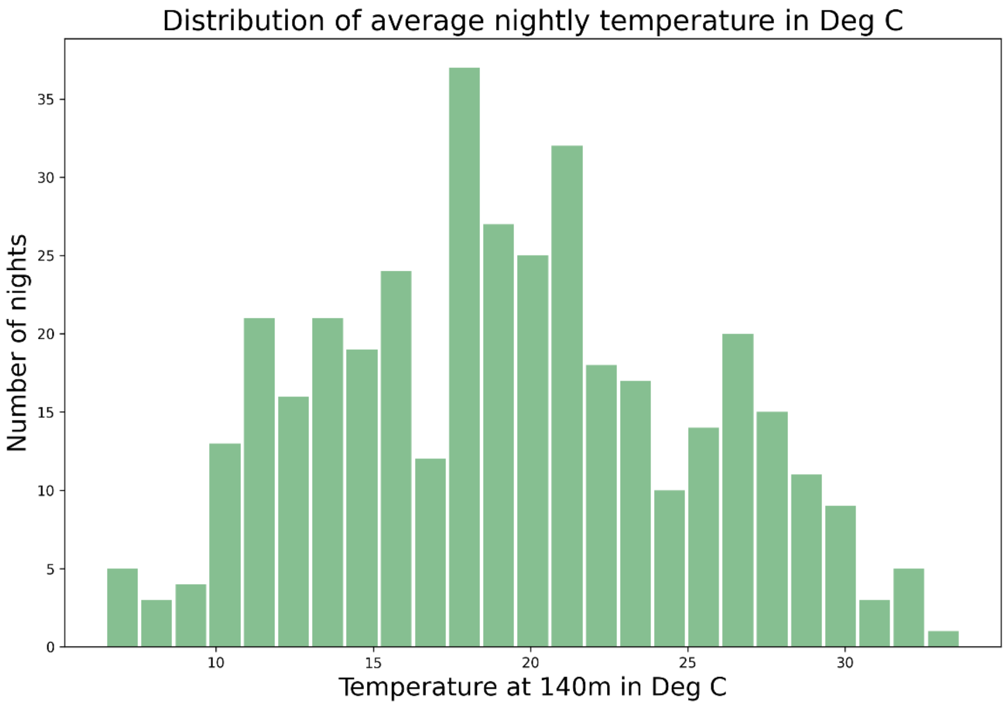
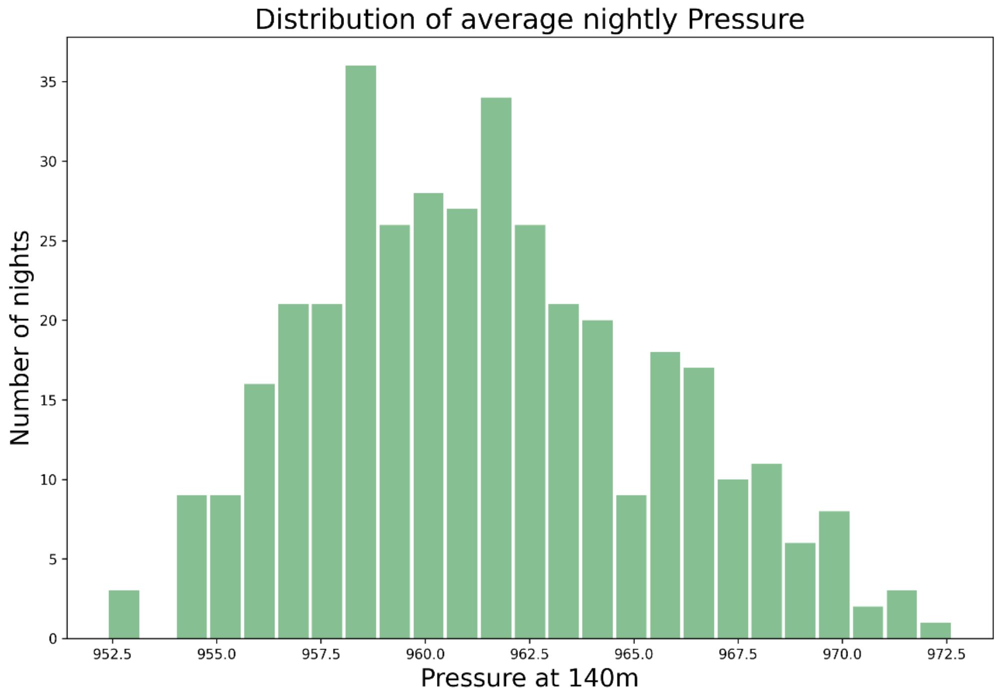
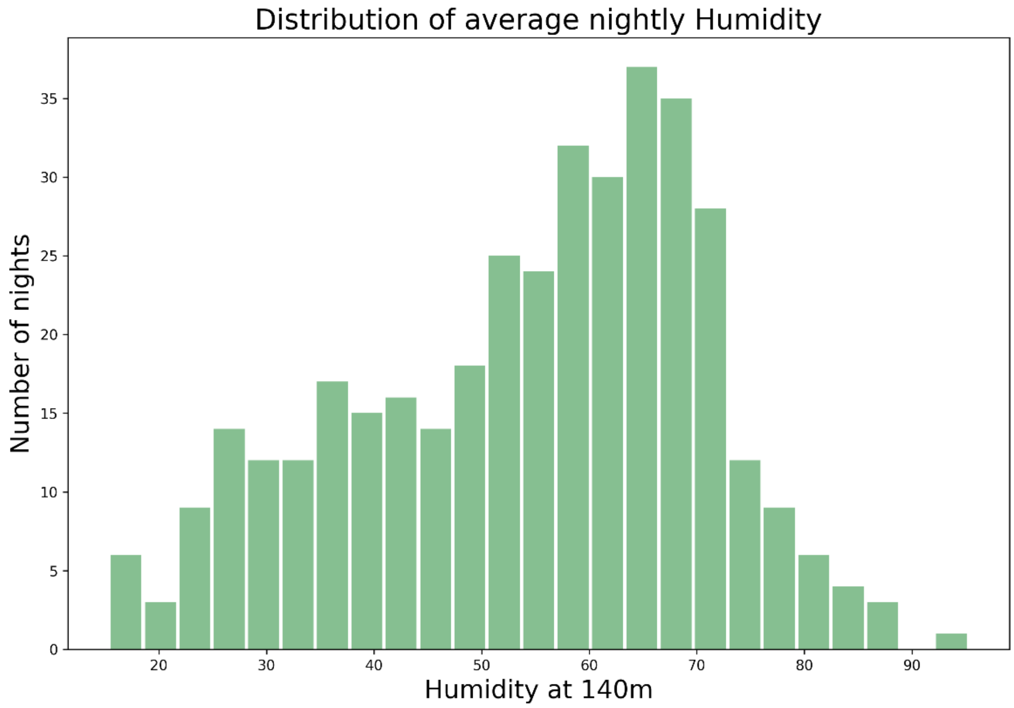
APPENDIX 1: WEATHER DISTRIBUTIONS OF AVERAGE NIGHTLY WEATHER CONDITIONS


