LOXTON WIND ENERGY FACILITY 2
NORTHERN CAPE, SOUTH AFRICA
BAT (CHIROPTERA) SCOPING REPORT

March 2023

Produced for

Loxton Wind Facility 2 (Pty) Ltd

Produced by

Camissa Sustainability Consulting

Amsterdam, Netherlands

CONTENTS

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;	Appendix 2
b) a declaration that the specialist is independent in a form as may be specified by the competent authority;	Appendix 3
c) an indication of the scope of, and the purpose for which, the report was prepared;	Section 1.1
(cA) an indication of the quality and age of base data used for the specialist report;	Section 4
(cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Section 5.1, Section 6
d) the date and season of the site investigation and the relevance of the season to the outcome of the assessment;	Section 4
e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	Section 4
f) details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives;	Section 6
g) an identification of any areas to be avoided, including buffers;	Section 6, Figure 5
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;	Appendix 1 (Figure 5)
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 5

Regulation GNR 326 of 4 December 2014, as amended 7 April 2017, Appendix 6	**Section of Report**
k) any mitigation measures for inclusion in the EMPr;	Section 6
l) any conditions for inclusion in the environmental authorisation;	Section 6
m) any monitoring requirements for inclusion in the EMPr or environmental authorisation;	Section 6
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 7
o) a description of any consultation process that was undertaken during the course of preparing the specialist report;	NA
p) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	NA
q) any other information requested by the competent authority.	NA
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.	Appendix 5: Site Sensitivity Verification Report

1 INTRODUCTION

The applicant **Loxton Wind Facility 2** (Pty) Ltd is proposing the development of a commercial Wind Energy Facility (WEF) and associated infrastructure on a site located approximately 17 km North East of Loxton within the Ubuntu Local Municipality and the Pixley Ka Seme District Municipality in the Northern Cape Province.

Two additional WEF's are concurrently being considered on the surrounding properties and are assessed by way of separate impact assessment processes contained in the 2014 Environmental Impact Assessment Regulations (GN No. R982, as amended) for listed activities contained in Listing Notices 1, 2 and 3 (GN R983, R984 and R985, as amended). These projects are known as Loxton WEF 1 and Loxton WEF 3.

A preferred project site with an extent of approximately 58 000 ha has been identified as a technically suitable area for the development of the three WEF projects. The Loxton WEF 2 project site covers approximately 15 000 ha and comprises the following farm portions:

- Portion 4 of the Farm Rietfontein No. 572;
- Portion 12 of the Farm Rietfontein No. 572;
- Portion 11 of the Farm Rietfontein No.572;
- Remaining Extent of Farm Rietfontein No.572;
- Remaining Extent of the Farm Saaidam No. 574;
- Remaining Extent of the Farm Yzervarkspoort No. 139;
- Portion 2 of the Farm Yzervarkspoort No. 139;
- Remaining Extent of the Farm Springfontein No. 573
- Remaining Extent of Farm 582

The Loxton WEF 2 project site is proposed to accommodate the following infrastructure, which will enable the wind farm to supply a contracted capacity of up to 480 MW:

- Up to 62 wind turbines with a maximum hub height of up to 160 m and a rotor diameter of up to 200 m;
- A transformer at the base of each turbine;
- Concrete turbine foundations with a permanent footprint of approximately 9.1 ha;
- Each turbine will have a crane hardstand of 70 m x 45 m. The permanent footprint for turbine hardstands will be up to approximately 20 ha.
- Each turbine will have a temporary blade hardstand of 80 m x 45 m. The temporary footprint for blade hardstands will be up to approximately 23 ha.
- Temporary laydown areas (with a combined footprint of up to approximately 38 ha) which will accommodate the boom erection, storage and assembly area;
- Battery Energy Storage System (with a footprint of up to 5 ha);
- One construction period laydown areas (temporary) up to 6 ha each;
- Medium voltage (33 kV) cables/powerlines running from wind turbines to the facility substations. The routing will follow existing/proposed access roads and will be buried where possible.
- One on-site substations up to 4 ha in extent to facilitate the connection between the wind farm and the electricity grid;
- Access roads to the site and between project components inclusive of stormwater infrastructure. A 15 m road corridor may be temporarily impacted upon during construction and rehabilitated to 6m wide after construction. The WEF will have a total road network of up to 100 km;
- One temporary site camp establishment and concrete batching plant (each with a combined footprint of up to 2 ha); and

- Operation and Maintenance buildings (each with a combined footprint of up to 2 ha) including a gate house, security building, control centre, offices, warehouses, parking bays, storage facility and a workshop.

The Electrical Grid Infrastructure (EGI) associated with the Loxton WEF considers a 300m wide corridor route from the Loxton Switching Station/Collector Station to the Gamma MTS. The EGI is located within the Central Strategic Powerline Corridor and therefore subject to a Basic Assessment process in accordance with GN 113 of 16 February 2018 listed under NEMA, 1998.

1.1 Scope and Objectives

This report presents a Bat (Chiroptera) Specialist Assessment for the Loxton WEF 2. Collisions with wind turbine blades are a leading cause of bat mortality globally (Cryan, 2011; O'Shea et al., 2016). Given the nature, scale, and uncertainty of these impacts to bats, specialist studies are required to assess the risks of renewable energy infrastructure on bats (Rodrigues 2015, MacEwan et al. 2020, SANBI 2020, Bennun et al. 2021).

The objectives of this assessment are to present the baseline ecological condition of the project site for bats, and to use these characterisations to predict and assess the potential impact of the project on bat species and their habitats as well as to provide actions to mitigate impacts if required. The specific terms of reference that guided the compilation of this scoping report were:

- Describe the baseline environment of the project and its sensitivity relative to bats
- Identify the nature of potential impacts of the proposed project on bats during construction, operation, and decommissioning
- Identify information gaps and limitations
- Identify potential mitigation or enhancement measures to minimise impacts to bats.

2 ASSUMPTIONS AND LIMITATIONS

The core techniques used to assess bat activity in this study are acoustic monitoring and roost surveys both of which have several limitations which will influence the findings and recommendations of this study.

Acoustic monitoring allows for rapid, passive collection of a large volume of bat activity data which can help identify the bat species present within a particular location and their associated spatio-temporal relative activity patterns. In the context of wind farms, acoustic monitoring is therefore a useful technique however, there are several constraints that must be acknowledged. These are discussed in detail by Voigt et al. (2021), Adams et al. (2012), and Kunz et al. (2007a) and fundamentally, include that acoustic monitoring cannot provide an indication of bat abundance or population size at a site. In addition, population demographics such as age and sex of bats cannot generally be determined from echolocation calls. Due to the large volume of data collected by bat detectors it is impractical and prohibitively time-consuming to inspect each file for echolocation calls and to identify the associated bat species. Specialised statistical software uses bat call reference libraries to automate the identification process but developing such libraries is challenging given the variation individual species display in their echolocation call structure and overlap between species. This study used the Wildlife Acoustics library "Bats of South Africa Version 5.4.2", but this excludes reference calls for most South African species thus these may have been overlooked. However, given the duration of the monitoring and spatial coverage of the detectors, the acoustic data provides a reasonable inventory of the species present, and a good indication of the relative magnitude of bat activity. Lastly, bat activity is notably variable in response to a number of factors such as land use change, climactic variability, variations in prey abundance and meteorological conditions which can vary over different time scales. Since this study is limited to 12 months, the baseline conditions presented here may not be representative of activity over longer time frames meaning risk may be misinterpreted.

The major limitation with roost surveys is finding roosting bats. Bats use a diversity of roosting sites including trees, buildings, crevices, and underground sites (caves and mines). The presence of these features at a site can help to target roost searches but evidence of bats may not always be apparent even if bats are present. Importantly, the absence of bat evidence in these situations does not equate to evidence of bat absence (Collins 2006). Thus, this study uses a precautionary approach and will apply buffers to roosts (largely buildings and rocky crevices) even if bats were not located given their potential role in supporting roosting bats.

It is difficult to assess the risk to bats during operation of the proposed facility based on acoustic data collected during pre-construction surveys. For example, Hein et al. (2013) showed that pre-construction bat activity was not a significant indicator of collision risk. Lintott et al. (2016) argued that environmental impact assessments do not predict the risks to bats accurately. This may partly be because it is hypothesized that bats may be attracted to wind turbines (Cryan and Barclay 2009, Guest et al. 2022) which some evidence suggests may be the case (Horn et al. 2008, Richardson et al. 2021). While this report makes predications about the potential risk to bats posed by the project, these carry a degree of uncertainty and must be verified by using post-construction surveys to ensure that the predictions are accurate and bat behaviour has not altered from pre-construction levels (Lintott et al. 2016).

3 LEGAL REQUIREMENTS AND GUIDELINES

There are various international, regional, and local legislation, policies, regulations, guidelines, conventions, and treaties in place for the protection of biodiversity, under which bats would also be protected or considered. These create a policy environment and impact management framework aiming to prevent excessive impacts to biodiversity. Specific policies include the following:

- Convention on Biological Diversity Post-2020 Global Biodiversity Framework
- United Nations Sustainable Development Goals
- Convention on the Conservation of Migratory Species of Wild Animals (1979)
- Convention on Biological Diversity (1993)
- Constitution of the Republic of South Africa, 1996 (Act No. 108 of 1996)
- National Environmental Management Act, 1998 (NEMA, Act No. 107 of 1998)
- National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004)
- Northern Cape Nature Conservation Act (Act 9 of 2009)
- The Equator Principles (2013)
- International Finance Corporation Performance Standards (PS6)
- The Red List of Mammals of South Africa, Swaziland, and Lesotho (2016)
- South Africa National Biodiversity Strategy and Action Plan (2005)
- Guidelines for the implementation of the Terrestrial Flora (3c) & Terrestrial Fauna (3d) Species Protocols for environmental impact assessments in South Africa
- Mitigating biodiversity impacts associated with solar and wind energy development. IUCN Guidelines for project developers (2021)
- South African Good Practise Guidelines for Surveying Bats in Wind Energy Facility Developments – Pre-Construction (2020)
- South African Good Practise Guidelines for Operational Monitoring for Bats at Wind Energy Facilities (2020)
- South African Bat Fatality Threshold Guidelines (2018)
- Mitigation Guidance for Bats at Operational Wind Energy Facilities in South Africa (2018)

4 ASSESSMENT METHODOLOGY

The Project Area of Influence (PAOI) was defined as the AoI of each Loxton WEF plus a 10 km buffer given that bats are volant mammals (Scottish Natural Heritage 2019). This area was studied at a desktop level to determine which bat species (i.e., impact receptors) are likely to occur at the project, to provide information on their natural history and conservation status, and to contextualise the project site within the larger social-ecological environment with respect to bats. Bats were also studied through eight months of field surveys in the PAOI which began on 6 November 2021 and will be completed in November 2022 based on best practise in South Africa (MacEwan et al. 2020). The field data, as well as the desktop information from the PAOI, was used to assess impacts for each WEF individually. The final EIA will be based on the full 12 months of data from the pre-construction bat monitoring.

During the field surveys, bat activity was sampled at 10 locations with Wildlife Acoustics, Inc. SM4 bat detectors (Figure 1, Table 1). Since a preliminary turbine layout was available, the study design was focused on surveying areas within the project boundary where turbines were likely to be installed. In addition, the study design prioritised collecting bat activity at height because seven meteorological towers are present on site. At three locations, SMM-U2 microphones were positioned at the top of a 10 m aluminium mast. At seven locations, microphones were positioned on a meteorological tower at 50 m and 100 m respectively. Sampling took place nightly from sunset to sunrise.

This assessment is based on 366 nights of bat monitoring data. The sampling period included winter (92 nights), spring (92 nights), summer (90 nights) and autumn (92 nights). The monitoring period therefore spans a full annual cycle and as such provides a representative sample of annual bat activity patterns and how this changes seasonally.

