Scoping report: Preconstruction Bat Monitoring Assessment for the Proposed Dalmanutha Wind Energy Facility, located east of Belfast in Mpumalanga, South Africa

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Prepared for
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EXPERTISE OF BAT SPECIALISTS

Low de Vries is a registered bat assessment specialist with SABAA and has consulted for numerous field projects, which included bird surveys and the removal of dangerous snakes in Mozambique, as well as several biodiversity surveys in South Africa. He obtained a PhD in Zoology while investigating the general ecology of aardwolves with special focus on home range, diet and prey abundance. After his PhD he spent 14 months on Marion Island assisting with field work on elephant seals, fur seals and killer whales. During his subsequent (and current) postdoctoral position at the University of Pretoria he spent three years conducting research on the ecology of bats and has obtained extensive knowledge on bat behaviour and experience in bat handling.

Disclaimer by specialist

I declare that the work presented in this report is my own and has not been influenced in any way by the developer. At no point has the developer asked me as specialist to manipulate the results in order to make it more favourable for the proposed development. I consider myself bound to the rules and ethics of the South African Council for Natural Scientific Professions (SACNASP) and the EIA Regulations (2014, as amended). I have the necessary qualifications and expertise (*Pr. Sci. Nat. Zoological Science)* in conducting this specialist report.

Dr. Low de Vries

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Checklist according to SABAA guidelines (MacEwan *et al*., 2020)

Scoping-specific Guideline requirement	**Section in report**	**Completed**
Literature review: collation and review of existing literature	3.1 **Error! Reference source not found.**	Yes
Identify habitats which may be used by bats	3. **Error! Reference source not found.**	Yes
Desktop search for any designated Protected Areas within 100 km of the site	3.1 **Error! Reference source not found.**	Yes
Indicate the entire area of interest supplied by the developer/ client.	1.2 **Error! Reference source not found.**Influence	Yes
A walkover survey for small sites/drive-through survey for large sites	2.2 **Error! Reference source not found.**	Yes
Pre-construction Guideline requirement		
Determine the assemblage of potentially occurring and detected bats and present their fatality risk	3.1 **Error! Reference source not found.** 3.2 **Error! Reference source not found.**	Yes, seasonally
Determine presence of rare bats and Species of Conservation Concern (SCC)	3.2 **Error! Reference source not found.**	Yes, seasonally
Locate bat roosting habitat in the study region	3.3 **Error! Reference source not found.**	Yes
Compare differences in the assemblage and activity of bats between ground level and rotor sweep height	3.2.1.3 **Error! Reference source not found.** **Error! Reference source not found.** Sensitive bat features	Yes
Compare differences in the assemblage and activity of bats between monitoring localities and between different habitat types	3.2 **Error! Reference source not found.**	Yes
Determine seasonal variation in the assemblage and activity of bats	3.2.1.2 **Error! Reference source not found.**species	Yes, seasonally
Identify any incidence of bat migration	**Error! Reference source not found. Error! Reference source not found.**	Yes
Determine variation in the assemblage and activity of bats between sunset and sunrise	**Error! Reference source not found. Error! Reference source not found.** **Error! Reference source not found. Error! Reference source not found.**species	Yes
Determine how wind speed and other meteorological conditions correlate with bat activity	**Error! Reference source not found. Error! Reference source not found.**	No, climate data no received
Determine the relative importance/sensitivity of different parts of the site	**Error! Reference source not found. Error! Reference source not found.**	Yes

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Determine the relative importance/sensitivity of the site	**Error! Reference source not found. Error! Reference source not found.**	Yes
Identify potential site-specific impacts of the proposed WEF on bats.	**Error! Reference source not found. Error! Reference source not found.** **Error! Reference source not found.** Possible Impacts	Yes
Describe effective site- and habitat/turbine-specific bat mitigation measures	**Error! Reference source not found. Error! Reference source not found.**	Yes
Monitoring duration in relation to the size of the WEF (MW) and its position relative to REDZ.	**Error! Reference source not found. Error! Reference source not found.** **Error! Reference source not found. Error! Reference source not found.**	Yes
The area of influence (AOI)/ study area and turbine layout if provided by the developer	**Error! Reference source not found. Error! Reference source not found.** **Error! Reference source not found. Error! Reference source not found.**	Yes
Consider the potential impacts of ancillary developments	4. **Error! Reference source not found.**	Yes
Roost surveys of potential and known roosts in Summer and Winter	3.3 **Error! Reference source not found.**	Yes
Identify medium to large roosts or caves within 20 km of study area	3.3 **Error! Reference source not found.**	Yes
Manual transect or point acoustic surveys for 8 nights even spread across all seasons	3.2.2 **Error! Reference source not found.**	Yes
Static surveys with fixed acoustic song meters as per the site size and WEF design	**Error! Reference source not found. Error! Reference source not found.** 3.2 **Error! Reference source not found.**	Yes

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ACRONYMS & GLOSSARY OF TERMS

AOI: Area of Influence, the area that is affected by the proposed development.

Acoustic monitoring: Recording and analyses of echolocation calls to determine bat community species composition and abundance.

ACR: African Chiropteran Report.

AOI: Area of Influence, the area that is affected by potential impacts.

Bat call: An echolocation call emitted by a bat used to detect prey and navigate through its surroundings.
Bat detector: Electronic device for the detection and recording of bat echolocation calls. The terms Bat Detector and Song Meter are used interchangeably in this report.
Bat roost: A structure, natural or manmade, were bats roost during the day. This includes caves, trees, rocky outcrops, buildings and culverts.
Blade tip sweep height: Height between ground level and the lowest point of the wind turbine rotor sweep zone.
bp/h: Bat passes per hour, calculated as a mean or median value from the nightly average bat passes per hour.
Buffer zone: A zone established around areas that are identified as sensitive for bats and includes flyways, foraging areas and bat roosts.
CITES: Convention on International Trade in Endangered Species of Wild Fauna and Flora.
Cumulative Impact: Impacts created due to past, present and future activities and impacts associated with these activities.
Echolocation: A physiological process for locating distant or invisible objects (such as prey) by means of sound waves reflected back to the emitter (such as a bat) by the objects.
EMPr: Environmental Management Programme: A legally binding working document, which stipulates environmental and socio-economic mitigation measures which must be implemented by several responsible parties throughout the duration of the proposed project.

Endemic: A species that is restricted to a particular area.

EIA (Environmental Impact Assessment): The process of identifying environmental impacts due to activities and assessing and reporting these impacts.

GPS: Global Positioning System device.
IUCN: International Union for Conservation of Nature.
LEOCAP: Bat species *Laephotis capensis*.
LR1-10: Names for potential bat roost locations.
LSM1-6: Names for deployed Bat Detectors.
MW: Megawatts.
NEMA: National Environmental Management Act.
NYCTHE: Bat species *Nycteris thebaica.*
Pre-construction phase: The period prior to the construction of a wind energy facility.
Pulse: A single emission of sound by a bat.

Red data species: Species included in the Critically Endangered, Endangered, Vulnerable or Rare categories as defined by the IUCN.
REDZ (Renewable Energy Development Zones): Areas were wind and solar photovoltaic power development can occur in concentrated zones.
Rotor blades: The air foil of a wind turbine that catches the wind and rotates.
Rotor swept area: The area through which rotor blades of a wind turbine rotate.
S&EIA: Social and Environmental Impact Assessment (EIA): The process of identifying social and environmental impacts due to activities and assessing and reporting these impacts.
SABAA: South African Bat Assessment Association.
SABPG: South African Best Practice Guidelines for Pre-construction Monitoring of Bats at Wind Energy Facilities
SACNASP: South African Council for Natural Scientific Professions.
SANBI: South African National Biodiversity Institute.
SAUPET: Bat species *Sauromys petrophilus*.
Scoping Report: A report contemplated in regulation 21 of the NEMA amended EIA regulations R326 dated 7 April 2017.
Song meters: A particular brand of Bat Detector developed by Wildlife Acoustics. The terms Song Meter and Bat Detector are used interchangeably in this report.
SD card: A storage device for song meter recordings.
TADAEG: Bat species *Tadarida aegyptiaca.*
ToPS: Threatened or Protected Species.
Turbine: A device that harnesses wind energy and turns it into kinetic energy used for the generation of electricity.
WEF: Wind Energy Facility.

1. Introduction

1.1 Project details

Volant Environmental (Pty) Ltd was commissioned by ENERTRAG South Africa (Pty) Ltd to conduct a pre-construction survey for a proposed wind energy facility (WEF) and associated infrastructure which will be known as the Dalmanutha WEF. Up to 75 wind turbines will be constructed, each with a hub situated 200 m above ground level and a blade length of up to 100 m [blade tip sweep height: 100 m above ground level]. Turbines will be connected with underground cabling where possible and each turbine will be built on a concrete foundation with turbine hardstands. Access roads to turbines, measuring up to 10 m in width will be constructed. In addition, a concrete batching plant, a Battery Energy Storage System (BESS) and operation and maintenance buildings will be constructed. This survey serves as a preconstruction assessment of the bat activity and bat species present in the Area of Influence (AOI) of the proposed WEF.

1.2 Project location

The proposed Dalmanutha WEF (WEF boundary in Figure 1) is located 10 km south-east of Belfast in the Emakhazeni Local Municipality in Mpumalanga Province of South Africa and can be accessed from the N4 that runs north of the project area. The AOI (AOI = WEF boundary) covers an area of 9 789 ha and is mainly used as agricultural land with crops and livestock present across a large section of the AOI. Although much of the area is made up of grassland and agricultural land, large patches of exotic trees, including black wattle (*Acacia mearnsii*) and blue gum trees (*Eucalyptus globulus*), are distributed across the AOI.