Distribution of average nightly wind speed in m/s
Number of nights
Wind at 100m in m/s


Distribution of average nightly temperature in Deg C
Number of nights
Temperature at 140m in Deg C


Distribution of average nightly Pressure
Number of nights
Pressure at 140m
0
5
10
15
20
25
30
35
952.5
955.0
957.5
960.0
962.5
965.0
967.5
970.0
972.5


Distribution of average nightly Humidity
Number of nights
Humidity at 140m
0
5
10
15
20
25
30
35
20
30
40
50
60
70
80
90

APPENDIX 2: SPECIALIST CV

ABBREVIATED CURRICULUM VITAE:
STEPHANIE CHRISTIA DIPPENAAR

Stephanie Dippenaar Consulting, trading as Ekovler

PROFESSION: ENVIRONMENTAL MANAGEMENT, SPECIALISING IN BAT IMPACT ASSESSMENTS

Nationality: South African
ID number: 6402040117089

CONTACT DETAILS

Postal Address:	8 Florida Street, Stellenbosch, 7600
Telephone Number:	021-8801653
Cell:	0822005244
e-mail:	sdippenaar@snowisp.com

EDUCATION

1986	BA University of Stellenbosch
1987	BA Hon (Geography) University of Stellenbosch
1999	MEM (Masters in Environmental Management) University of the Free State

MEMBERSHIPS

- Steering committee of The South African Bat Assessment Association
- Member of the Southern African Institute of Ecologists and Environmental Scientists (SAIEES), since 2002.
- SACNASP registration in process.