Roost surveys were undertaken which entailed discussions with landowners to locate any known roosts or potential roosts with evidence of bats. In addition, buildings at farmsteads within the PAOI, as well as accessible rocky outcrops/crevices (Figure 1), were systematically surveyed during field visits in April 2022 (autumn), May 2022 (autumn), and September 2022 (spring). The surveys aimed to directly observe roosting bats, locate evidence of roosting bats (e.g., culled insect remains, fur-oil-stained exit and entry points, guano/droppings), and assess the likelihood for each potential roost to support bats.

Acoustic data retrieved from each bat detector were processed using Kaleidoscope® Pro (Version 5.4.2, Wildlife Acoustics, Inc.). Bats were automatically identified using the embedded “Bats of South Africa Version 5.4.0” reference library and verified by inspecting echolocation files. The number of acoustic files recorded was used as a measure to quantify bat activity. Based on MacEwan et al. (2020) this was converted into a metric “bat passes per recording hour” by dividing the total number of bat passes recorded each night by the total number of recording hours each night (calculated as the difference in hours between sunset and sunrise). This metric was used to rank the magnitude of bat activity as either low, medium or high, benchmarked against published median values for different ecoregions in South Africa in MacEwan et al. (2020).

Table 1: Summary of the Bat Acoustic Monitoring Sampling Locations and Effort

Bat Detector	Coordinates	# Sample Nights	Altitude (m)	Habitat Features
LO1	31.258261°S 22.433164°E	50 m = 337 100 m = 337	1,538	Eastern Upper Karoo, microphones sampling open air habitat at 50 m and 100 m, 1.5 km southwest of farm dam
LO2	31.296279°S 22.392912°E	50 m = 297 100 m = 330	1,500	Eastern Upper Karoo, microphones sampling open air habitat at 50 m and 100 m, on top of ridge with rocky crevices
LO3	31.339913°S 22.436523°E	50 m = 255 100 m = 165	1,511	Eastern Upper Karoo, microphones sampling open air habitat at 50 m and 100 m, on top of ridge 100 m from edge

Bat Detector	Coordinates	# Sample Nights	Altitude (m)	Habitat Features
LO4	31.374009°S 22.381146°E	50 m = 336 100 m = 217	1,503	Eastern Upper Karoo, microphones sampling open air habitat at 50 m and 100 m, 200 m west of rocky crevice habitat, 2.7 km south of farmstead
LO5	31.433819°S 22.501232°E	50 m = 302 100 m = 147	1,539	Eastern Upper Karoo, microphones sampling open air habitat at 50 m and 100 m, on top of plateau, 4 km northwest of farmstead
LO6	31.488172°S 22.519130°E	50 m = 37 100 m = 111	1,548	Eastern Upper Karoo, microphones sampling open air habitat at 50 m and 100 m
LO7	31.508778°S 22.459861°E	50 m = 335 100 m = 335	1,491	Eastern Upper Karoo, microphones sampling open air habitat at 50 m and 100 m, 500 m southeast of rocky boulders
LO8	31.321026°S 22.376290°E	366	1,432	Eastern Upper Karoo, located at farmstead with farm dams, buildings, and trees
LO9	31.325799°S 22.514819°E	139	1,404	Eastern Upper Karoo, located adjacent to cultivated areas, 400 m east of dam, 1 km west of farmstead
LO10	31.443305°S 22.490778°E	303	1,455	Eastern Upper Karoo, at base of koppie with rocky crevices, adjacent to riparian area

5 SPECIALIST FINDINGS

5.1 Ecological Baseline

Based on current taxonomic information and bat occurrence data, 10 bat species could occur within the PAOI (Table 2). The PAOI is in the arid Nama Karoo Biome and the landscape is characterised by relatively flat or gently sloping plains interspersed with mountainous terrain (inselbergs and koppies). The vegetation is dominated by Eastern Upper Karoo comprising low growing shrubs and bunch grasses thus the vegetation structure has limited heterogeneity. The vegetation is more structurally complex in association with aquatic resources (rivers, drainage areas) and in isolated areas (e.g., at farmsteads and livestock watering points) where trees are present. Small areas of Upper Karoo Hardeveld intrude into the PAOI which is associated with steep slopes of koppies, butts, mesas as well as with large boulders and stones (Mucina and Rutherford 2006). In the east of the PAOI Bushmanland Vloere is associated with flat areas of pans and river bottoms. The climate of the PAOI is arid, with low, unreliable rain which falls mostly in late summer and early autumn, peaking in March (Mucina and Rutherford 2006). Critical biodiversity areas and Ecological support areas have been identified for the PAOI (Figure 1).

Bat roosting sites in the PAOI are relatively limited and unlikely to support large congregations of bats. The closest known major bat roost is approximately 55 km north. Rocky outcrops are present and these geological features may provide roosting spaces for species such as Roberts’s flat-headed bat, Egyptian free-tailed bat, Lesueur's wing-gland bat, and Long-tailed serotine that roost in rocky crevices (Monadjem et al. 2018). The Long-tailed serotine roosts in small groups of a few individuals while Roberts’s Flat-headed bat tends to roost communally in small groups of tens of individuals (Jacobs and Fenton 2002). Egyptian free-tailed bats can roost in groups of tens to a few hundred individuals (Herselman and Norton 1985).

Bats are also likely to roost in buildings associated with farmsteads within and bordering the project especially Cape serotine and Egyptian Free-tailed Bat (Monadjem et al. 2018). Trees growing at these farmsteads, and in limited places elsewhere on site usually at livestock water points, could also provide roosting spaces for bats although the extent of this is limited since these trees are typically not large and day-time temperatures may be too hot to use them as roosts (Monadjem et al. 2018). The building inspections on site did not reveal any roosting bats although bats do typically use these structures for roosts and visible signs of bat presence (brown, stained exit/entry points) was found at some buildings.

Sensitive features in the PAOI at which bat foraging activity may be concentrated include farmsteads, wetlands, farm dams, irrigated cultivated areas, the livestock water points, rocky outcrops, and along drainage networks/riparian areas. The presence of water, vegetation and lighting at these features could promote insect activity and hence attract foraging bats. For example, Long-tailed serotine have been captured foraging for flies at a livestock kraal (Shortridge 1942). Activity could also be concentrated along the non-perennial rivers and smaller streams.

Table 2: Bat Species Potentially Occurring within the PAOI

Common Name *Species Name*	Key Habitat Requirements*	Prob. of Occurrence	Conservation Status IUCN	RSA	WEF Risk
Natal long-fingered bat *Miniopterus natalensis*	Temperate or subtropical species. Primarily in savannas and grasslands. Roosts in caves, mines, and road culverts. Clutter-edge forager.	**Confirmed (650 passes)**	LC/Unknown	LC	High
Cape serotine *Neoromicia capensis*	Arid semi-desert, montane grassland, forests, savanna and shrubland. Roosts in vegetation and human-made structures. Clutter-edge forager.	**Confirmed (41,841 passes)**	LC/Stable	LC	High
Egyptian free-tailed bat *Tadarida aegyptiaca*	Desert, semi-arid scrub, savanna, grassland, and agricultural land. Roosts in rocky crevices, caves, vegetation, and human-made structures. Open-air forager.	**Confirmed (89,152 passes)**	LC/Unknown	LC	High
Roberts's flat-headed bat *Sauromys petrophilus*	Wet and dry woodlands, shrublands and Acacia-wooded grasslands always in areas with rocky outcrops and hills. Roosts in narrow rock crevices and fissures. Open-air forager.	**Confirmed (21,629 passes)**	LC/Stable	LC	High
African Straw-coloured fruit bat *Eidolon helvum*	Non-breeding migrant in the PAOI.	Low	NT/D	LC	High
Long-tailed serotine *Eptesicus hottentotus*	Montane grasslands, marshland and well-wooded riverbanks, mountainous terrain near water. Roosts in caves, mines, and rocky crevices. Clutter-edge forager.	**Confirmed (719 passes)**	LC/Unknown	LC	Medium
Lesueur's wing-gland bat *Cistugo lesueuri*	Roosts in rock crevices, usually near water, associated with broken terrain (koppies and cliffs) in high-altitude montane vegetation. Clutter-edge forager.	Moderate	LC/Decreasing	LC	Medium
Egyptian slit-faced bat *Nycteris thebaica*	Savannah, desert, arid rocky areas, and riparian strips. Gregarious and roosts in caves but also in mine adits, Aardvark holes, rock crevices, road culverts, roofs, and hollow trees. Clutter forager.	Moderate	LC/Unknown	LC	Low
Geoffroy's horseshoe bat *Rhinolophus clivosus*	Savannah woodland, shrubland, dry, riparian forest, open grasslands, and semi-desert. Roosts in caves, rock crevices, disused mines, hollow baobabs, and buildings. Clutter forager.	Moderate	LC/Unknown	LC	Low
Damara Horseshoe bat *Rhinolophus damarensis*	Arid savannah and shrubland in the Nama-Karoo biome. Roosts in natural caves but will use mines.	Low	LC/Unknown	LC	Low

*Child et al. (2016), *Monadjem et al. (2020); †IUCN (2021); δ MacEwan et al. (2020)

5.2 Pre-Construction Bat Monitoring Results

In total, 153,991 bat passes were recorded over the 366-nights of acoustic monitoring. Most bat activity, approximately 60 %, was attributed to Egyptian free-tailed bat (Table 2). Natal long-fingered bat and Long-tailed serotine were seldomly recorded. The acoustic activity data suggest that risk for these two species [based on the risk levels in MacEwan et al. (2020)] will be low for all months and heights and hence these are not discussed in further detail. The remainder of this report focuses on activity patterns and risk to Egyptian free-tailed bat, Roberts's flat-headed bat and Cape serotine.

For Cape serotine, the vast majority of its activity was recorded at 10 m. Activity at 50 m and 100 m was generally lower relative to ground level suggesting collision risk above 50 m is low when comparing to the risk levels in MacEwan (2020). Median bat activity per hour each night for Cape serotine was 0 passes at both 50 m and 100 m. At 10 m, median activity per night varied monthly with relatively high activity levels between January and April, decreasing to low levels between May and August. Between September and December activity was relatively high again (Figure 2). There was more variability in Cape serotine activity in autumn (April and May) and spring (September and October), with the maximum number of bat passes per hour across the sampling nights, 39.1, recorded in October.