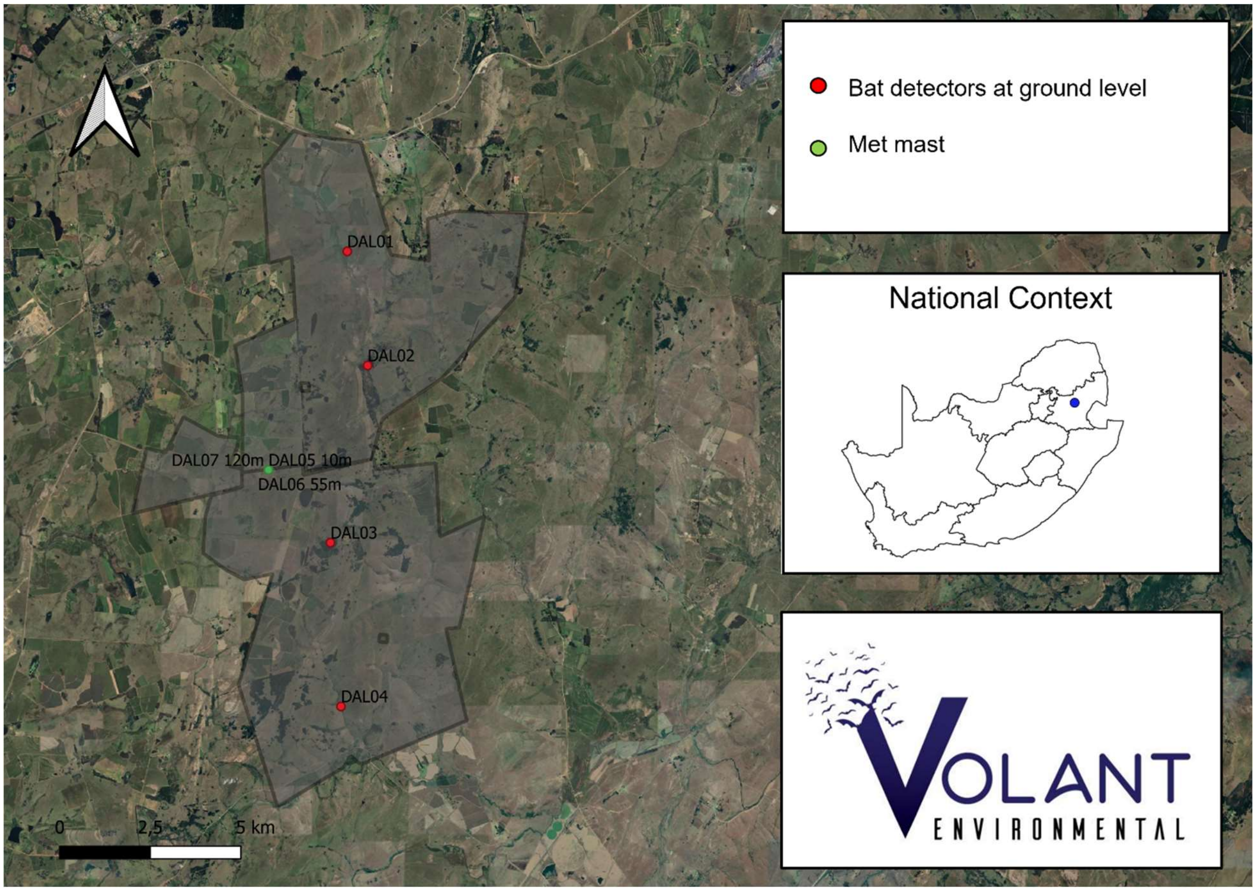


Figure 1. Map of proposed Area of Influence, locations of met mast and all static bat detectors

1.3 Description of Ecoregion

The are proposed AOI falls across the Steenkamp Montane Grassland in the north-eastern section, the KaNgwane Montane Grassland in the south-eastern section and the Eastern Highveld Grassland in the western section (SANBI 2018, Figure 2). These grasslands are all grouped together as Temperate Grasslands based on maps by Olson et al (2001). Based on the South African Best

Practice Guidelines for Pre-Construction Monitoring of Bats at Wind Energy Facilities (SABPG, MacEwan et al. 2020) this is classified as the Drakensberg Grassland, and all fatality risks will be assessed based on this ecoregion.

Although most of the area is relatively flat there is a lower lying region in the southeast of the AOI. This region does however no differ significantly in habitat type from the rest of the area. The average daily maximum temperature for the warmest month of the year (January) is *ca.* 21 °C and 0°C during July which is the coldest month of the year. The area receives an average of 674 mm of rain per year.

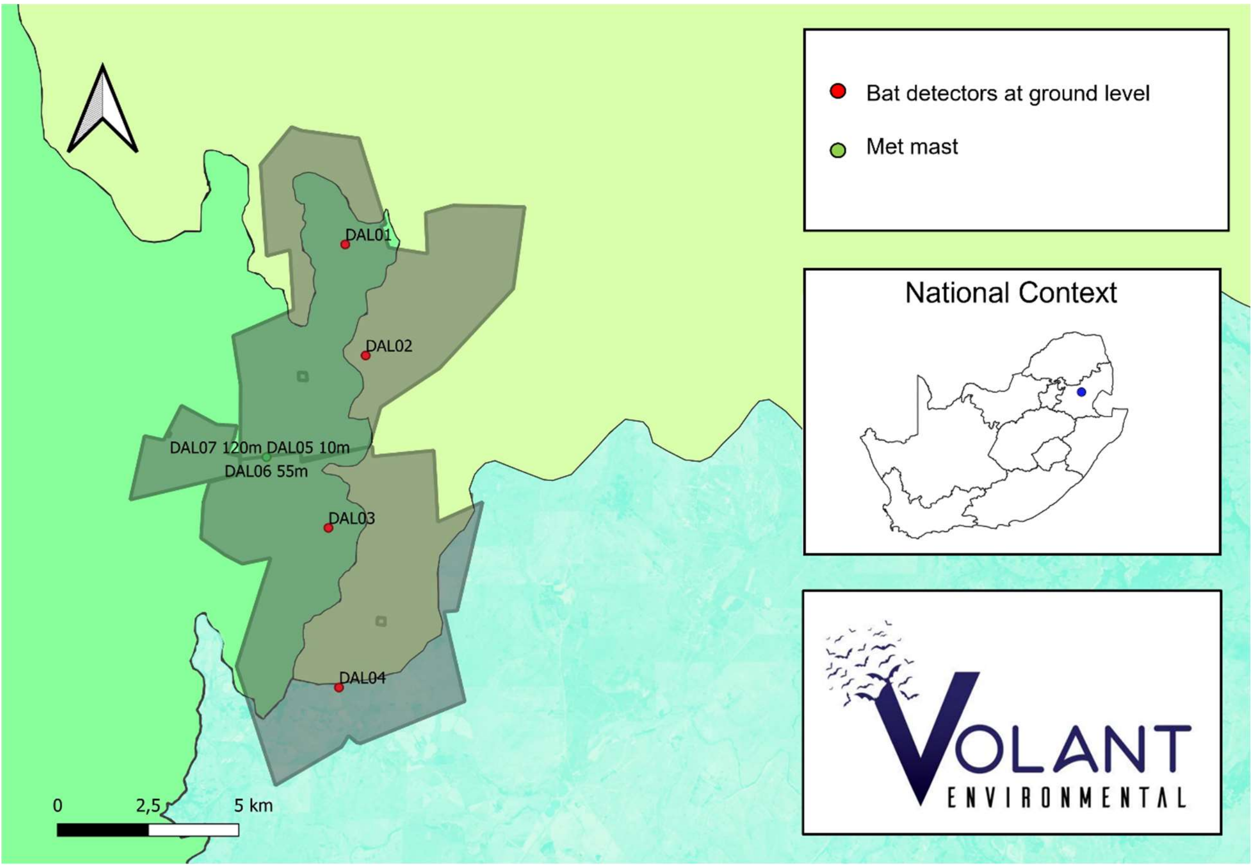


Figure 2. Ecoregions across survey area

1.4 Bat Validity Period

The current survey is only representative for the first six months of the survey period (June 2021 to December 2022), and no conclusion should be drawn from these data for a longer period. Bats are known to migrate before winter periods or annually to maternity roosts (Jacobsen and du Plessis, 1976), and as such the species assemblages for the area could potentially be vastly different during other periods of the year. The data collected to date should, however, be a good representation for similar seasons of different years and should be applicable for a five-year period.

1.5 Assumptions and Limitations

The microphones located on the met mast at 55m and 120m malfunctioned and did not record between the 13th of September and the 1st of October. The mics were replaced on the 1st of October and are in working condition.

The batteries were stolen from the DAL1 during August and no recordings were made between the 10th and 23rd of August. The issue has been addressed and no further problems are anticipated.

The SD card at DAL1 malfunctioned during October, and no data were collected during this time.

Not all farms could be accessed during the survey, and as such transects could not be driven cross the entire area. Enough roads were, however, driven to cover all habitat types and travers the majority of the property.

Distribution records of bats in southern African are still poorly reported and limited for many species. In addition, migratory patterns of bats are largely unknown in South Africa. Studies have reported that bats do migrate, but the exact routes followed are not known (Pretorius *et al*., 2020). The same is true for breeding behaviour and the formation of maternity colonies for many species.

WEF pre-construction monitoring reports on bats are reliant on reporting echolocation calls (if no bat mortality data from adjacent facilities are available), but without echolocation call libraries accurate identification of calls is not always possible. Published libraries created from release and handheld calls from captured bats are available for southern Africa but are geographically limited. The echolocation calls of a particular species from different regions in South Africa are known to vary to some degree (Monadjem *et al*., 2020), and as such call libraries created in different regions are not always comparable.