EMPLOYMENT RECORD

- 1989: The Academy: University of Namibia. One-year contract as a lecturer in the Department of Geography.
- 1990: Windhoek College of Education. One-year contract as a lecturer in the Department of Geography.
  - Research assistant, Namibian Institute for Social and Economic Research, working on, amongst others, a situation analyses on women and children in Namibia, contracted by UNICEF.
  - Media officer for Earthlife African, Namibian Branch.
- 1991: University of Limpopo. One-year contract as a lecturer in the Department of Environmental Sciences.
- 1992: Max Planc Institute (Radolfzell-Germany). Mainly involved in handling birds and assisting with aviary studies.
- Swiss Ornithological Institute. Working in the Arava valley, Negev – Israel, as a radar operator on a project, contracted by Voice of America, involved in an Impact Assessment Study concerning shortwave towers on bird migration patterns.

- 1993 - 2004: University of Limpopo. Lecturer in the sub-discipline Geography, School of Agriculture and Environmental Sciences. Teaching post- and pre-graduate courses in environment related subjects in the Faculty of Mathematics and Natural Sciences, Faculty of Law, Faculty of Health and the Water and Sanitation Institute.
  - 2002-2004: Member of the Faculty Board of the Faculty of Natural Sciences and Mathematics.
  - 2002: Principal investigator of the Blue Swallow project, Northern Province, Birdlife SA.
  - 2002: Evaluating committee for the EMEM awards (award system for environmental practice at mines in South Africa)
  - 2001-2004: Private consultancy work, focussing on environmental management plans for game reserves.
- 2004-2011: CSIR, South Africa, doing environmental strategy and management plans and environmental impact assessments, mainly on renewable energy projects.
- 2011 onwards: Sole proprietor private consultancy.
- From 2015 to 2017: Teaching a part-time course in Environmental Management to Post-graduate students at the Department of Geography and Environmental Studies, University of Stellenbosch.

PROJECT EXPERIENCE RECORD

The following table presents an abridged list of project involvement, as well as the role played in each project:

Completion	Project description	Role
In progress	Preconstruction Bat monitoring at Khoe Wind Energy Facility	Bat specialist
In progress	Preconstruction Bat monitoring at Hugo Wind Energy Facility	Bat specialist
In progress	Operational bat monitoring at Roggeveld Wind Farm	Bat specialist
In progress	Operational bat monitoring at Kangnas Wind Farm	Bat specialist
In progress	Operational bat monitoring at Perdekraal East Wind Farm	Bat specialist
2022	Preconstruction Bat monitoring at Juno 2 and Juno 3 Wind Energy Facilities	Bat specialist
2022	Background study for the impact on bats by Small Scale Wind Turbines in Cape Town Municipality	Bat specialist
In progress	Preconstruction Bat monitoring at Patatskloof Wind Energy Facility	Bat specialist
In progress	Preconstruction Bat monitoring at Karee Wind Energy Facility	Bat specialist
In progress	Operational bat monitoring at Excelsior Wind Farm	Bat specialist
2021	Preconstruction Bat monitoring at Koup 1 and Koup 2 Wind Energy Facilities	Bat specialist
In progress	Preconstruction bat monitoring for two wind energy facilities at Kleinzee	Bat specialist
2021	Preconstruction bat monitoring at Komas and Gromis Wind Energy Facilities	Bat specialist
In progress	Preconstruction Bat monitoring at Kappa 1 and 2 Wind Energy Facilities	Bat specialist
2020	Preconstruction Bat monitoring at Kokerboom 3 and 4 Wind Energy Facilities	Bat specialist
2020	Operational bat monitoring at Khobab Wind Farm	Bat specialist