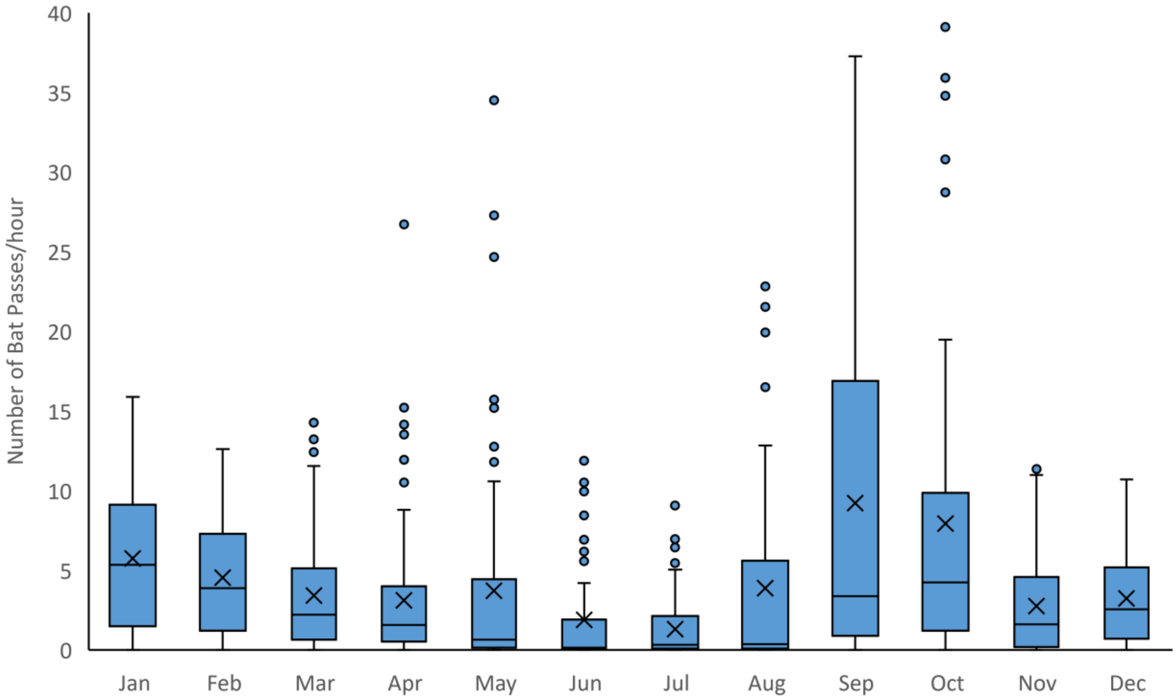

Figure 2: Boxplot of the number of Bat Passes/hour by month for Cape serotine per month at 10 m.

While overall, high risk is predicted for Cape serotine based on its activity levels at 10 m, this varied between the three bat detectors recording at this height and by month. Median activity was highest at LO8 and LO9 and these bat detectors were located near farmsteads in the PAOI (Figure 1) where there are several habitat features that will attract bats. These include the buildings which may serve as roosts for bats, lighting around the farmstead which will attract insects and therefore foraging bats, trees which will serve as foraging and roosting spaces, and aquatic habitat at which bats can drink and forage. Compared to LO8 and LO9, bats were less active at LO10 which is in a shallow valley between two koppies which rise in the southwest of the PAOI. According to MacEwan et al. (2020), relatively high bat activity was recorded at LO8 and LO9 during most of the year, and based on the magnitude and temporal pattern of bat activity recorded there, it is possible that bats are roosting in buildings and/or trees in these parts of the PAOI and/or using these areas for foraging. This demonstrates the importance of farmsteads in this landscape for bats, and these are likely to be important areas for bats across the PAOI. At LO10 high risk is predicted for October and November, with medium risk in early spring, summer and autumn, and low risk in winter.

The acoustic data showed that for Egyptian free-tailed bat, ~62 % of its total activity was recorded at 10 m, ~24 % was recorded at 50 m and ~14 % at 100 m (weighted by the number of bat detectors at each height). Median and mean activity was generally higher for Egyptian free-tailed bat at 10 m compared to 50 m/100 m, except for during March and April when mean activity was higher at 50 m/100 m relative to 10 m (Figure 3). Activity at 50 m was generally higher than at 100 m. As with Cape serotine, activity for this species was also highest from spring through to autumn, with decreased activity in winter (Figure 3). This seasonal pattern was consistent across the three monitoring heights. Activity was notably higher near the two farmstead locations during spring, when some of the highest levels of activity were recorded. For example, a median of 15 and 18 bat passes/night during September and October respectively, at LO8. The data show that collision risk for Egyptian free-tailed bat is likely to be lowest during June and July, because consistently low levels of activity were recorded across the monitoring locations. Collision risk would expand into spring and summer, and then contract again towards late autumn, with the temporal width of the risk period varying with height. For example, at 50 m, low risk is typically a two month period (June and July) whereas at 100 m risk may be lower for a wider period, May to August (Table 3).

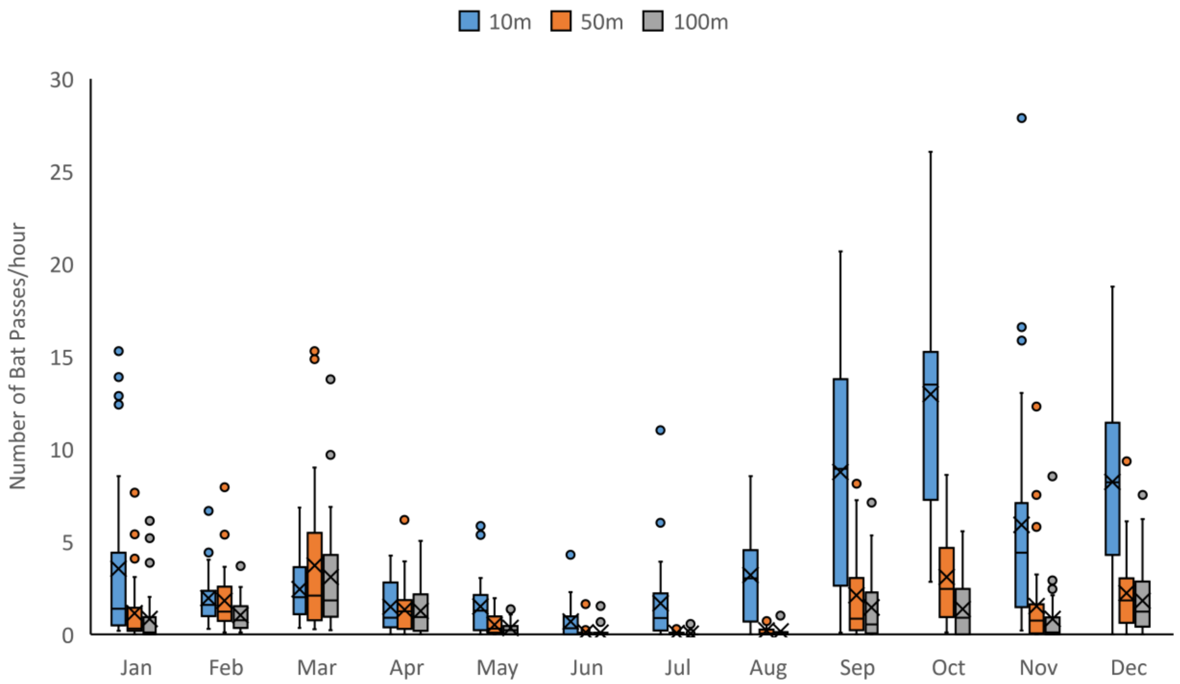

Figure 3: Boxplot of the number of Bat Passes/hour by month for Egyptian free-tailed bat.

Table 3: Risk Heatmap for Egyptian free-tailed bat based on Median Bat Passes/hour at the Loxton WEFs

	10m			50m							100m						
	LO8	LO9	LO10	LO1-50	LO2-50	LO3-50	LO4-50	LO5-50	LO6-50	LO7-50	LO1-100	LO2-100	LO3-100	LO4-100	LO5-100	LO6-100	LO7-100
Jan																	
Feb																	
Mar																	
Apr																	
May																	
Jun																	
Jul																	
Aug																	
Sep																	
Oct																	
Nov																	
Dec																	

Risk Rating
High
Medium
Low
No Data

For Roberts's flat-headed bat, ~56 % of weighted activity was at 50 m, and ~22 % each at 10 m and 100 m. The overall magnitude of activity for this species was low for most months, and across most monitoring locations (Table 4). Some high risk periods were identified such as February and October, but generally, medium risk is predicted for summer until mid-autumn.

Table 4: Risk Heatmap for Roberts's flat-headed bat based on Median Bat Passes/hour at the Loxton WEFs

	10m			50m							100m						
	LO8	LO9	LO10	LO1-50	LO2-50	LO3-50	LO4-50	LO5-50	LO6-50	LO7-50	LO1-100	LO2-100	LO3-100	LO4-100	LO5-100	LO6-100	LO7-100
Jan																	
Feb																	
Mar																	
Apr																	
May																	
Jun																	
Jul																	
Aug																	
Sep																	
Oct																	
Nov																	
Dec																	

Risk Rating
High
Medium
Low
No Data

At ground level, the data showed that median activity of Cape serotine was highest between 19h00 and 22h00 for most seasons, with the magnitude of activity corresponding with high risk according to the reference data in MacEwan et al. (2020). In winter, median activity was 0 bat passes/hour for all time periods, and in summer, a second peak occurred before dawn which can be related to breeding cycles or indicative of roosting (Beason et al. 2020). These pattern was driven by activity near the farmstreads at LO8 and LO9 whereas activity at LO10 did not increase again near dawn. The data showed a similar pattern for Egyptian free-tailed bats (Figure 3) with the exception that in autumn, median activity did not reach high risk levels for any time period.

At height, although the data (Table 3 and Table 4) show high risk predicted for Egyptian free-tailed bat and Roberts's flat-headed bat during certain months, for Roberts's flat-headed bat median activity per hourly period was low (data not shown). For Egyptian free-tailed bat, high risk is predicted between 20h00 and 00h00 in summer, autumn and spring (data not shown), with low risk outside of these time periods.

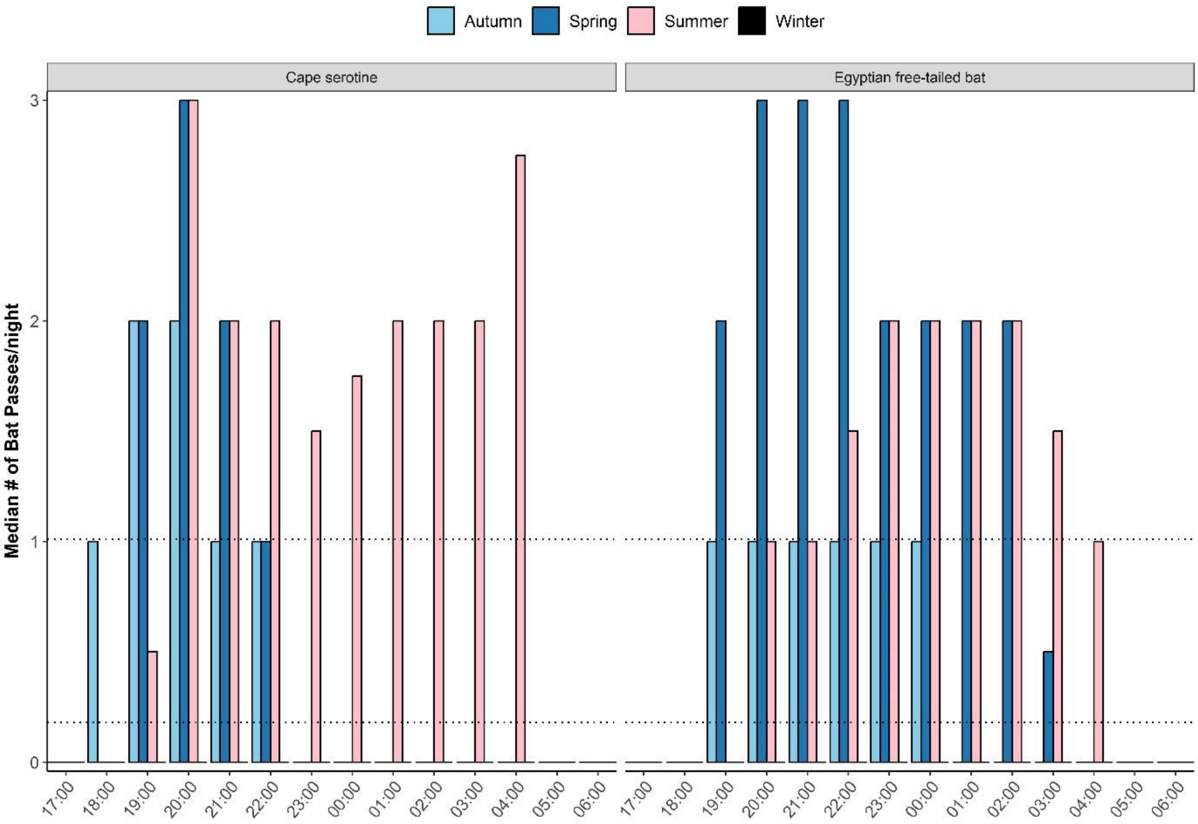

Figure 4: Median number of bat passes per night across hourly time periods for Cape serotine and Egyptian free-tailed bat at ground level (10 m). 17:00 represents bat activity between 17:00 and 18:00 etc. Median bat activity between the two dotted lines represents medium risk.