2. Methods

2.1 Regulatory requirements

Amendments were made to the NEMA: EIA Regulations of 2014: GNR 326 EIA Regulations; GNR 327 Listing Notice 1; GNR 325 Listing Notice 2; GNR 324 Listing Notice 3 which pertains to WEF and the activities surrounding their construction. Under Listing Notice 2 it is stated that a Scoping and Environmental Impact Assessment (EIA) is required for WEF with an electricity output 20 MW or more and which is not located in an urban area or on existing infrastructure. Only a Basic Assessment (BA) is, however, required in cases where the entire boundary of the proposed WEF is located in a Renewable Energy Development Zone (REDZ). The proposed Dalmanutha WEF is not located in a REDZ, and accordingly a S&EIA process must be followed. The South African Best Practice Guidelines for Pre-construction Monitoring of Bats at Wind Energy Facilities - ed 5 (SABPG, MacEwan *et al*., 2020) does, however, not differentiate between areas located within or outside of a REDZ, and as such the same measures outlined in the Guidelines must be followed and applied. Monitoring of bats must be conducted before the final BA or EIA is submitted. All methods used to inform desktop studies and conduct field surveys were implemented according to the SABPG (MacEwan *et al.*, 2020).

2.2 Desktop survey

A thorough desktop study was undertaken to estimate the likelihood of specific species of bats being present at the proposed WEF AOI. This included investigations into available literature, including Bats of Southern and Central Africa (Monadjem *et al.*, 2020), the African Chiroptera Report (ACR, 2020) and preconstruction reports for the WEF constructed to the east of the current AOI. A search was conducted to determine if there are any protective areas present within 100 km of the area for the proposed WEF using Protected Planet (https://www.protectedplanet.net/).

2.3 Field surveys

All methods used for field surveys were implemented according to the South African Bat Assessment Association's (SABAA) document on best practice guidelines for pre-construction monitoring of bats at wind energy facilities in South Africa (MacEwan *et al.*, 2020).

2.3.1 Site visits

Several site visits have been completed to date spanning winter to middle of summer (Table 1). In addition to the seasonal site visits monthly visits were done to retrieve data from bat detectors and ensure that all equipment was in working condition.

Table 1. Summary of field conducted up to this stage of the survey

Date	Activity	Conditions	Comments
10 – 13 June 2021	Scoping phase	Middle of dry season. Very dry and cold	Bat detectors were deployed, and preliminary roost inspections conducted
24 – 27 September 2021	Driven transects	Still very cold, but grasslands were lush	All transects were driven and data collected
5 – 8 January 2022	Roost inspections and driven transects	Heavy rains during the early mornings and very wet conditions	All potential roosts were inspected, nightly transects driven and data retrieved

2.3.2 Scoping survey

An initial survey was performed by walking and driving across the project area as a ground truthing exercise to identify potentially sensitive areas for bats and hotspots, identify areas for placement of bat detectors and possible roosting sites. This was performed prior to the deployment of the bat detectors.

2.3.3 Passive Bat Detectors

Nightly recordings of bats were captured using the Wildlife Acoustics Bat detector SM4BAT FS Ultrasonic Recorders (hereafter referred to as “bat detectors”). Bat detectors were set to start recording 30 min before sunset until 30 min after sunrise in order to ensure that all active bats would be recorded. A total of seven bat detectors were deployed across the project AOI, spatially arranged in such a manner to cover all major habitat types and important bat habitat features (Figure 1) as required by the SABPG (MacEwan et al. 2020). As per the SABPG (MacEwan *et al.*, 2020), one bat detector must be deployed at a height of 7 - 10 m per 5 000 ha or for every significant biotope on the project AOI, and one detector must be deployed at a height of 50 – 80 m per 10 000 ha for meteorological masts that are 80 m tall. If a mast is taller than 80 m an additional bat detector must be deployed as close to the top of the mast as possible. This considered, four bat detectors were deployed at 9 m above ground level in June 2021. A further three bat detectors were deployed on the meteorological mast, one at 10 m and one at 55 m and one at 120 m. During the recording time, the device is ‘armed’ and will begin a recording if a ‘Trigger’ is detected. A trigger is defined as a sound within the set frequency range (Default: >16 kHz) amplitude (Default: 12 dB) for a minimum duration (Default: 1.5 ms). The recording then continues for the duration of the Trigger Window (Default: 3 second) after the last Trigger, and then saves the recorded data. If there are constant Triggers, the recording will save and close after the maximum length of a recording file (Default: 00m:15s). The batteries for the bat detectors were exchanged approximately every month and at this time all data were copied from the SD card and backed up.

2.3.4 Active surveys

Thus far winter, spring and summer transects have been performed to date covering 7 nights (Table 2). By the end of the 12-month period, a minimum of 8 nights of active sampling will be completed across all four seasons (2 nights per season). Transects were only conducted under fair weather conditions (nights with rain or strong winds were avoided). Bats were recorded using a Bat detector SM4BAT FS Ultrasonic Recorder with the microphone attached on the outside of the vehicle while driving at a maximum of 30 km/h along the same transect routes between survey periods. All transects were tracked using a GPS. The tracks from the GPS were downloaded and used to determine where each bat call was recorded.

Table 2. Transect driven during active monitoring

Date	Start time	End time	Total
10-Jun	17:09	19:10	02:01
11-Jun	17:18	19:47	02:29
12-Jun	17:02	19:26	02:24
24-Sep	17:57	20:30	02:33
25-Sep	17:55	20:40	02:45
05-Jan	18:55	21:10	02:15
06-Jan	18:56	21:45	02:49
Total			17:16

2.3.5 Bat Roost Surveys

Potential bat roosts were visited and visually inspected during the day for signs of bats. These included, occupied houses and trees. No caves were found on the project area, and none are known within 20 km of the AOI. There are, however, mines in the area that could act as bat roosts, but these could not be visited.

2.4 Data Analyses

2.4.1 Passive Bat Detectors

All recorded bat calls were analysed using Kaleidoscope Pro v5.4.0 (www.wildlifeacoustics.com). Bat calls were analysed monthly as they were collected using both the auto-identification and cluster-analyses features in Kaleidoscope Pro v5.4.0. While the auto-identificatin feature is useful in assisting with bat identification it does not always provide a reliable identification due to the limited number of species in the call library. There is also at times variation in call parameters within the same species, and as such Kaleidoscope Pro v5.4.0 often misidentifies species. This considered, we used the cluster-analyses feature where calls are grouped based on specific parameters. Each cluster was identified manually by investigating specific call parameters, including the peak frequency, bandwidth, and call length. These parameters, along with the spectrogram and waveform were compared to data given in Monadjem *et al*. (2020). Within each cluster one call was selected with a strong amplitude and minimal background noise to identify the species for that cluster.

2.4.2 Active Surveys

Due to high levels of background noise that was recorded while driving active transects we did not use the auto-identification or cluster feature in Kaleidoscope Pro v5.4.0., but rather identified each call manually. The geographic coordinate of each bat pass was obtained by matching the time of the recording with the GPS track time.

2.4.3 Data Processing

At times two bat species were recorded simultaneously and grouped together in the same cluster. All of these clusters were duplicated to ensure that the number of bat passes were not underrepresented in this report. On the other hand, single files can contain multiple clusters that are identified as the same species. Therefore, any clusters that contained duplicate detection of a species within a single file were removed to avoid overestimation of the number of passes. Recording times were obtained from the summary files created by each bat detector and used to determine the number of bat passes per hour.

3. Results

3.1 Desktop survey

Based on the desktop study that was conducted there are 13 species of bats from four families that could potentially occur in the area (Table 3). Based on the South Africa Renewable Energy EIA application site (https://portal.environment.gov.za/portal/apps/webappviewer) no other

renewable energy projects have been conducted in the area and as such data could not be drawn from previous reports
No conservation areas were found within 100km of the proposed WEF site.

Table 3. Bat species that could potentially occur on the AOI based on a desktop study

Family	Latin name	Common name
Vespertilionidae	*Glauconycteris variegata*	Variegated butterfly bat
Vespertilionidae	*Laephotis botswanae*	Botswana long-eared bat
Vespertilionidae	*Laephotis capensis*	Cape serotine
Vespertilionidae	*Myotis bocagii*	Rufous myotis
Vespertilionidae	*Myotis tricolor*	Temminck's myotis
Vespertilionidae	*Myotis welwitchii*	Welwitsch's myotis
Vespertilionidae	*Pipistellus hesperidus*	Dusky pipistelle
Vespertilionidae	*Pipistellus rusticus*	Rusty pipistelle
Vespertilionidae	*Scotophilus dinganii*	Yellow-bellied house bat
Miniopteridae	*Miniopterus natalensis*	Natal long-fingered bat
Molossidae	*Tadarida aegyptica*	Egyptian free-tailed bat
Molossidae	*Mops midas*	Midas free-tailed bat
Emballonuridae	*Taphozous mauritianus*	Mauritian tomb bat

3.2 Static monitoring

3.2.1 Bat passes per bat detector

A total of nine species of bats from four families were detected across the three months (Table 4). All these species are listed as Least Concern based on the IUCN Red Data list and are not endemic to South Africa. These species were detected with varying frequency with *L. capensis* being the most common species across the AOI and is most likely breeding in the area.
The number of bat passes detector at each bat detector displays typical bat activity during feeding, with activity peaking early in the evening, between 19:00 and 21:00 and declining throughout the evening (Figure 3). There is another increase in activity around 4:00, possibly due to bats returning to their roosts.