Completion	Project description	Role
2020	Operational bat monitoring at Loeriesfontein 2 Wind Farm	Bat specialist
In progress (year 5)	Operational bat monitoring at the Noupoort Wind Farm	Bat specialist
2019	Paalfontein bat screening study	Bat specialist
2019	12 Amendment reports	Bat specialist
2019	Preconstruction bat impact assessment for the Bosjesmansberg WEF	Bat specialist
2018	Preconstruction Bat Monitoring at the Tooverberg Wind Energy Facility	Bat specialist
2016	Bat "walk through" for the Hopefield Powerline associated with the Hopefield Community WEF	Bat specialist
2016	Environmental Management Plan for Elephants in Captivity at the Elephant Section, Camp Jabulani, Kapama Private Game Reserve.	Project Manager
2016	Environmental Management Plan for Hoedspruit Endangered Species Centre, Kapama Game Reserve.	Project Manager
2012-2013	Bat impact assessment for the Karookop Wind Energy Project EIA.	Bat specialist
2012	Bat specialist study for Vredendal Wind Farm EIA.	Bat specialist
2011-2012	Bat monitoring and bat impact assessment for the Ubuntu Wind Project EIA, Jeffreys Bay.	Bat specialist
2011	Bat specialist study for the Banna Ba Pifhu Wind Energy Development, Jeffrey's Bay .	Bat specialist
2011(project cancelled)	Basic Assessment for the development of an air strip outside Betty's Bay.	Project Manager
2011	Bat specialist study for the wind energy facility EIA at zone 12, Coega IDZ, Port Elizabeth.	Bat specialist
2010-2011	Bat specialist study for the Wind Energy Facility EIA at Langefontein, Darling.	Bat specialist
2010-2011	Bat specialist study for the EIA concerning four wind energy development sites in the Western Cape.	Bat specialist
2010	Bat specialist study for Electrawinds Wind Project EIA, Port Elizabeth.	Bat specialist
2010	Environmental Management Plan for the Goukou Estuary.	Project Manager
2010	EIA for the 180MW Jeffrey's Bay Wind Project, Eastern Cape (Authorisation received).	Project Manager
2010	EIA for 9 Wind Monitoring Masts for the Jeffrey's Bay Wind Project (Authorisation received).	Project Manager
2009-2010	EIA for the NamWater Desalination Plant, Swakopmund (Authorisation received).	Project Manager
2007 -2011	EIA for the proposed Jacobsbaai Tortoise reserve, Western Cape(Letf CSIR before completion of project, Authorisation rejected).	Project Manager
2007-2008	Environmental Impact Assessment for the Kouga Wind Farm, Jeffrey's Bay, Eastern Cape (Authorisation received).	Project Manager
2006-2008	Site Selection Criteria for Nuclear Power Stations in South Africa.	Co-author
2005	Auditing the Environmental Impact Assessment process for the Department of Environment and Agriculture, Kwazulu Natal, South Africa	Project Manager
2005	Background paper on Water Issues for discussions between OECD countries and Developing Countries.	Author

Completion	Project description	Role
2005	Integrated Environmental Education Strategy for the City of Tshwane.	Co- author
2005	Developing a ranking system prioritizing derelict mines in South Africa, steering the biodiversity section.	Contributor
2005	Policy and Legislative Section for a Strategy to improve the contribution of Granite Mining to Sustainable Development in the Brits-Rustenburg Region, North-West Province, South Africa.	Author
2005	Environmental Management Plan for the purpose of Leopard permits: Dinaka Game Reserve.	Project Manager in collaboration with Flip Schoeman✞
2004	Environmental Management Plan for the introduction of lion: Pride of Africa.	Project Manager in collaboration with Flip Schoeman✞
2004	Environmental Management Plan for the establishment of a Conservancy: Greater Kudu Safaris	Project Manager in collaboration with Flip Schoeman✞