6 IDENTIFICATION AND ASSESSMENT OF IMPACTS

Impacts to bats that are likely to occur because of the construction, operation and decommissioning of the wind energy facility are identified and assessed in the following section. The unit of analysis against which impacts were assessed is the local bat community and their associated habitats within the PAOI. Impacts considered for assessment include habitat modification and disturbance, fatality due to collisions with wind turbine blades, and light pollution since these are the major impacts likely to be associated with the project (Kunz et al. 2007b, Cryan and Barclay 2009). For each impact, the respective mitigation measures were categorised into those aimed at first avoiding impacts, then minimising impacts, and finally restoring areas impacted (Figure 5).

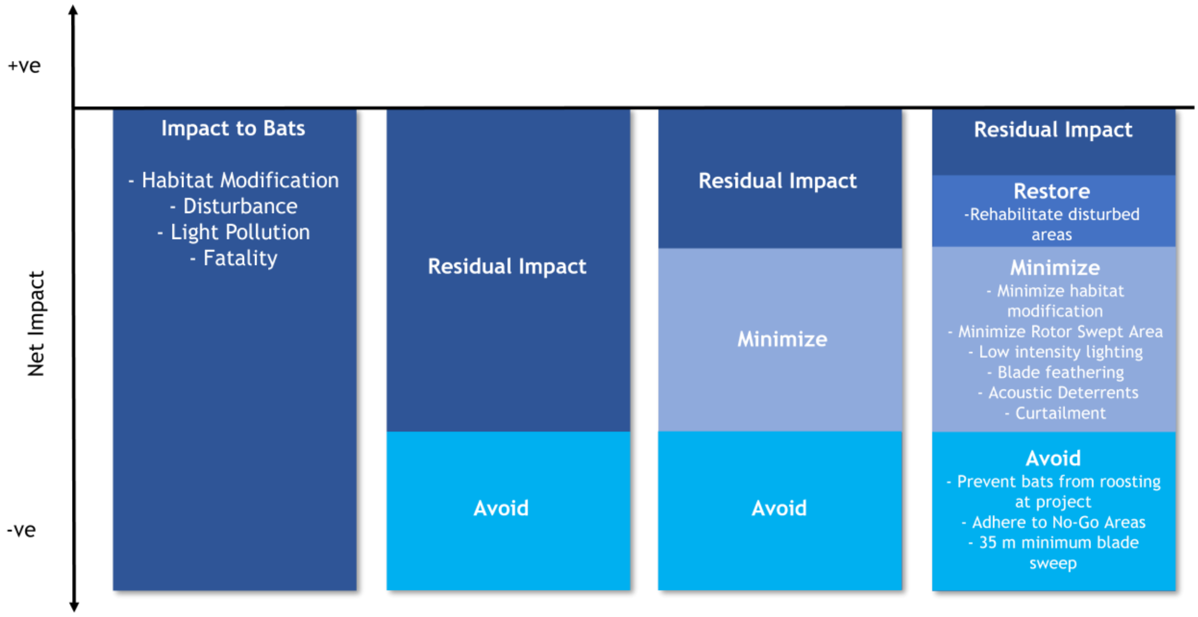

Figure 5: Mitigation Hierarchy applied to the Project with Mitigation Measures.

6.1 Impact Assessment

6.1.1 Construction Phase

Impacts

Removal of vegetation, noise and dust generated during construction activities, and the presence of new infrastructure in the landscape, will negatively and indirectly impact bats by removing habitat used for foraging and commuting, through disturbance, and displacement (Kunz et al. 2007b, Millon et al. 2015, Millon et al. 2018, Bennun et al. 2021, Leroux et al. 2022).

Construction of WEF infrastructure could result in destruction (direct impact) of bat roosts (rocky crevices, buildings) and disturbance (indirect impact) of bat roosts potentially resulting in roost abandonment. Bat mortality can occur if roosts which contain bats are destroyed. Installation of new infrastructure in the landscape (e.g., buildings, turbines, road culverts) can provide new roosting spaces for some bat species, attracting them to areas with wind turbines and potentially increasing the likelihood of collisions.

Mitigation - Avoid

Habitat modification impacts can be avoided by buffering habitat and landscape features that bats use to spatially limit the potential for bats to interact with project infrastructure, and to avoid impacting key bat habitat (Barré et al. 2018, Leroux et al. 2022). Habitat features present in the landscape that have been buffered include farmsteads, farm dams, water pumps, wetlands, cultivated areas, livestock kraals, rocky crevices, rivers, riparian areas, and drainage networks since these are areas with greater bat concentrations of activity. This study assumes that all buildings and rocky outcrops are potentially roosts and must be buffered since numerous species use these features for roosting. South African best practise recommends a 500 m buffer for small roosts (1 – 49 bats) of Least Concern bat species. As such, the farmstead buildings in the PAOI have been buffered by 500 m since the acoustic data suggest bats are roosting in farmstead buildings. All other habitat features were buffered by 200 m as per best practise (Rodrigues 2015, MacEwan et al. 2020), except for drainage lines and rocky outcrops which have been buffered by 50 m. The drainage networks are small, non-perennial streams that largely do not have a strong riparian vegetation element, and the rocky crevices are unlikely to support large congregations of bats. Bats are more likely to roost in larger groups in buildings.

No infrastructure may be placed within these buffered areas (Figure 6). However, road an powerline infrastructure may need to be routed through sensitive areas for practical reasons. Existing road networks should be used as much as possible in these cases to limit the creation of additional roads which have known impacts on wildlife (Perumal et al. 2021). All substation and laydown alternatives avoid no-go areas (Figure 6) however some of the temporary blade laydown areas overlap with buffered turbines. These areas must be rehabilitated after construction.

To avoid bats roosting in new project infrastructure, road culverts and buildings must be properly sealed to prevent bats from roosting. If bats colonize these spaces, a suitable qualified bat ecologist must be engaged to remove them.

Disturbance effects can be avoided by restricting construction activities to daylight hours (i.e., no construction at night) and avoiding blasting near rocky outcrops.

Mitigation - Minimize and Restore

Modification and disturbance of bat habitat is likely to have species specific effects depending on species foraging guild, season, and distance to wind turbines (Barré et al. 2018, Leroux et al. 2022). For example, clutter edge species (e.g., Cape serotine) are more likely to be impacted by habitat modification given their greater association with physical habitat features compared to high-flying species (e.g., Egyptian free-tailed bat). As such, buffers may not be effective to fully remove all impacts. Beyond avoidance, measures to minimize further impacts include minimizing the clearing of vegetation, minimizing disturbance and destruction of rocky outcrops, and applying good construction abatement control practices to reduce emissions and pollutants (e.g., noise, erosion, waste) created during construction. Where trees, rocky outcrops or buildings need to be removed (although this must be avoided), these features must be examined by a suitably qualified bat ecologist before construction commences to search for roosting bats. Following construction, all areas disturbed must be rehabilitated through native species planting within all areas under the projects control.

Impact Phase: Construction					
Nature of the impact: MODIFICATION & DISTURBANCE OF BAT HABITAT (ROOSTING, FORAGING, COMMUTING)					
Description of Impact: Removal of vegetation, noise and dust generated during construction activities, and the presence of new infrastructure in the landscape, will negatively and indirectly impact bats by removing habitat used for foraging and commuting, through disturbance, and displacement. Construction of WEF infrastructure could result in destruction and/or disturbance to bat roosts, and inadvertently provide new roosting spaces for some bat species in risky locations.					
Impact Status: Negative					
	E	**D**	**R**	**M**	**P**
Without Mitigation	Site	Short Term	Recoverable	Moderate	Probable
Score	1	2	3	3	3
With Mitigation	Site	Short Term	Recoverable	Low	Low Probability
Score	1	2	2	2	2
Significance Calculation	**Without Mitigation**		**With Mitigation**		
S=(E+D+R+M)*P	Low Negative Impact (27)		Low Negative Impact (14)		
Mitigation measures to reduce residual risk or enhance opportunities: Avoid: - Limit potential for bats to roost in project infrastructure (e.g., buildings, turbines, road culverts) by ensuring they are properly sealed such that bats cannot gain access. - No construction activities at night. - No placement of infrastructure (except roads and MV Cabling) in no-go areas (Figure 6).					

<table>
<tr><td colspan="2">- No blasting where this would destroy rocky outcrops.

<u>Minimise:</u>
- Minimise clearing of vegetation
- Minimise disturbance and destruction of rocky outcrops, trees and buildings, and where this is required, these features should be examined for roosting bats by a qualified bat ecologist.
- Apply good construction abatement control practices to reduce emissions and pollutants (e.g., noise, erosion, waste) created during construction.

<u>Restore:</u>
- Rehabilitate all areas disturbed during construction (including aquatic habitat).</td></tr>
<tr><td>Residual impact</td><td>Residual impacts are likely to be minor although buffer distances have been shown to be ineffective at avoiding and minimizing risk to bats because these are two small for some species (Barré et al. 2018).</td></tr>
</table>

6.1.2 Operational Phase

<u>Impacts</u>

Bat mortality (direct impact) through collisions with wind turbine blades is the principal impact of wind energy facilities on bats (Cryan and Barclay 2009, Arnett et al. 2016).

In addition, construction of project infrastructure will increase ecological light pollution from artificial lighting associated with the substation and other operational and maintenance buildings. Light pollution can alter ecological dynamics (Horváth et al. 2009). Lighting attracts and can cause direct mortality of insects, reducing the prey base for bats, especially bat species that are light-phobic. These species may also be displaced from previous foraging areas due to lighting. Other bat species forage around lights, attracted by higher numbers of insects. This may bring these species into the vicinity of the project and indirectly increase the risk of collision with wind turbines.

<u>Mitigation - Avoid</u>

Collisions can be avoided by not placing wind turbines in the vicinity of bat habitats which for bats includeds both physical landscape features themselves (near wetlands, vegetation etc.) and open airspace away from these features (Schnitzler et al. 2003). Risk of collision impact is related to bat morphology with fast flying, open-air species more likely to be impacted than low-flying species who forage closer to the ground or in edge spaces near vegetation (Thaxter et al. 2017, Aronson 2022, Figure 7). Impacts to low-flying species can be avoided by ensuring blades do not sweep close to ground level.