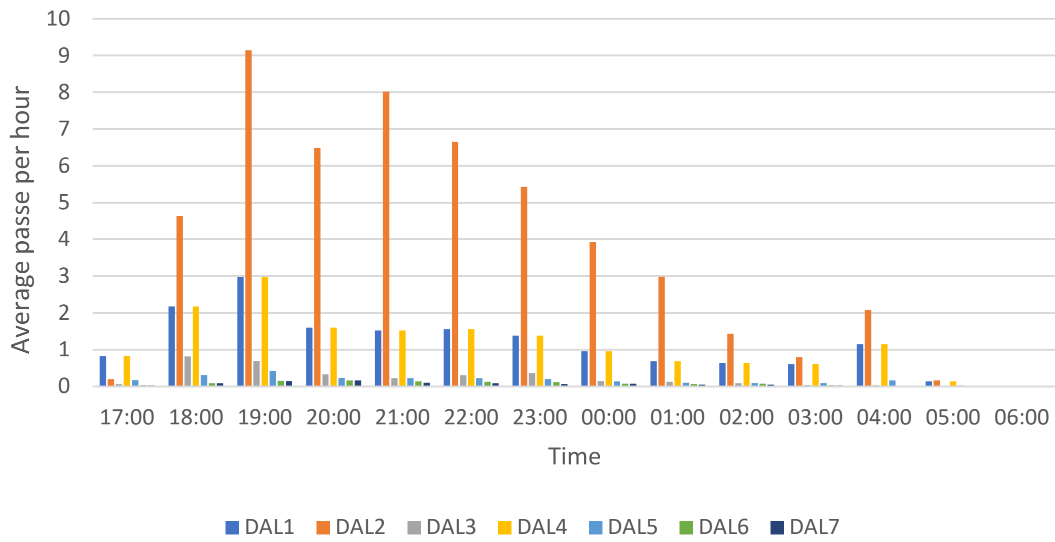
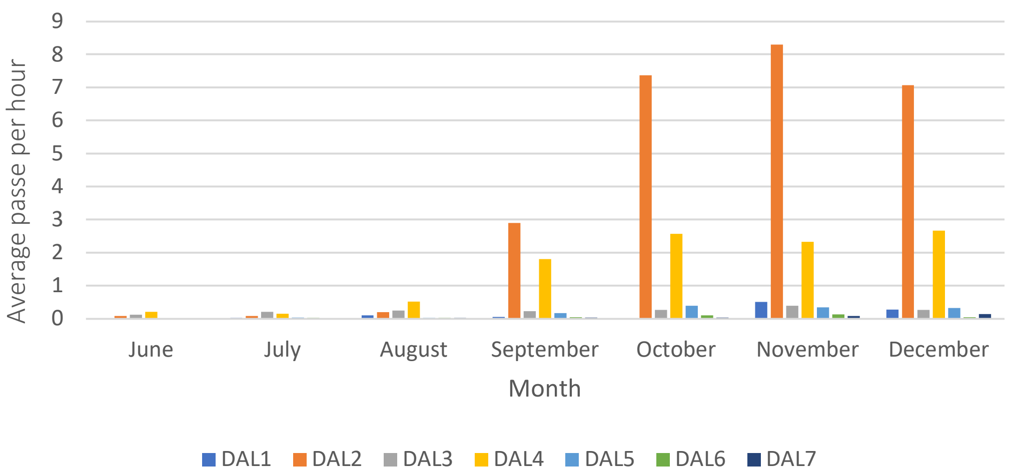


Figure 3. Average number of bat passes detected per hour at each bat detector

Monthly bat passes increased from September and showed a sharp increase during October indicating a large number of bats moving into the area (Figure 4). This is especially pronounced at DAL2 and DAL4. DAL2 is situated next to a large water source which is most likely used by bats for drinking, and this happens early during the evening as indicted in Figure 3. Insect abundance also tends to be higher around water, and this area could thus provide excellent feeding habitat. DAL4 is situated next to a known roost, and the increase in activity and maintenance thereof during December is an indication of bats moving to the area to give birth. Considering that DAL4 was situated close to a roost it does not classify the area as sensitive, but rather is an indication of the sensitivity of bat roosts in the area.

Bat activity increased sharply during spring and remained relatively stable throughout summer indicating that bats are not just moving through the area, but that breeding colonies are present. It must, however, be stated that the summer season only consists of one month’s data at the current stage and a more comprehensive conclusion will be drawn once more data has been collected. During the Quarterly report it was stated already that there appears to be breeding colonies in the area, and that does indeed appear to be the case.

A



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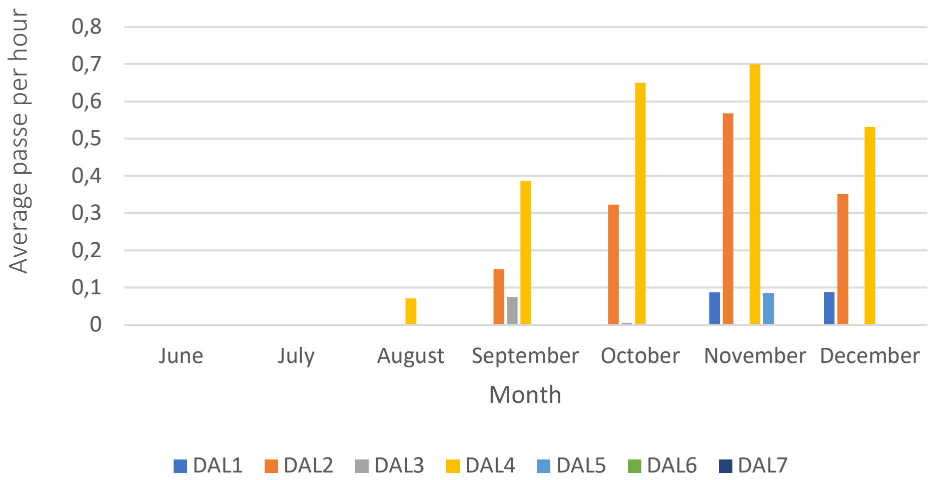

Figure 4. Monthly bat passes per bat detected shown as an Average (A) and Median (B)

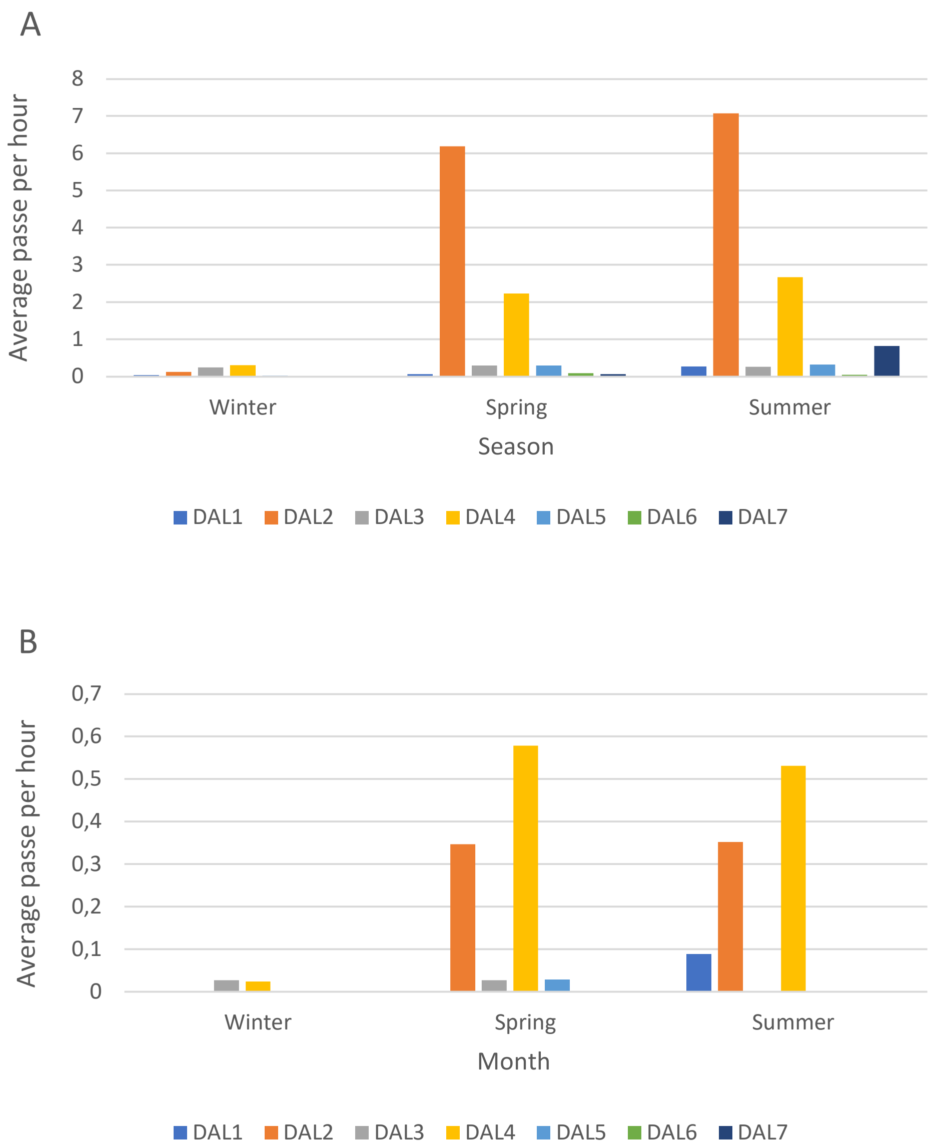

Figure 5. Seasonal bat passes per bat detected shown as an Average (A) and Median (B)

3.2.2 Bat passes per species

A total of eight bat species were recorded during the survey period (Table 4), all of Least Concern status, not CITES listed and not ToPS species. The species are from four different families of varying risk of impact with turbines. A total of 93 108 bat passes were detected during the survey period with more than a third recorded from one species, *L. capensis* (Table 5). This species is thus clearly dominant in the area and has a large influence on activity patterns observed across the AOI.