MEMBERSHIPS, CONFERENCES, WORKSHOPS AND COURSES

- Member of the Steering Committee of the South Africa Bat Assessment Association.
- Member of the KZN Bat Rescue Group.
- Updated Basic Fall Arrest certification.
- Presenting a paper at the South African Bat Assessment Association conference, October 2017: Ackerman, C and S.C Dippenaar, 2017: Friend or Foe? The Perception of Stellenbosch Residents Towards Bats, 2017.
- Attend Snake Awareness, Identification and Handling course by Cape Reptile Institute, 2016.
- Attend a course in the management and care of bats injured by wind turbines by Dr. Elaenor Richardson, Kirstenbosch, 27 August 2014
- Mist netting and bat handling course by Dr. Sandie Sowler, Swellendam, 5 November 2013.
- Attendance and fieldwork to identify bat species and look at new AnalookW software with Chris Corben, the writer of the Analook bat identification software package and the Anabat Detector, during 10 and 11 October 2013.
- Attend yearly Bats and Wind Energy workshops.
- A four-day training course on Bat Surveys at proposed Wind Energy Facilities in South Africa, hosted by The Endangered Wildlife Trust, Greyton, between 22 and 26 January 2012.
- Presentation as a plenary speaker at the 4th Wind Power Africa Conference and Renewable Energy Exhibition, at the Cape Town International Convention Centre, on 28 May 2012. Title: *Bat Impact Assessments in South Africa: An advantage or disadvantage to wind development EIAs.*
- Anabat course by Dr. Sandy Sowler, Greyton, February 2011.
- Attending a Biodiversity Course for Environmental Impact Assessments presented by the University of the Free State, May 2010.

LANGUAGE CAPABILITY

Fluent in Afrikaans and English, very limited Xhosa

PEER REVIEWED PUBLICATIONS

Dippenaar, S, and Lochner, P (2010): EIA for a proposed Wind Energy Project, Jeffrey's Bay in SEA/EIA Case Studies for Renewable Energy.

Dippenaar, S. and Kotze, N. (2005): People with disabilities and nature tourism: A South African case study. Social work, 41(1), p96-108.

Kotze, N.J. and Dippenaar, S.C. (2004): Accessibility for tourists with disabilities in the Limpopo Province, South Africa. In: Rodgerson, CM & G Visser (Eds.), Tourism and Development: Issues in contemporary South Africa. Institute of South Africa.

APPENDIX 3: SITE SENSITIVITY VERIFICATION

Site Sensitivity Verification Report: Karee Wind Energy Facility

In terms of Part A of the Assessment Protocols published in GN 320 on 20 March 2020