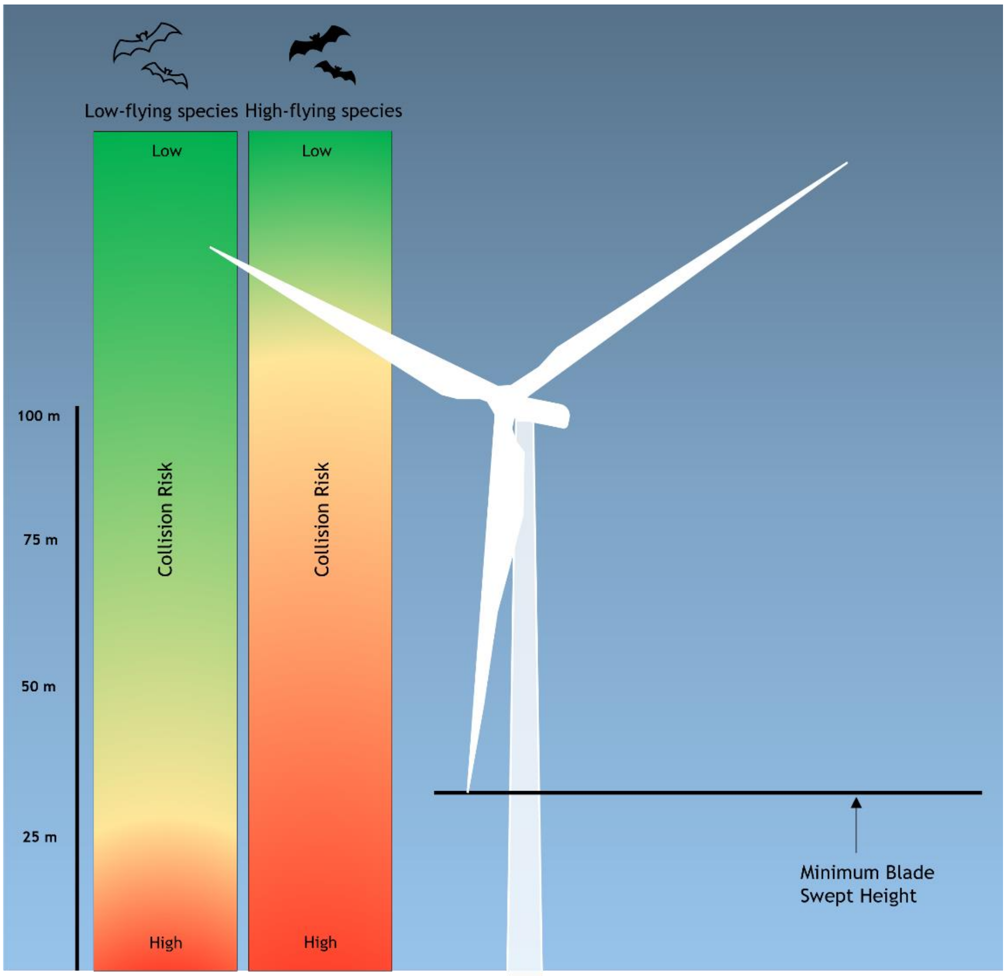

Figure 7: Conceptual Framework used to differentiate risk between low and high-flying bat species and the relationship with turbine size.

The species principally at risk from the proposed project are Cape serotine and Egyptian free-tailed bat since the other species were recorded less often. High risk was identified for Cape serotine at ground level (represented by 10 m) and low risk at height (above 50 m). Activity is likely to decrease exponentially between these two heights (Wellig et al. 2018) meaning risk would decrease from high at 10 m to low at 50 m. The size of the rotor swept area should account for this because the lower the blades sweep the ground, the higher risk they will present to bats. It is therefore recommended to maintain a minimum blade sweep of 35 m to avoid collision impacts as much as possible (Figure 7). There is limited published emperical evidence for this specific height but based on the activity of Cape serotine this is likely to be a reasonable height were risk would reduce from high to moderate or low. The turbines are proposed to have a maximum hub height of up to 160 m and a rotor diameter of up to 200 m. The final choice of turbine should ensure that the blades do not sweep below 35 m above the ground.

Collision impacts can also be avoided by not installing wind turbines within or adjacent to key bat habitats. To ensure no parts of the wind turbines, including the blade tips, intrude into bat buffers, all buffers were adjusted to account for the blade length and hub height of the assessed turbine in line with Mitchell-Jones and Carlin (2014) and based on the following equation:

[Eq. 1]

$$b = \sqrt{(buffer + bl)^2 - (hh - fh)^2}$$

$$b = \sqrt{(200 + 100)^2 - (135 - 0)^2}$$

$$b = 268\, m$$

Where:
b = adjusted/blade tip buffer
buffer = 200 m[1]
bl: Turbine blade length = 100 m
hh: Hub height = 135 m
fh: Feature height = 0 m

The specific turbine height assessed in this report has a 135 m hub height and 200 m rotor diameter, based on the minimum blade sweep of 35 m. This represents a likely hub height and the maximum blade length being applied for. This reports therefore assesses the worst-case scenario for bats; namely the largest rotor swept area. No turbines in the proposed layout (Figure 5) are currently located within no-go areas and hence the layout is acceptable in terms of avoiding risks to bats. Should the turbine size change during the development process, the adjusted/blade tip buffers must be updated to account for any changes in the hub height or blade length.

To avoid impacts due to light pollution from the substation and operation and maintenance buildings, the project should avoid using excessive lighting and infrastructure must not be constructed within the no-go buffers. This will increase the distance between lighting sources and bat habitats, avoiding the impact as much as possible.

Mitigation - Minimize and Restore

For some high-flying species such as Egyptian free-tailed bat, the habitat or land use below does not generally influence their activity (Monadjem et al. 2020) which makes habitat based mitigations (e.g., buffers) less effective. This species was recorded at 50 m and 100 m, where median activity levels suggest high risk (Table 3). Mitigation to avoid impacts to higher-flying species should include the choice of turbine design since this has the potential to influence bat fatality [e.g., Barclay et al.(2007)] but the impact of turbine size on bat fatality is poorly understood. Generally, impacts to high-flying species should be avoided by limiting the size of the rotor swept area as much as practicable since they are active across much of the rotor swept zone.

However, due to the characteristics of the species present on site, i.e., high risk, open-air foraging species, residual impacts could occur since there is still likely to be a high degree of risky airspace even with a minimized rotor swept area. In addition, some bats may be attracted to turbines (Horn et al. 2008, Cryan and Barclay 2009, Richardson et al. 2021, Guest et al. 2022, Leroux et al. 2022) once installed and operational and therefore additional mitigation measures would be needed to minimize impacts.

The first additional mitigation measure to minimize residual collision impacts is the use of blade feathering for all turbines to prevent free-wheeling of blades below the turbine cut-in speed as a standard procedure from commencement of operation. This has been shown to reduce bat fatality with the benefit of not impacting on energy production (Young et al. 2011, Good et al. 2012).

During operation, bat fatality monitoring must be undertaken to search for bat carcasses beneath wind turbines to measure the residual impact of the WEF on bats for a minimum of two years (Aronson et al. 2020) assuming the application of the above mitigation measures. Mitigation measures that are known to further minimise bat fatality if needed based on the fatality monitoring results include curtailment and/or acoustic deterrents (Arnett et al. 2013, Romano et al. 2019, Weaver et al. 2020, Rnjak et al. 2023). These techniques must be used if post-construction fatality monitoring indicates that species fatality thresholds have been exceeded (MacEwan et al. 2018) to minimise impacts, maintain the impacts to bats within acceptable limits of change and prevent declines in the impacted bat population. The bat fatality thresholds for the project were determined as follows:

[1] 50 m for drainage lines and rocky outcrops, resulting in a buffer to blade tip of 65 m, and 500 m buffer for building roosts resulting in a buffer to blade tip of 585 m.

(a) Annual fatality threshold per 10 ha = 0.2[2]

(b) Turbine area of influence (ha) = 9,112

(c) Annual fatality threshold per LC species = (a) x [(b)/10]

= 183 individuals[3]

Thus, according to the threshold guidance (MacEwan et al. 2018), the bias-adjusted threshold fatality value is 183 individuals per least concern (LC) bat species per annum. Should this be exceeded, curtailment and/or acoustic deterrents must be used to reduce fatality levels to below the threshold. For frugivorous bats, conservation important or rare/range restricted bats, i.e., Species of Special Concern (SSC), the annual fatality threshold is 1 individual. The likelihood of SSC's being present on site is low (Table 2). A Biodiversity Management Plan (BMP) for bats must be developed which includes the post-construction fatality monitoring plan design, fatality thresholds calculations and rationale, an initial curtailment plan, and an adaptive management response plan that provides a timeous action pathway for mitigation should fatality thresholds be exceeded.

Regarding light pollution, effects from lighting might still impact bats and insects after avoidance measures depending on the intensity. This can be minimised by using motion-sensor lighting, minimising sky-glow by using hoods, and by using low pressure sodium lights at the substation and operation and maintenance buildings.

Impact Phase: Operation					
Nature of the impact: BAT FATALITY					
Description of Impact: Bat mortality (direct impact) through collisions and/or barotrauma with wind turbine blades is the principal impact of wind energy facilities on bats.					
Impact Status: Negative					
	E	**D**	**R**	**M**	**P**
Without Mitigation	Local	Long term	Recoverable	High	Highly Probable
Score	2	4	3	4	4
With Mitigation	Local	Long term	Recoverable	Moderate	Probable
Score	2	4	3	3	3
Significance Calculation	**Without Mitigation**		**With Mitigation**		
S=(E+D+R+M)*P	Moderate Negative Impact (52)		Moderate Negative Impact (33)		
Mitigation measures to reduce residual risk or enhance opportunities: Avoid: No placement of turbines within no-go areas (Figure 7). Maintain a minimum blade sweep of 35 m to avoid impacts to lower flying bats such as clutter-edge species (e.g., Cape serotine). Minimise: - Minimise the rotor diameter - Feather blades for all turbines to prevent free-wheeling below the turbine cut-in speed from start of operation - Implement post-construction fatality monitoring and apply curtailment or deterrents if fatality thresholds are exceeded.					

[2] Based on reference value for Nama Karoo in MacEwan et al. (2018).
[3] This threshold must be compared to the unbiased annual bat fatality estimate generated as part of the post-construction fatality monitoring program.

Residual impact	Curtailment and deterrents can successfully reduce bat fatality (Arnett 2011, Arnett et al. 2016, Weaver et al. 2020), but not completely. Through the application of fatality thresholds, residual impacts should be minimized.

Impact Phase: Operation					
Nature of the impact: LIGHT POLLUTION					
Description of Impact: Light pollution can alter ecological dynamics.					
Impact Status: Negative					
	E	**D**	**R**	**M**	**P**
Without Mitigation	Local	Long term	Recoverable	Moderate	Probable
Score	2	4	3	3	3
With Mitigation	Local	Long term	Recoverable	Moderate	Low Probability
Score	2	4	2	3	2
Significance Calculation	Without Mitigation		With Mitigation		
S=(E+D+R+M)*P	Moderate Negative Impact (36)		Low Negative Impact (22)		
Mitigation measures to reduce residual risk or enhance opportunities: Avoid: - No placement of substations and operational and maintenance buildings within no-go areas (Figure 7). - Avoid excessive lighting Minimise: - Use of motion-sensor lighting, avoid sky-glow by using hoods, increase spacing between lighting units, and use low pressure sodium lights (Rydell 1992, Stone 2012).					
Residual impact	Given the limited extent of light pollution currently in the region, the application of the above mitigation measures is likely to result in minor residual impacts.				

6.1.3 Decommissioning Phase

Impacts

Impacts during the decommissioning phase will be indirect and involve disturbance to bats through excessive noise and dust, and damage to vegetation.

Mitigation - Avoid

Disturbance effects can be avoided by restricting decommissioning activities to daylight hours (i.e., no works at night).

Mitigation - Minimize and Restore

Disturbance can be minimized by applying good abatement control practices to reduce emissions and pollutants (e.g., noise, erosion, waste) created during decommissioning works. All areas disturbed must be rehabilitated through native species planting within all areas under the projects control.

Impact Phase: Decommission
Nature of the impact: DISTURBANCE OF BATS
Description of Impact:

Impacts during the decommissioning phase will be indirect and involve disturbance to bats through excessive noise and dust, and damage to vegetation.					
Impact Status: Negative					
	E	D	R	M	P
Without Mitigation	Site	Short Term	Recoverable	Moderate	Probable
Score	1	2	3	3	3
With Mitigation	Site	Short Term	Recoverable	Low	Low Probability
Score	1	2	2	2	2
Significance Calculation	**Without Mitigation**		**With Mitigation**		
S=(E+D+R+M)*P	Low Negative Impact (27)		Low Negative Impact (14)		
Mitigation measures to reduce residual risk or enhance opportunities: Avoid: - No decommissioning activities at night. Minimise: - Apply good abatement control practices to reduce emissions and pollutants (e.g., noise, erosion, waste) created during decommissioning activities. Restore: - Rehabilitate all areas disturbed during construction (including aquatic habitat).					
Residual impact	Residual impacts are likely to be minor since ceasing project activities on site is likely to benefit bats.				