Table 4. List of bat species that has been detected on the Area of Influence including their conservation status, foraging habits and risk of impact with wind turbines

Species name	Common name	Conservation Status	Foraging habits	Risk of Impact[1]
		Family: Vespertilionidae		
Laephotis capensis	Cape serotine	Least concern	Clutter-edge	Low
Scotophilus dinganii	Yellow-bellied house bat	Least concern	Clutter-edge	Medium to high
Myotis bocagii	Rufous myotis	Least concern	Clutter-edge & clutter	Medium to high
Pipistrellus rusticus	Rusty pipistrelle	Least concern	Clutter-edge	Medium to high
Pipistrellus hesperidus	Dusky pipistrelle	Least concern	Clutter-edge	Medium to high
		Family: Miniopteridae		
Miniopterus natalensis	Natal long-fingered bat	Least concern	Clutter-edge	High
		Family: Emballonuridae		
Taphozous mauritianus	Mauritian tomb bat	Least concern	Open-air	High
		Family: Molossidae		
Mops midas	Midas free-tailed bat	Least concern	Open-air	High
Tadarida aegyptiaca	Egyptian free-tailed bat	Least concern	Open-air	High

[1] MacEwan *et al*., 2020

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Bat activity per species was relatively constant throughout the night, but there is a slight increase around 19:00 and a steady decline after 1:00 indicating times of foraging activity. *Scotophilus dinganii* increased again at 4:00, possibly due to bats returning to roosts

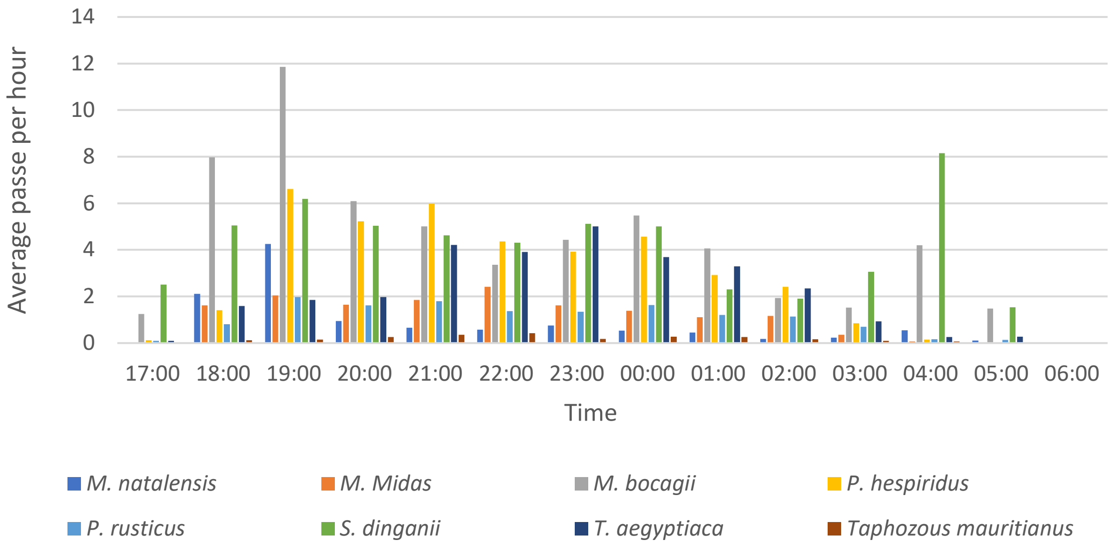


Figure 6. Average number of bat passes recorded per hour

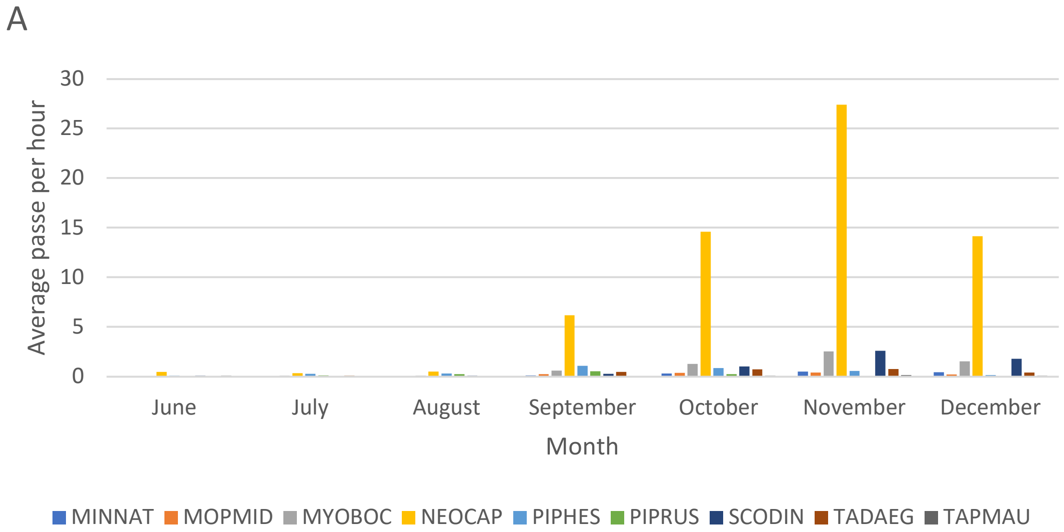
Table 5: Total number of bat species and bat passes per species detected during the survey period

Species	Median p/h	Average p/h	Total
L. capensis	8,109541	9,080304	66290
M. natalensis	0,148827	0,206131	1291
M. bocagii	0,73961	0,877425	6561
P. hesperidus	0,285358	0,46839	494
P. rustica	0,103117	0,160745	5152
T. aegyptiaca	0,228344	0,35478	4031
M. midas	0,090282	0,174507	1931
T. mauritianus	0,024854	0,062227	3608
S. dinganii	0,708867	0,835574	3750
Total			93 108

Monthly activity per species displays a similar pattern to that observed previously with activity increasing from September and peaking in November (Figure 7), a pattern that is especially pronounced for *L. capensis*. Given that we have established that the colony located close to DAL4 is a breeding colony the decline in December indicates that more individuals move or migrate through the area than what stays behind in December. It is thus possible that individual bats move through the area to breeding roosts in addition to breeding in the area. The pronounced increase observed at DAL2 indicates that bats use water sources in the area as they move through. Bats are known to have stop overs along migratory routes, and this site could potentially act as such a location for migratory bats. Whether on not bats do in fact move through the area will be confirmed if there is again an increase in activity during Autumn when bats are expected to return from their maternity roosts.

Scotophilus dinganii also showed an increase during November and December, indicating that these bats might also be giving birth in the area. These bats do not form large colonies and are often encountered as single bats. As such, finding roosts for these bats are difficult, but it is known that they roost in houses. This further indicates the sensitivity of buildings on the AOI.

The assumption that bats do move through the area without necessarily breeding is further substantiated by the number of bat passes detected per season (Figure 8) where activity is highest during spring. It must, however, be stated again that there is currently only one month representing the summer period and that summer activity might change when more data is available



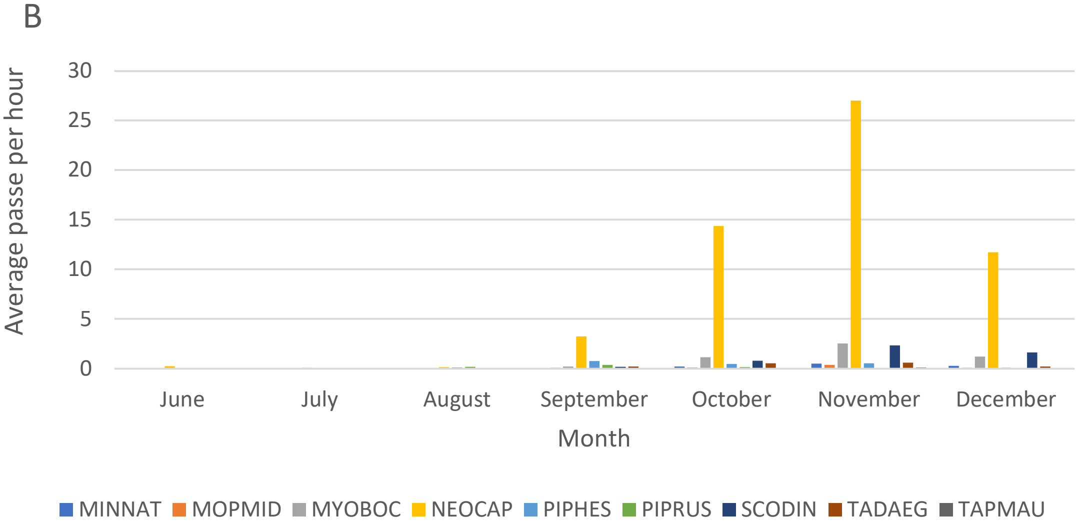


Figure 7. Monthly bat passes per species indicated as an Average per hour (A) and Median per hour (B)