1 INTRODUCTION

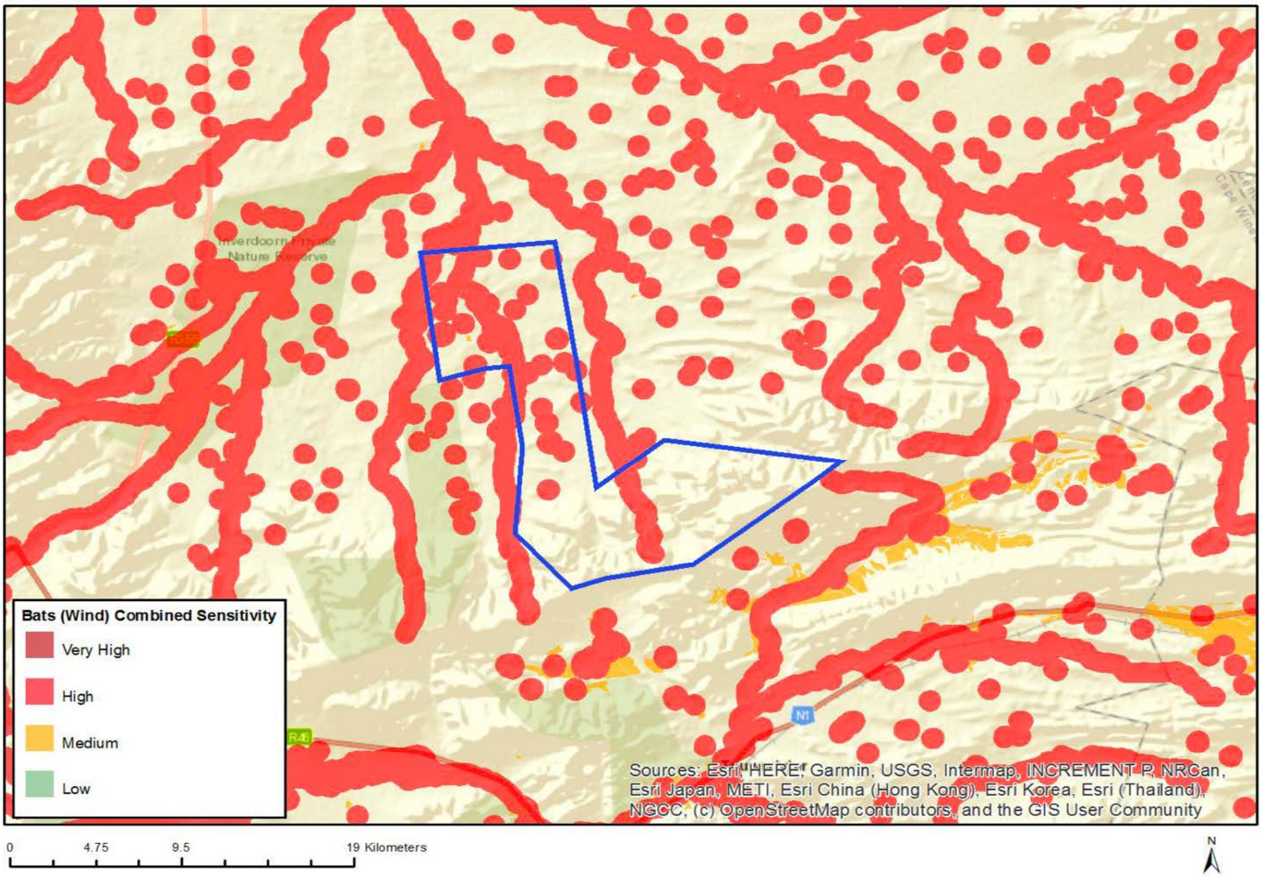
South Africa Mainstream Renewable Power Developments (Pty) Ltd, has appointed SiVEST SA (Pty) Ltd to undertake the required BA Processes for the proposed construction of the 200 MW Karee Wind Energy Facility (WEF) and associated grid infrastructure near Touws River in the Western Cape Province. The project site is approximately 11 841 ha in extent and is situated in the Komsberg Wind Renewable Energy Development Zone (REDZ). The planned location of the Karee WEF itself covers a smaller area of around 1753.1ha that had been identified inside the project site.

Stephanie Dippenaar Consulting, trading as EkoVler, was appointed to undertake a Bat Impact Assessment, including a 12-month pre-construction bat monitoring programme, to inform the Basic Assessment (BA) process for the proposed WEF. This pre-construction bat monitoring was conducted between 11 June 2021 and 27 June 2022.

According to the Specialist Assessment Protocols published in GN 320 on 20 March 2020, a site sensitivity verification has been undertaken to confirm the current land use and environmental sensitivity of the proposed project area, as identified by the national web-based environmental Screening Tool.

2 SITE SENSITIVITY VERIFICATION

The national web-based environmental screening tool was applied to the study area, and it was determined that areas of high bat sensitivity are expected to occur within the project site, as shown in Figure A below.



Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
	X		

Figure A: Expected bat-sensitive features at the Karee Wind WEF site, as per the site sensitivity report

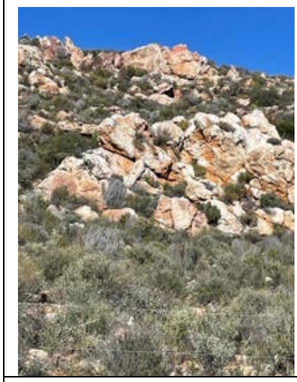
To verify this classification, the following methods were applied during the 12-month pre-construction bat monitoring exercise:

- A desktop analysis was undertaken, utilising available national and provincial databases, existing reports from the surrounding area, as well as digital satellite imagery (Google Earth Pro and QGIS).
- Onsite inspections and roost searches were conducted by a bat specialist during fieldwork sessions.
- Data, consisting of nightly bat activity, was recorded for 12 months from four static monitoring points, which were positioned amongst the proposed turbine blades at heights of 10 m, 12 m, 55 m, and 105 m respectively. The systems represented the different biotopes within the project site.
- Interviews with landowners and investigations of farm dwellings were conducted.