6.2 Cumulative Impacts

For the purposes of the cumulative impact assessment (CIA), cumulative impacts are defined as the total impacts resulting from the successive, incremental, and/or combined effects of a project when added to other existing, planned and/or reasonably anticipated future projects, as well as background pressures (IFC 2013). The project considered here is the Loxton Wind Energy Facility 2. The goal of this assessment is to evaluate the potential resulting impact to the vulnerability and/or risk to the sustainability of the bat species affected (IFC 2013).

6.2.1 Step 1: VECs and spatial-temporal boundary

Following guidance in IFC (2013), the first step in the CIA was to determine the Valued Environmental Components (VECs), the bat species most likely to be affected by cumulative impacts, and the temporal and geographic scope of the analysis. Of the species recorded in the PAOI during the acoustic monitoring, and based on bat distribution records (ACR 2020), Cape serotine (*Laephotis capensis*) and Egyptian free-tailed bat (*Tadarida aegyptiaca*) are most likely to be impacted cumulatively. This is because they are the most widespread bat species in South Africa (Monadjem et al. 2020), classified as high risk species to wind energy impacts (MacEwan et al. 2020), the most impacted by operating wind energy facilities in the country (Aronson 2022), and baseline monitoring showed relatively high levels of activity.

The temporal time frame over which cumulative impacts are considered was 25 years, the typical lifespan of a renewable energy facility. However, cumulative effects could extend beyond this timeframe if development of the cluster of three projects is phased over time.

The Ecologically Appropriate Area of Analysis (EAAA) for the assessment was determined by considering the ecology of the identified species likely to be affected since cumulative impacts should be evaluated across scales potentially affected species are likely to occur (Voigt et al. 2012, Lehnert et al. 2014). Data on the spatial ecology of the Egyptian free-tailed bat and Cape serotine, specifically the sizes of their foraging or community ranges, are not available. Data from European free-tailed bat, *Tadarida teniotis*, in Portugal (Marques et al. 2004) and Serotine bat, *Eptesicus serotinus*, in England (Robinson and Stebbings 1997) were used as surrogates.

Feeding areas for some *T. teniotis* individuals were over 30 km from their roost while the maximum distance between *E. serotinus* feeding areas was over 41 km.

Cumulative impact assessment in South African typically consider developments within a radius of 35 km which therefore is potentially in line with the movement ecology of the two VECs. Hence the EAAA was a 35 km radius around the PAOI (Figure 8).

6.2.2 Step 2: Other Activities and External Drivers

The second step in the CIA was to identify other past, existing, or planned activities within the EAAA and to assess the external influences and stressors on the two VECs. With reference to the Renewable Energy Application database (Q4, 2022), currently one approved wind energy project is located within the EAAA (Figure 8). However, two additional approved facilities are just beyond the EAAA. Also considered are the two other projects being develop as part of the larger project: Loxton WEF 1 and Loxton WEF 3. Given that the EAAA includes a Renewable Energy Development Zone (Beaufort West), it is reasonable to expect further development over the 25-year period considered in this assessment. The REDZ provides policy support for renewables growth, and its existence creates an enabling environment for wind energy development. As such, at least a moderate level of wind energy development can be expected over the following 25 years in the EAAA.

There are no documented major past threats to Egyptian free-tailed bat and Cape serotine or current threats to them other than renewable energy (Child et al. 2016). Egyptian free-tailed bats can also be threated indirectly by roost disturbance, especially caves. This CIA considers renewable energy the primary impact to these VECs.

6.2.3 Step 3: Baseline Status of VECs

Egyptian free-tailed bat is very widely distributed, locally common and recorded from many protected areas in South Africa however, although the population is stable, the population size is unknown (Child et al. 2016). It is classified as Least Concern nationally and globally. This species is present in the PAOI and based on its activity levels, it is at high risk of collision during autumn, spring, and summer (Table 3). It is flexible in its habitat requirements and one reason for its wide distribution is its affinity to roost in buildings or other man-made structures (Monadjem et al. 2020).

Cape serotine is also widely distributed in South Africa with a large population and hence is classified as Least Concern nationally and globally. However, it is possible that this species comprises a complex of closely related species (Monadjem et al. 2020). The population trend is stable, but the population size is unknown. High risk was predicted for this species at 10 m with low risk predicted from 50 m and higher. This species was recorded at 50 m, so it is reasonable to assume some level of risk between 10 m and 50 m. Cape serotine is also flexible in its habitat requirements and its use of buildings and other anthropogenic structures as roosts has possibly led to its numbers increasing.

6.2.4 Step 4: Assess Cumulative Impacts on VECs

The key potential impacts that could affect the long-term sustainability and/or viability of the Egyptian free-tailed bat and Cape serotine in the EAAA are collisions with wind turbines. This may lead to local extinctions and fragmentation of the national population since bats have low reproductive rates (Barclay and Harder 2003). Other impacts may include displacement from foraging and commuting areas due to wind turbines (Millon et al. 2018, Leroux et al. 2022).

6.2.5 Step 5: Assess Significance of Predicted Cumulative Impacts

Rodhouse et al. (2019), Davy et al.(2020) and Frick et al. (2017) have all shown that in North America, Least Concern bats may be experiencing impacts due to wind farms that could result in changes to their conservation status. This may be a future scenario for widespread, common Least Concern bats species in South Africa. As such, the significance of cumulative impacts is assessed as High without mitigation. The application of mitigation measures is anticipated to reduce the overall cumulative impact of the project to a moderate level.

Impact Phase: Construction, Operation, and Decommission					
Nature of the impact: CUMULATIVE IMPACTS					
Description of Impact: The total impacts resulting from the successive, incremental, and/or combined effects of the project when added to other existing, planned and/or reasonably anticipated future projects, as well as background pressures.					
Impact Status: Negative					
	E	**D**	**R**	**M**	**P**
Without Mitigation	National	Long term	Recoverable	High	Highly Probable
Score	4	4	4	4	4
With Mitigation	Local	Long term	Recoverable	Moderate	Probable
Score	2	4	3	3	3
Significance Calculation	Without Mitigation		With Mitigation		
S=(E+D+R+M)*P	High Negative Impact (64)		Moderate Negative Impact (36)		
Mitigation measures to reduce residual risk or enhance opportunities: The mitigation measures proposed in this report (buffering key habitats used by bats, use of appropriate lighting technology, blade feathering, and using curtailment and/or acoustic deterrents) should be applied to all future projects so that there is a collective management responsibility (IFC 2013).					
Residual impact	Curtailment and deterrents can successfully reduce bat fatality (Arnett 2011, Arnett et al. 2016, Weaver et al. 2020), but not completely. Through the application of fatality thresholds across all projects in the cumulative impact area, residual impacts should be minimized.				

6.2.6 Step 6: Management of Cumulative Impacts

Management interventions for bats at operating wind farms in South Africa are benchmarked against fatality thresholds. These thresholds attempt to manage impacts to bats by considering potential population level effects, with the threshold values set below the rate at which populations may decline due to anthropogenic pressures (MacEwan et al. 2018). Thresholds have been set for this project and these should be determined for all other future wind energy developments. In theory, should each individual development apply thresholds and appropriate mitigation measures if these are exceeded, the EAAA VEC populations should not decline.

The mitigation measures proposed in this report (buffering key habitats used by bats, use of appropriate lighting technology, blade feathering, and using curtailment and/or acoustic deterrents) should be applied to all future projects so that there is a collective management responsibility (IFC 2013).

7 ENVIRONMENTAL MANAGEMENT PROGRAMME

Objective	Avoid and minimise modification and disturbance of bat habitats
Project component/s	All project infrastructure
Potential Impact	Vegetation clearing for project infrastructure, as well as noise, dust and pollution generated during construction activities, will impact bats by removing habitat used for foraging and commuting, through disturbance, and displacement. Construction of WEF infrastructure could result in destruction and/or disturbance to bat roosts, and inadvertently provide new roosting spaces for some bat species in risky locations.
Activity/risk source	All construction activities and associated activities (e.g., driving)

<table>
<tr><td colspan="1">Mitigation: Target/Objective</td><td colspan="2">1. Avoid potential for bats to roost in project infrastructure (e.g., buildings, turbines, road culverts)
2. Avoid disturbance to bats
3. Minimise disturbance to bats
4. Minimise habitat loss
5. Restore disturbed habitats</td></tr>
<tr><td>Mitigation: Action/control</td><td>Responsibility</td><td>Timeframe</td></tr>
<tr><td>1. Ensure all project infrastructure (e.g., buildings, turbines, road culverts) is properly sealed such that bats cannot gain access.
2. No construction activities at night. No blasting where this would destroy rocky outcrops.
3. No placement of infrastructure (except roads and MV Cabling) in No-Go areas.
4. Minimise clearing of vegetation, minimise disturbance and destruction of farm buildings and rocky crevices, minimise removal of trees. Apply good construction abatement control practices to reduce emissions and pollutants (e.g., noise, erosion, waste).
5. Rehabilitate all areas disturbed during construction, (including aquatic habitat).</td><td>EPC Contractor/Operator</td><td>During design and planning phase and throughout construction phase</td></tr>
<tr><td>Performance Indicator</td><td colspan="2">- No bat roosts are destroyed
- No bats colonise new project infrastructure for roosting
- No infrastructure in No-Go areas (except roads and MV Cabling)
- All areas disturbed during construction are rehabilitated</td></tr>
<tr><td>Monitoring</td><td colspan="2">- An appointed ECO must inspect all new project infrastructure, in conjunction with or via training from a bat ecologist, to ensure bats cannot gain access.
- ECO to ensure compliance with good construction abatement control practices.
- ECO must ensure no infrastructure is placed in No-Go areas (see Figure 6).
- If a bat roost is encountered during construction, the ECO must consult a bat ecologist to determine appropriate actions.
- ECO to ensure all disturbed areas are rehabilitated.</td></tr>
</table>

<table>
<tr><th>Objective</th><th colspan="2">Avoid and minimise bat fatality</th></tr>
<tr><td>Project component/s</td><td colspan="2">Wind Turbines</td></tr>
<tr><td>Potential Impact</td><td colspan="2">Bat mortality through collisions with wind turbine blades.</td></tr>
<tr><td>Activity/risk source</td><td colspan="2">Operating Wind Turbines</td></tr>
<tr><td>Mitigation: Target/Objective</td><td colspan="2">1. Avoid bat fatalities through turbine layout design
2. Minimise bat fatalities through turbine design, and by using blade feathering, curtailment, and deterrents</td></tr>
<tr><td>Mitigation: Action/control</td><td>Responsibility</td><td>Timeframe</td></tr>
<tr><td>1. No placement of turbines within No-Go areas to reduce spatial overlap between bats and wind turbines.
2. Maintain a minimum blade sweep of 35 m to minimize impacts to lower flying bats such as clutter-edge species (e.g., Cape serotine).
3. Minimise the rotor swept areas to reduce impacts to high-flying species (e.g., Egyptian free-tailed bat).
4. All turbine blades must be feathered, or a similar technique should be used, to prevent free-wheeling below the turbine cut-in speed.
5. Implement fatality monitoring throughout the operational phase and apply curtailment or deterrents if fatality thresholds are exceeded.</td><td>EPC Contractor/Operator</td><td>BMP developed prior to operation.