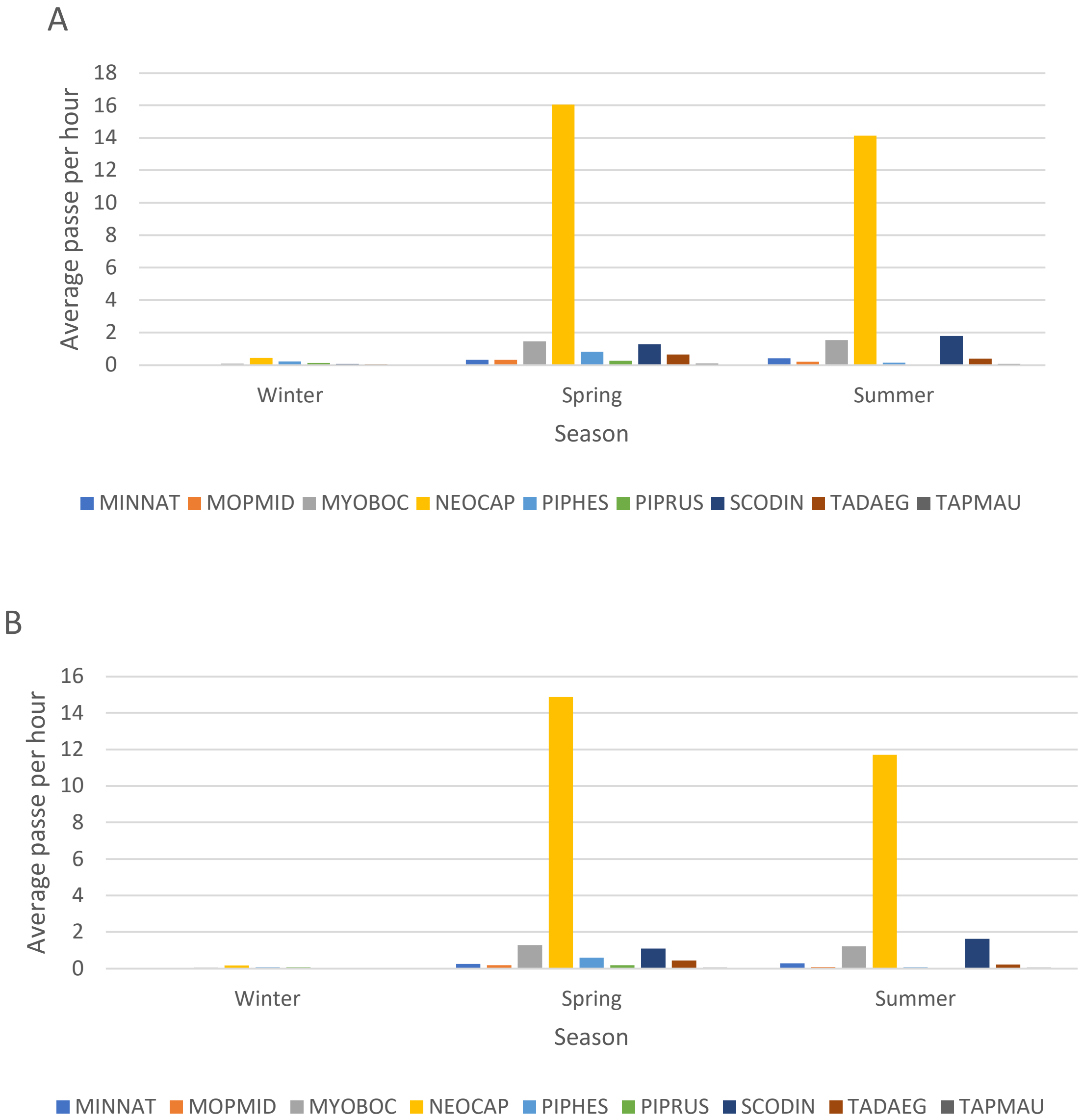
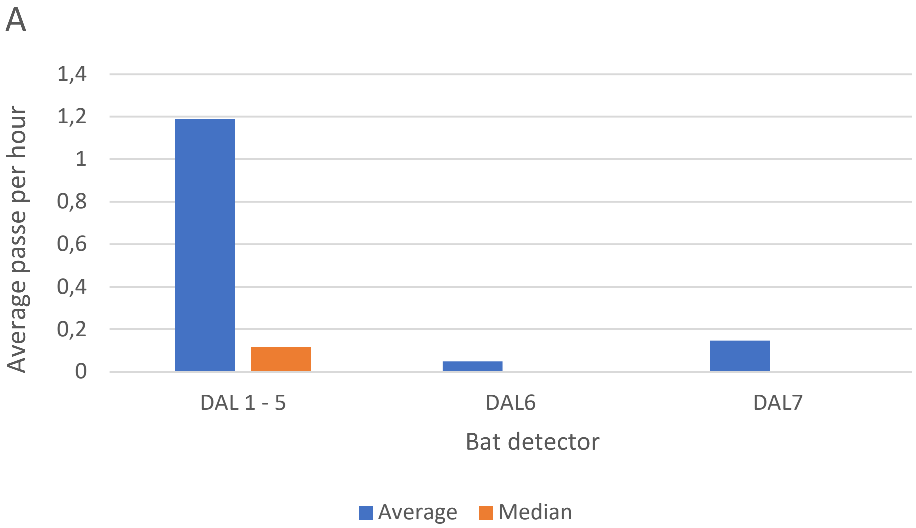


Figure 8. Seasonal bat passes per bat species detected shown as an Average (A) and Median (B)

3.2.1.3 Bat activity at height

Activity was always higher at ground level than at heigh regardless if all bat detectors at 10m were considered or whether only the 10m detector at the same geographic location was considered. This indicates that bats in the area forages closer to ground level with less activity at heigh. The medians for both detectors at height was 0 bat passes per hour



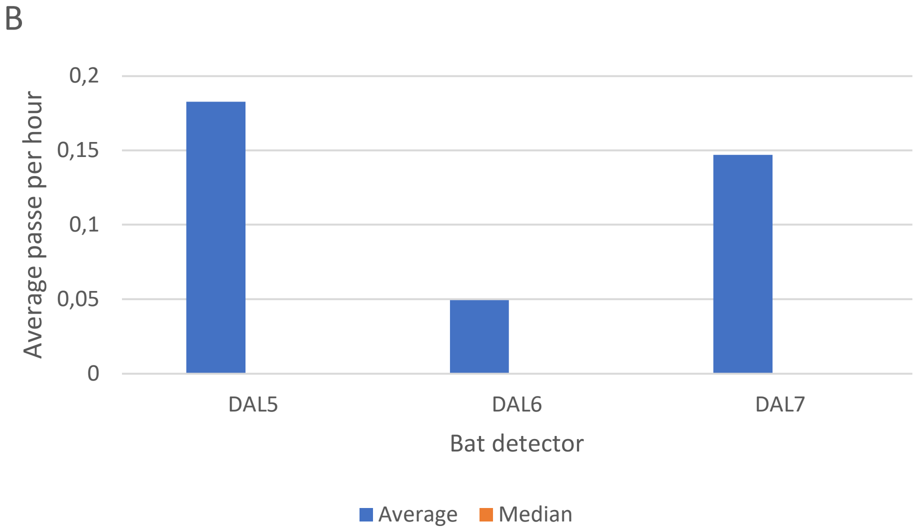


Figure 9. Average and Median bat passes per hour. Figure A depicting when all bat detectors at ground level is considered and figure B when only the 10 m bat detector at the same location is considered

3.3 Active monitoring

Transects were driven during June and September as required by SABPG. Transects were driven for two nights for a minimum length combined length of 5h across the two nights. During June only four species were detected and was mostly grouped around vegetated areas (Figure 10). During September more bat activity was detected, but it was still mostly centered around vegetated area or bodies of water (Figure 11). This is similar to what was found with static detectors and indicates that any areas were bats might forage could be considered sensitive. Summer transects will be driven during January 2022.