3 THE OUTCOME OF THE SITE SENSITIVITY VERIFICATION

See Table A below for photos indicating bat conducive features at the Karee WEF project site.

Table A: Environmental features that may be favourable to bats.

	**Vegetation** Although most of the project site is covered in the typical Karoo vegetation of the area, for those bats that might prefer roosting in vegetation or under the bark of trees, trees situated in the dry riverbeds towards the southern part of the project site, could provide ample roosting opportunities.
	**Rock formations and rock faces** Rock formations in the mountainous southern parts provide many roosting opportunities for bats. The valleys in these areas could provide possible flight routes.
	**Open water and food sources** Water troughs for the livestock, farm dams and water collecting in the riverbeds not only provide water to drink for bats, but also promote insect activity which could result in relative higher bat activity after rainy spells.

As indicated in the Screening Tool Site Sensitivity Map, Figure A, the project site is classified as high sensitivity due to the availability of natural water resources. Although this is confirmed if the area towards the northern section of the project site is considered, the bat study also indicates high sensitivity towards the southern section, comprising a section of the Bonteberg mountains. The deep valleys, rock formations, and numerous roosting opportunities, renders this part of the WEF highly sensitive to bats. Near-ground and high-altitude bat activity is in the upper class of the bat activity threshold for Succulent Karoo (MacEwan, et al. 2018), thereby confirming the classification of the site as high sensitivity.