BMP active throughout operation phase.</td></tr>
</table>

Annual fatality threshold per Least Concern species = 183 individuals.		
Performance Indicator	- ≤ 183 individuals per Least Concern species killed annually	
Monitoring	- ECO must ensure no turbines are placed in No-Go areas, including the blade tips (see Figure 6). - ECO must ensure the dimensions of the final selected turbine adhere to requirements (A minimum blade sweep of 35 m). - ECO must ensure blade feathering is implemented. - A Biodiversity Management Plan (BMP) for bats must be developed by a bat ecologist before operation which includes the design of a post-construction fatality monitoring program (PCFM) for bats, and an adaptive management response plan that provides an action plan for mitigation should fatality thresholds be exceeded. - ECO to ensure adherence to BMP and any mitigation measures implemented.	

Objective	Avoid and minimise light pollution	
Project component/s	Project Lighting	
Potential Impact	Light pollution can alter ecological dynamics	
Activity/risk source	Emission of light from project lighting	
Mitigation: Target/Objective	1. Avoid light pollution through spatial planning of the facility 2. Minimise light pollution by using appropriate lighting technology	
Mitigation: Action/control	**Responsibility**	**Timeframe**
1. No placement of substations and operational and maintenance buildings in No-Go areas. 2. Use as little lighting as possible, maximise use of motion-sensor lighting, avoid sky-glow by using hoods, increase spacing between lighting units, and using low intensity lights.	EPC Contractor/Operator	During design and planning phase and throughout operation phase
Performance Indicator	- No buildings in No-Go areas - Use of appropriate lighting technology	
Monitoring	- ECO must ensure no buildings are in No-Go areas (see Figure 6). - ECO must ensure lighting technology meets requirements.	

8 CONCLUSION

This report assessed impacts to bats that could occur because of the construction, operation and decommission of the Loxton WEF 2. The assessment was based on 12 months of baseline data on bat activity recorded at the project. Based on these data, the key issue for the WEF will be managing collision impacts to high-flying free-tailed bats; specifically Egyptian free-tailed bat, but also possibly Roberts's flat-headed bat. The magnitude of Egyptian free-tailed bat activity was high across the PAOI, including at 50 m and 100 m, based on median bat activity with reference to MacEwan et al. (2020). While this was restricted to certain nightly time periods and seasons, this high risk needs to be addressed and the mitigation options for high-flying species are relatively limited. This is because these bats are active across most of the rotor swept zone and hence are likely to encounter wind turbine blades should they be foraging or commuting in the vicinity of these structures. Additionally, bats may also be attracted to wind turbines (Guest et al. 2022, Leroux et al. 2022).

The first mitigation measure proposed to manage risk is to adhere to the no-go buffers which aim to spatially avoid impacts by buffering key habitat features used by bats. This measure is likely to be effective for most bat species recorded at the project, but additional mitigation measures are needed to avoid impacts to free-tailed bats, which forage high in the air, and to reduce residual impacts. Turbine design can be effective, and it is recommended to maintain a minimum blade sweep of at least 35 m. However, free-tailed bats will still collide with turbine blades above this height and as such, the rotor diameter must be limited as much as practicable to minimise the space where collisions might occur. Additionally, blade feathering for all turbines must be implemented from the start of operation to limit the rotation of turbine blades below the turbine cut-in speed when electricity is not being generated.

Mitigation measures to minimise residual impacts after the application of the above measures include curtailment and acoustic deterrents. These measures are effective, and given the predicted risk, it is possible they may need to be implemented because the fatality thresholds are relatively low. The residual impacts must be monitored using post-construction fatality monitoring for a minimum of two years (Aronson et al. 2020). Curtailment and/or acoustic deterrents must be used if this monitoring indicates that species fatality thresholds have been exceeded (MacEwan et al. 2018) to maintain the impacts to bats within acceptable limits of change and prevent declines in the impacted bat populations.

Considering that the overall impact to bats was assessed as moderate after the application of the mitigation measures proposed to avoid and minimise impacts to bats, the proposed project can be approved. However, on a species level, the project presents differential risk and impacts must be managed adaptively during the operational phase, particularly for those species (e.g. Egyptian free-tailed bat) for which high risk is predicted. This adaptive management will be guided by the Environmental Management Programme for bats which must include the development of a Biodiversity Management Plan (BMP) to manage impacts to bats during the operation of the facility. The BMP for bats must be developed by a bat ecologist before the commencement of operation and must include the post-construction fatality monitoring plan design, fatality thresholds calculations and rationale, a curtailment plan, and an adaptive management response plan that provides a timeous action pathway for mitigation, including roles and responsibilities, should fatality thresholds be exceeded.

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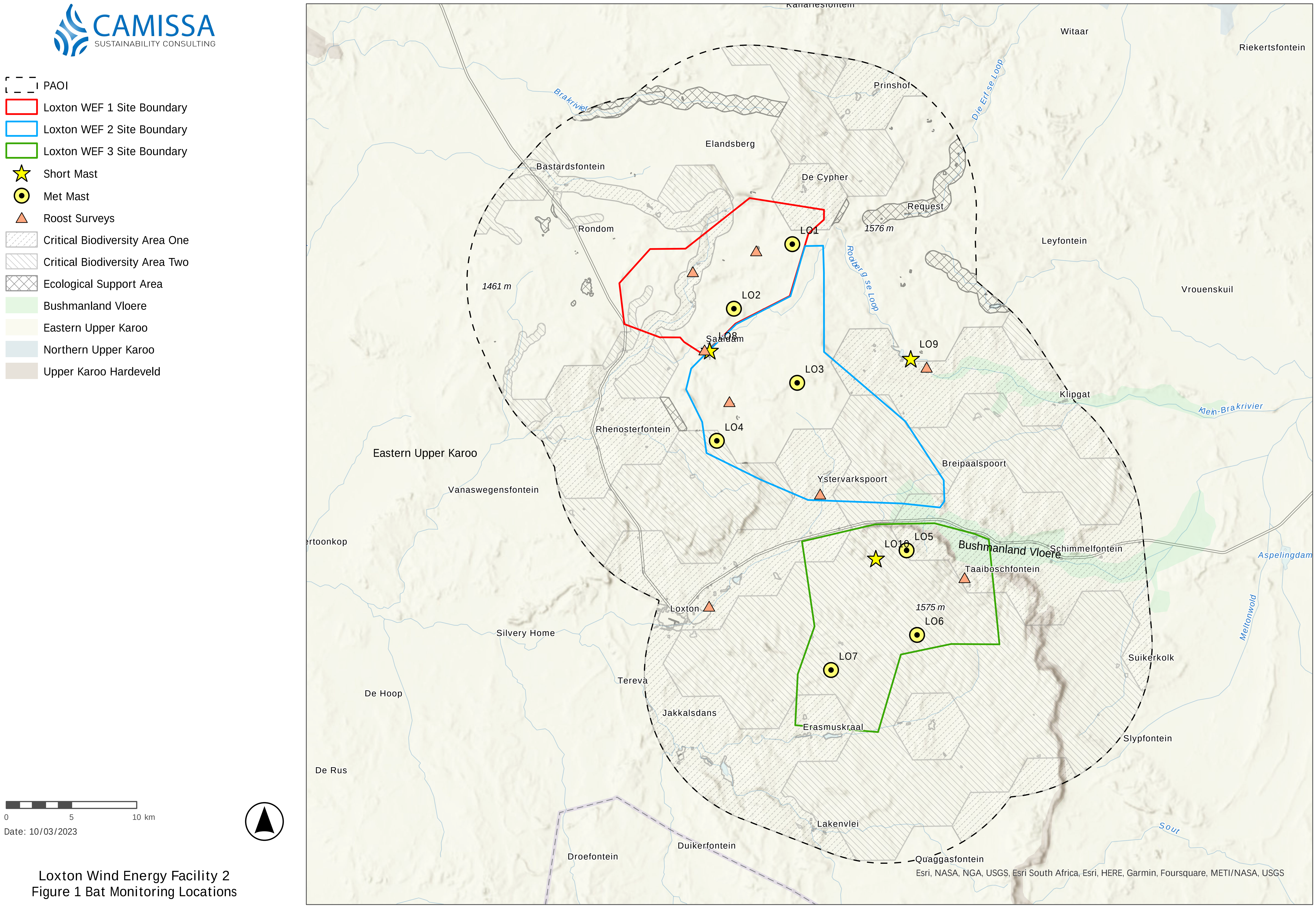
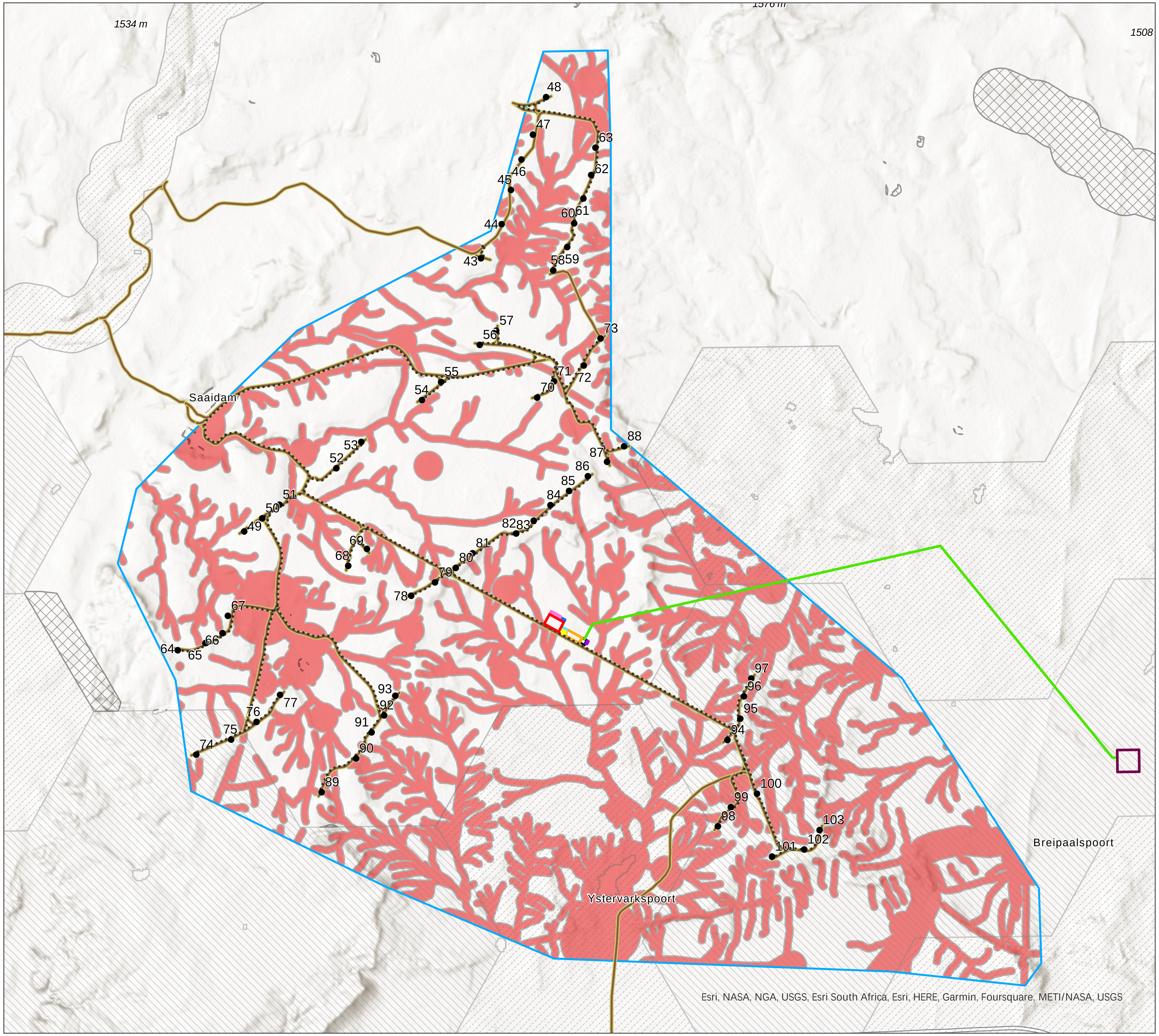
Appendix 1: Figures