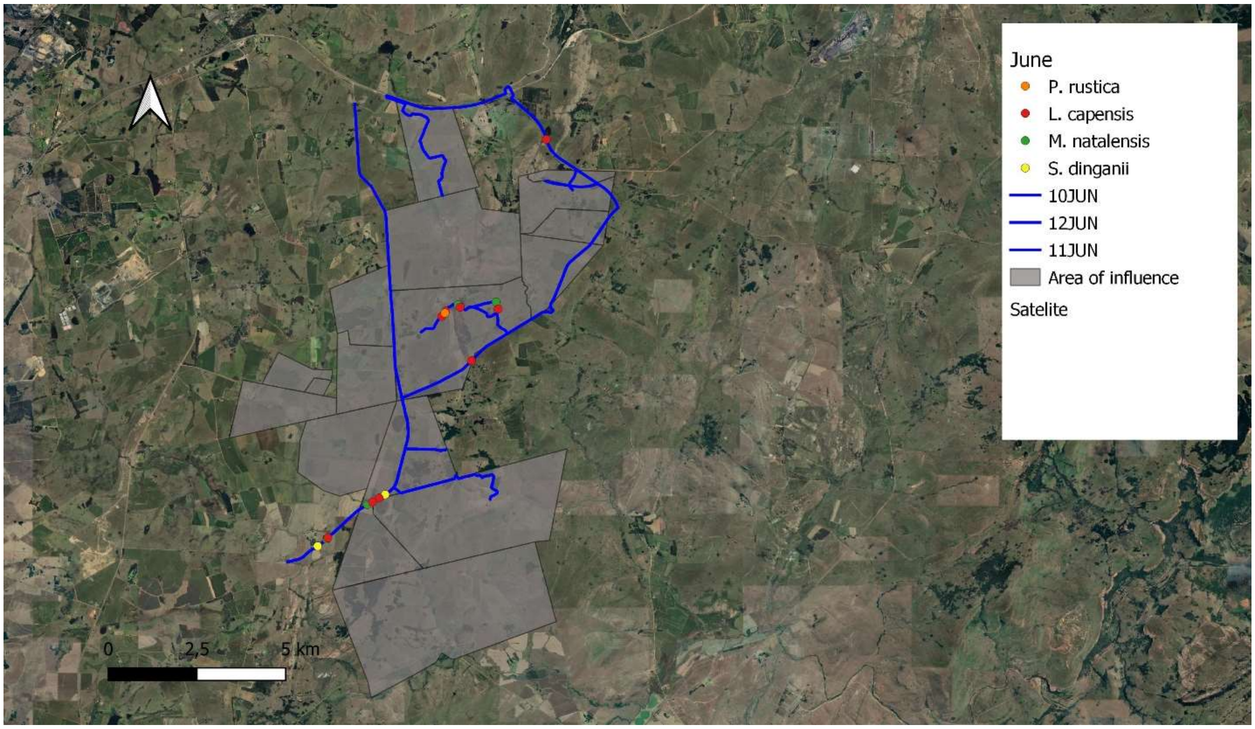


Figure 10. Transects driven on the AOI during June 2021

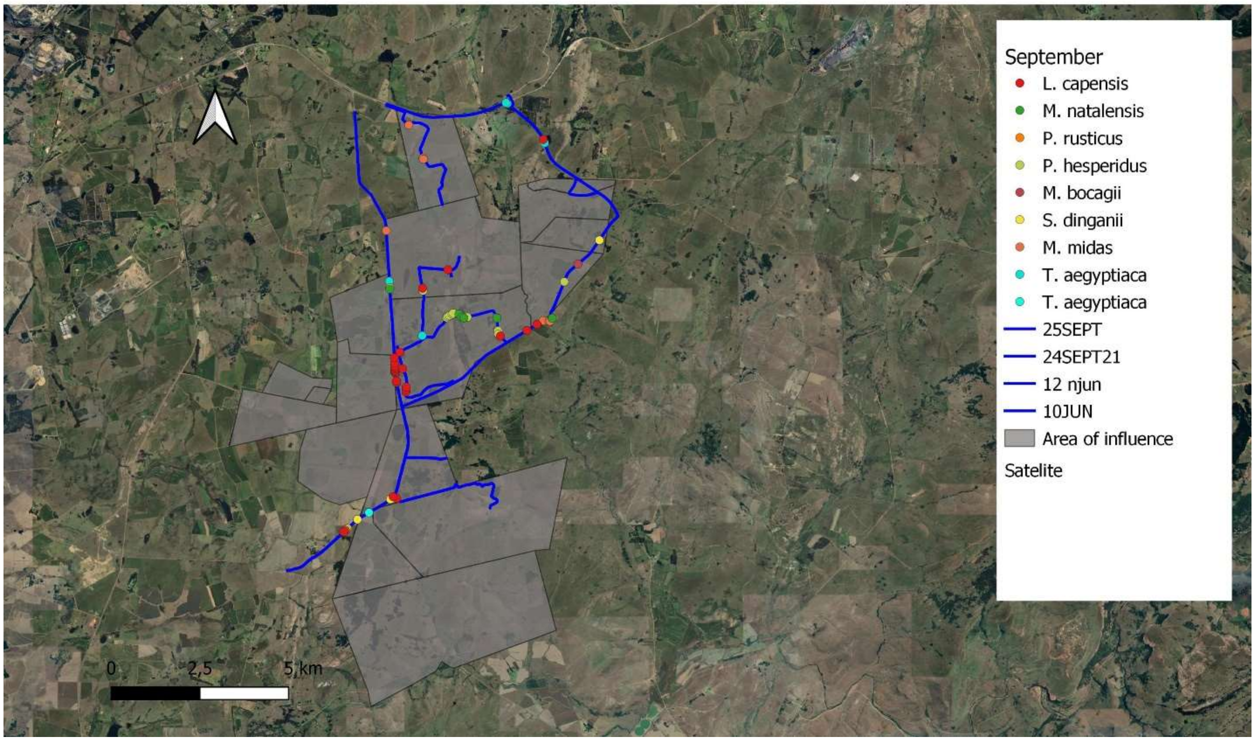


Figure 11. Transects driven on the AOI during September 2021

3.4 Bat roosts

At this stage three bat roosts have been found on the AOI, two occupied by *L. capensis* and one by *P. hesperidus* (Table 6, Figure *13*), with DR2 a confirmed maternity colony. These were confirmed with echolocation calls recorded at these roosts and bat carcasses discovered close to the roost (Figure 12). There are some larger trees scattered across the AOI that were investigated for signs of bats, but none were found. This is not a clear indication that these were not used as roosts, since detected roosting bats in trees can be difficult. As such, we consider these larger trees as potential roosts and suggest a buffer be placed around these. No caves were found on or near the AOI, but the presence of *M. natalensis* indicates that these bats may be using an abandoned mine as a roost. These bats were not present in high numbers, however, suggesting that, if such a roost is in the area it is not located close to the AOI.

Table 6. Bat roosts and potential roosting sites found on the project area

Roost	Structure	Latitude	Longitude	Occupation
DR1	House	30.060811	-25.812208	*L. capensis* confirmed
DR2	House	30.060811	-25.812208	*L. capensis* confirmed
DR3	House	30.139937	-25.787213	*P. hespiridus* confirmed
DR4	Tree	30.114225	-25.746425	Large tree, potential roost
DR5	Tree	30.127285	-25.836284	Large tree, potential roost
DR6	Tree	30.097004	-25.843681	Large tree, potential roost
DR7	Tree	30.095073	-25.743666	Large tree, potential roost

Figure 12. Bat carcasses found outside of bat roosts. A) L. capensis, B) P. hesperidus

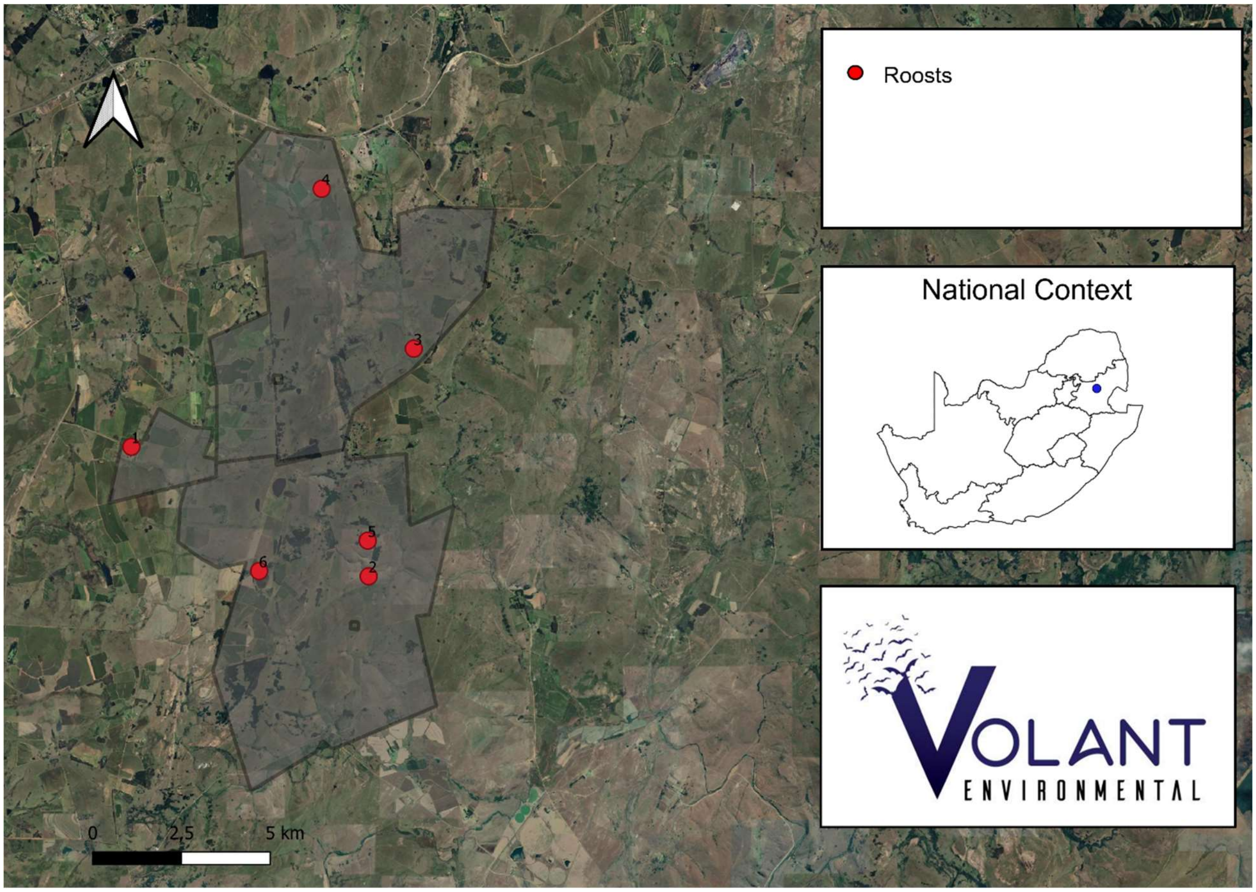


Figure 13. Bat roosts detected on the AOI

3.5 Sensitive bat features

Currently no bat sensitive features have been identified as HIGH or VERY HIGH sensitive feature, and this assessment will only be made once the full 12-month monitoring period has been conclude. As per the SABPG (McEwan *et al*., 2020) no turbines or any other structure, including infrastructure and major roads, may thus be constructed 200 m around bat sensitive areas.