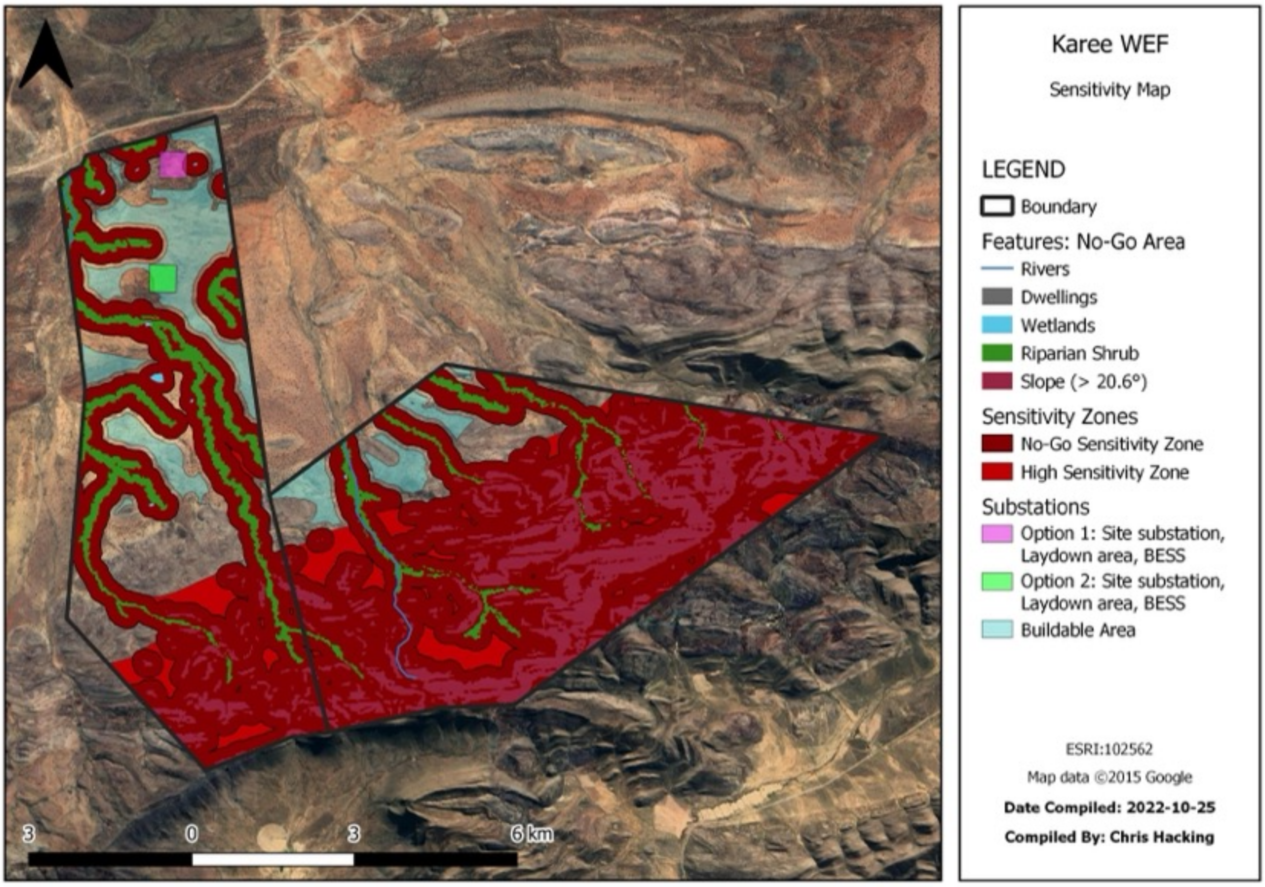


Figure B: Bat sensitivity map at the Karee Wind WEF site, as confirmed during the 12-months bat monitoring

4 CONCLUSION

The Site Sensitivity Verification Report indicates the Karee WEF area as having high bat sensitivity. Some of drainage lines in the south-western and south-eastern areas, with some relative larger trees and denser bushes, are particularly conducive to bat activity. This is confirmed by the 12-month bat monitoring study. In addition to what is portrayed on the Site Verification Report Map, the southern area also comprises numerous rock formations and deep valleys in the mountainous areas. These areas are classified as high sensitivity areas in the Bat Monitoring Report and are therefore identified as 'no-go' areas for development, as shown in Figure B above. In line with the SABAA Bat Threshold Document for Succulent Karoo (MacEwan, et al. 2018), the bat activity at the proposed project site is generally high near ground as well as within the sweep of the turbine blades. A more in-depth discussion supporting this conclusion is presented in Section 6 and 7 of the report to which this annexure is attached.

APPENDIX 4: SPECIALIST DECLARATION

environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

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

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

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

PROJECT TITLE

Karee Wind Energy Facility, near Touwsrivier, Western Cape

Kindly note the following:

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

Departmental Details

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

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

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

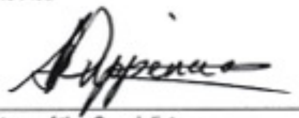
1. SPECIALIST INFORMATION

Specialist Company Name:	Stephanie Dippenaar Consulting trading as EkoVler			
B-BBEE	Contribution level (indicate 1 to 8 or non-compliant)	5	Percentage Procurement recognition	80%
Specialist name:	Stephanie C Dippenaar			
Specialist Qualifications:	MEM (Masters in Environmental Management)			
Professional affiliation/registration:	SAIEES (Southern African Institute for Ecologists and Environmental Scientists)			
Physical address:	8 Florida Street, Stellenbosch			
Postal address:	8 Florida Street, Stellenbosch			
Postal code:	7600	Cell:	082 200 5244	
Telephone:	082 200 5244	Fax:		
E-mail:	sdippenaar@snowisp.com			

2. DECLARATION BY THE SPECIALIST

I, Stephanie C Dippenaar, 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

Stephanie Dippenaar Consulting trading as EkoVler

Name of Company:

21 September 2022

Date

3. UNDERTAKING UNDER OATH/ AFFIRMATION

I, Stephanie C Dippenaar, 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

Stephanie Dippenaar Consulting trading as EkoVier

Name of Company

21 September 2022

Date

0G-9149-5 m/o
HPJ STEVENS

Signature of the Commissioner of Oaths

SUID-AFRIKAANSE POLISIEDIENS
STASIE BEVELVOERDER
STELLENBOSCH
2022 -09- 21
STATION COMMANDER
STELLENBOSCH
SOUTH AFRICAN POLICE SERVICE

Date