Based on data recorded from during transects areas with trees seems to be important to bats. These areas are foraging and potential roosting sites and a 200m buffer might be implemented around the larger vegetated areas, but currently is not listed as sensitive based on data from DAL3. Based on conversations with farmers these areas are being controlled, and trees removed in order to ensure that the exotic species do not spread too widely, but small portions is always left. All water bodies will have a 200m buffer around them as these are frequently used by bats for foraging and as drink sites. This is based on the data obtained from bat detector DAL02. All confirmed roosting locations will have a 200m buffer around them.

Currently these sensitive areas to not overlap with many of the proposed turbine locations, but some turbine locations will have to be reconsidered to avoid clashes with sensitive areas (Figure *14*).

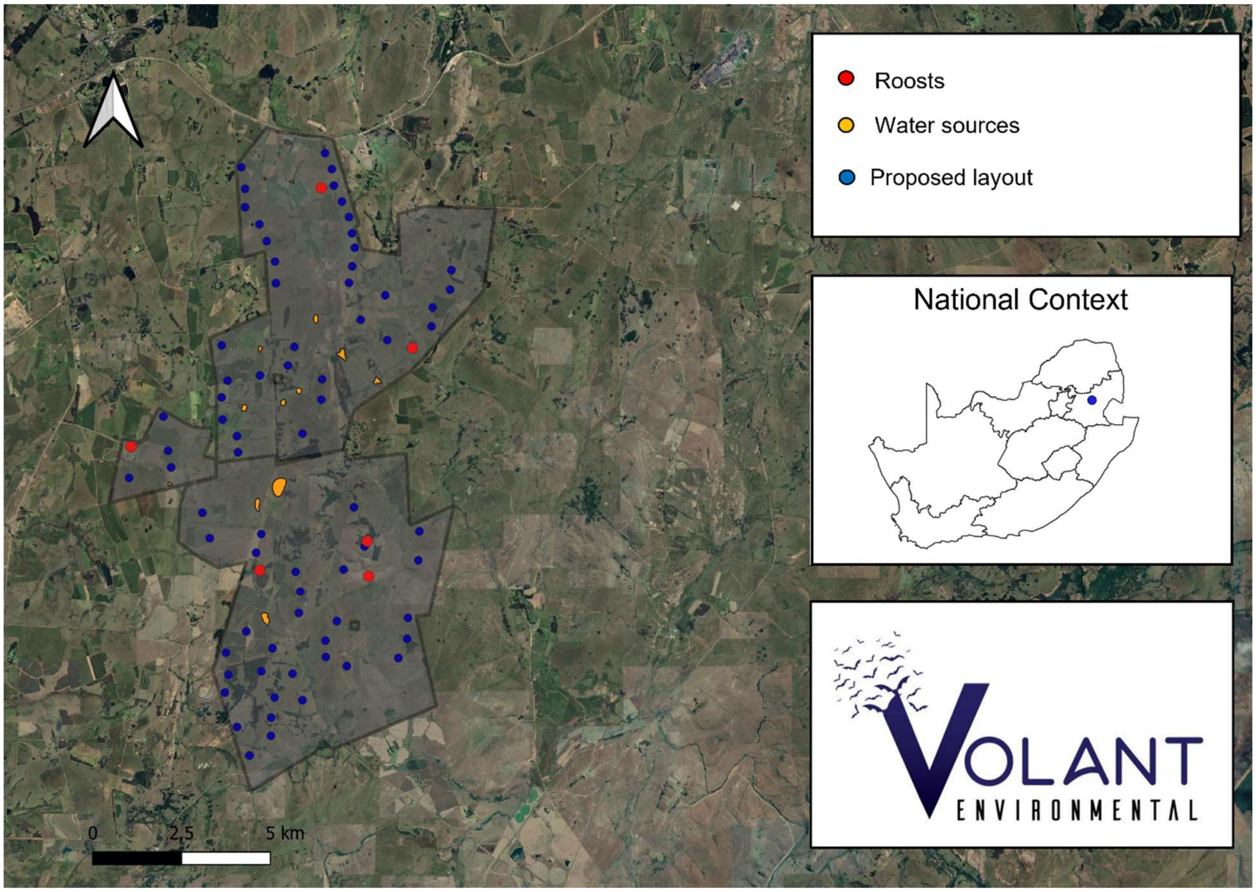


Figure 14. Bat sensitive features and proposed layout

4. Potential Impacts

4.1 Impacts identified

Construction Phase:

- Habitat destruction: access roads and turbine or infrastructure construction may necessitate the removal of foraging habitat and sensitive bat features, such as foraging areas.
- Destruction or disturbance of bat roosts: access roads and turbines or other infrastructure construction may necessitate the removal or disturbance of bat roosts.

Operational Phase:

- Bat mortality: physical bat strikes and barometric trauma caused by spinning blades of the turbines during the operational phase.
- Artificial lighting: Artificial lights can have a negative effect on bat behaviour by affecting flight paths used or attracting them to lights due to higher insect abundance and elevating the likelihood of collision mortality.
- Flight/migratory paths: Turbines placed on pathways used for migration can have severe effects on bats moving through the area during times when bats move between winter and summer roosts.

4.2 Mitigation measures

- Habitat destruction: Apply necessary buffers for roost sites and sensitive bat features, avoiding the construction of turbines and access roads in these areas. Roads must follow existing farm roads as far as possible.
- Bat mortality: Avoid placement of turbines near sensitive bat features and roosts, adaptive mitigation measures according to post-construction monitoring results (counted strikes) informed by environmental correlates of bat activity.
- Bat collisions: Increase turbine cut in speed as this has been shown to reduce collisions.

- Avoidance: It is recommended that NO development (including the full rotor swept zone of wind turbines) takes place in BOTH Very High and High bat sensitivity areas. Take note that these areas still need to be defined and will be shown in the final EIA report. Minimise impacts to natural and artificial wetlands and water bodies by implementing the appropriate buffer areas where no development may take place.

Artificial lighting: With the exception of compulsory civil aviation lighting, minimise artificial lighting at night, especially high-intensity lighting, steady-burning, or bright lights such as sodium vapour, quartz, halogen, or other bright spotlights at sub-station, offices and turbines.

Flight/migratory paths: Cut in speeds needs to be increased and possible curtailment during times when bats migrate.

Table 7. Potential impacts identified

Impact	Pre-mitigation (+ / -)	Post-mitigation (+ / -)	Residual impacts	Potential Fatal Flaw
Loss or destruction of foraging habitat	High	Medium / Low	No	No
Loss or destruction of bat roosts	High	Medium / Low	No	No
Bat mortality	High	Medium	Potentially	Unlikely
Artificial lighting	High	Medium / Low	No	No
Flight/migratory paths	High	Medium	Potentially	Unlikely

4.3 Environmental Management Programme conditions

A full Environmental Management Programme (EMPr) will be supplied in the final EIA report, but currently it is suggested that all potential bat roosts are avoided until it can be confirmed that these are not in use.

In addition, due to the perceived sensitivity of the river and drainage lines it will be recommended that these are avoided by all activities related to the WEF. Additional conditions will be provided should the final impact assessment reveal the necessity for more specific directives in this regard.

5. Discussion

This survey was carried out between June and December 2021 and data presented here was obtained as part of the scoping study for the proposed Dalmanutha WEF. A total of seven bat detectors were deployed across the AOI, five at ground level and two at height. We detected eight species of during the period with *L. capensis* being the most prominent species present.

Based on the SABPG (MacEwan et al. 2020) a median of below 0,23 bat passes per hour and ground level and below 0,04 passes per hour at height is considered low risk for bat mortalities in grassland habitats. The current survey found a median of 0,1 bat passes per hour at ground level and a median of 0 at height, classifying the area as LOW RISK. Consideration should, however, be given to the large numbers of *L. capensis* that is present in the area during spring and summer and during this time possible mitigation measures might have to be employed. This is especially relevant to water bodies which have a very high bat activity for all bat species. Mitigation measures have been shown to significantly reduce the number of bat mortalities at WEF, and this will help reduce any fatalities (Arnett et al 2007).

While no known caves are present close to the AOI, there are many mines. The presence of *M. natalensis*, a cave roosting species, indicated that one of more of these mines may be used as roosts for this species. *Miniopterus natalensis* is known to aggregate in large colonies and it is thus expected that this roost is not located close to the project area. No other exclusively cave roosting species were detected, further indicating that the roost is not near the AOI.

On completion of the 12-month survey period an updated sensitivity map with buffers will be presented, but currently it must be stressed that all water sources will be considered as SENSITIVE, and possibly no-go, areas. Buffers will be implemented around all sources of water. Currently this does not affect the proposed layout of the WEF. Given that all active roosts were found in buildings it is likely that buffers will be imposed around all building on the property.

Weather data was not available for the scoping report, but will be included in the final report to be submitted once the survey period is concluded in June 2022. Climatic variables will give a better indication of when mitigation measures will have to be imposed.

Considering that current data suggest that the project AOI is located in an area with LOW RISK of bat mortalities, and that the most common species in the area is at low risk of collision the project should be able to proceed, but a full 12-month survey will give a better indication of the viability of the project.

6. References

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7. Appendix 1.

7.1 Qualification of specialist

SACNASP
South African Council for Natural Scientific Professions

herewith certifies that

Low de Vries

Registration Number: 124178

is a registered scientist

in terms of section 20(3) of the Natural Scientific Professions Act, 2003
(Act 27 of 2003)
in the following fields(s) of practice (Schedule 1 of the Act)

Zoological Science (Professional Natural Scientist)

Effective **13 November 2019** Expires **31 March 2021**

Chairperson

Chief Executive Officer

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