Loxton Wind Energy Facility 2
Figure 1 Bat Monitoring Locations

CAMISSA
SUSTAINABILITY CONSULTING

- Loxton WEF 2 Site Boundary
- Proposed Turbine
- Turbine Foundations
- Substation
- O&M Building
- Storage Area
- Access Roads
- BESS
- Parking Bays
- Site Camp
- OH Line
- MV Cabling
- Batching Plant
- Construction Laydown
- Loxton MTS
- Critical Biodiversity Area One
- Critical Biodiversity Area Two
- Ecological Support Area
- No Go Areas



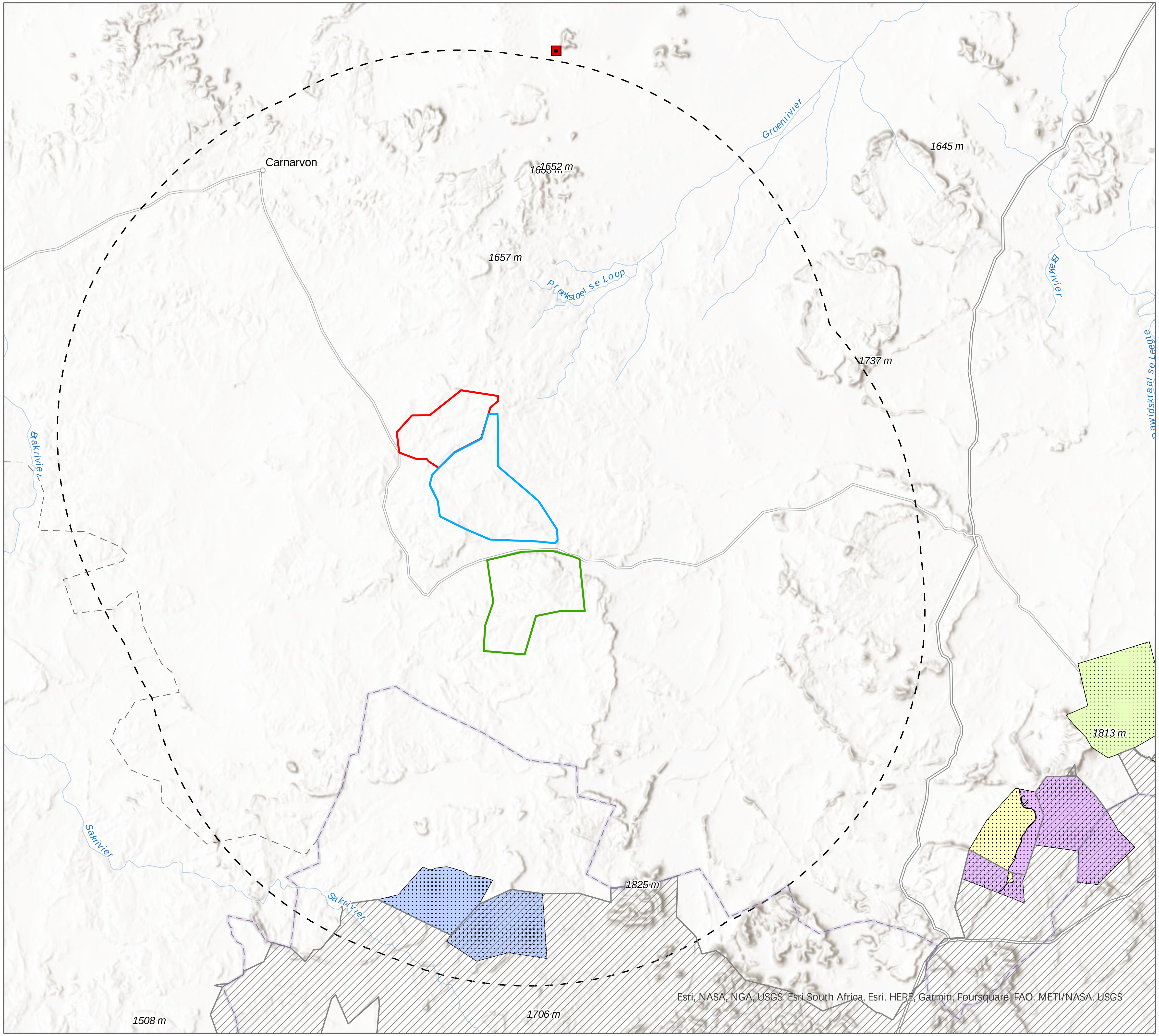
0 1.5 3 km

Date: 10/03/2023

Loxton Wind Energy Facility 2
Figure 6 Bat Constraints Map

CAMISSA
SUSTAINABILITY CONSULTING

- Major Bat Roost
- EAAA
- Loxton WEF 1 Site Boundary
- Loxton WEF 2 Site Boundary
- Loxton WEF 3 Site Boundary
- Nobelsfield Wind Energy Facility
- Mainstream Wind and Solar Energy Facility
- Nuweveld East Wind Energy Facility
- Modderfontein Wind Energy Facility
- Beaufort West REDZ



0 10 20 km

Date: 10/03/2023

Loxton Wind Energy Facility 2
Figure 8 Cumulative Impact Map

Appendix 2: Specialist CV

CURRICULUM VITAE JONATHAN ARONSON

jonathan@camisssaconsulting.com | 062 797 1247 | Amsterdam, Netherlands |www.linkedin.com/in/jbaronson

1 BACKGROUND

Jonathan is a research ecologist with 13 years of experience working on bat and wind energy interactions. He has been at the forefront of bats and wind energy research in South Africa and has worked on more than 100 WEF projects in South Africa, Kenya, Ethiopia, Mozambique, Zambia, Uzbekistan, Azerbaijan, Pakistan, Vietnam, and the UK. He has presented his research at the International Bat Research Conference, the Conference on Wind Energy and Wildlife Impacts, and at numerous local and international bat workshops and symposia.

He is experienced in undertaking pre-construction and operational monitoring projects for bats, impact assessments, mitigation strategy design (including the design of curtailment programs), due diligence exercises, ecological surveys, GIS screening studies and providing strategic advice. He has delivered training to local search teams at operational wind farms in South Africa, Pakistan and Vietnam on bat and bird carcass search methodologies, including providing on-going support and mentoring.

Jonathan has also helped shaped wind-wildlife best practise and policy, co-authoring the Good Practise Guidelines for Surveying Bats at Wind Energy Facilities in South Africa, and developing monitoring guidelines for bat fatality at operational wind power projects. He is a founding member of the South African Bat Assessment Advisory Panel (SABAAP) and a registered as a Professional Natural Scientist (Ecological Science) with SACNASP.

2 PROFESSIONAL HISTORY

Director/Founder, Camissa Sustainability Consulting (2020 – current)
International Finance Corporation (IFC) ESG Sustainability Advice & Solutions Department (2020 – current)
Senior Ecologist, Arcus Consultancy Services South Africa (Pty) Ltd (2019 - 2020)
Ecology Specialist, Arcus Consultancy Services South Africa (Pty) Ltd (2013 – 2019)
Director/Founder, Gaia Environmental Services Pty (Ltd) (2011 - 2013)

3 QUALIFICATIONS

MSc (Environment and Resource Management; Energy and Climate Specialization)
Vrije Universiteit Amsterdam (2020 – 2021)

MSc (Zoology)
University of Cape Town (2009 – 2011)

BSc - Honours (Freshwater Biology)
University of Cape Town (2007)

BSc (Zoology)
University of Cape Town (2003 – 2006)

4 AFFILIATIONS

South African Bat Assessment Advisory Panel (2013 to 2020)
Professional Natural Scientist (Ecological Science) – SACNASP Registration #400238/14

5 PROJECT EXPERIENCE

Research Projects

- Current State of Knowledge of Wind Energy Impacts on Bats in South Africa
- Darling National Demonstration Wind Farm Project. Designed and implemented a research project investigating bat fatality in the Western Cape

jonathan@camisssaconsulting.com | 062 797 1247 | Amsterdam, Netherlands |www.linkedin.com/in/jbaronson

Strategic Advice

- Risk screening for five wind farms in Uzbekistan and Azerbaijan (International Finance Corporation)
- Review of Terms of Reference for Bat Pre-construction Monitoring projects in India (International Finance Corporation)
- Stakeholder Advisory Committee for Good Practices Handbook Post-Construction Monitoring of Bird and Bat Fatalities at Onshore Wind Energy Facilities (International Finance Corporation)
- Review of Bird Fatality data from De Aar 1 and De Aar 2 Wind Farms (Mulilo)
- Management and mitigation recommendations for bats at three proposed wind farms (Rainmaker Energy)
- Peer Review for Three Bat Monitoring Reports for the Bokpoort II Solar Developments (Golder Associates)
- Peer Review of Operational Monitoring at the Jeffreys Bay Wind Farm, including updating the operational mitigation strategy for bats (Globeleq South Africa Management Services)
- Oyster Bay Wind Energy Facility. Reviewing a pre-construction bat monitoring study and providing input into a stand-alone study (RES Southern Africa)
- Review and design mitigation strategies for bats at the Kinangop Wind Park, Kenya (African Infrastructure Investment Managers)

Operational Monitoring Projects for Bats and Birds

- Pakistan Super Six Wind Farms (Consortium of six Companies)
- Loi Hai 2 and Phu Lac 2 Wind Farms (International Finance Corporation)
- Waainek, Chaba and Grassridge Wind Farms (EDF Energy)
- Golden Valley 1 Wind Farm (Biotherm Energy)
- Darling Wind Farm (ENERTRAG)
- Eskom Sere Wind Farm (Endangered Wildlife Trust)
- West Coast One Wind Energy Facility (Aurora Wind Power)
- Fazakerly Waste Water Treatment Works (United Utilities)
- Beck Burn Wind Farm (EDF Energy)
- Gouda Wind Energy Facility (Blue Falcon 140)
- Hopefield Wind Farm (Umoya Energy)

Pre-Construction Monitoring and Environmental Impact Assessments for Bats

- Taaibos and Soutrivier Wind Energy Facilities (WKN Windcurrent SA)
- Pofadder Wind Energy Facility (Atlantic Renewable Energy Partners (Pty) Ltd)
- Ummbila Emoyeni Wind Energy Facility (Windlab Developments South Africa (Pty) Ltd)
- Kleinberg Wind Energy Facility (Mulilo)
- Klipfontein & Zoute Kloof Solar PV Projects (Resource Management Services)
- Swellendam Wind Energy Facility (The Energy Team/Calidris)
- Swellendam Wind Energy Facility (Veld Renewables)
- Ingwe Wind Energy Facility (ABO Wind renewable energies)
- Duiker Wind Energy Facility (ABO Wind renewable energies)
- Pienaarspoort Wind Energy Facility (ABO Wind renewable energies)
- Choje Wind and Solar Energy Facility (Wind Relic)
- Wobben WEC Wind Project (Integrated Wind Power)
- Nuweveld Wind Energy Facility (Red Cap Energy)
- Banna Ba Phifu Wind Energy Facility (WKN Windcurrent SA)
- Kwagga Wind Energy Facility (ABO Wind renewable energies)
- Unika 1 Wind Farm in Zambia (SLR Consulting)
- Namaacha Wind Farm (Consultec)
- Paulputs Wind Energy Facility (WKN Windcurrent SA)
- Putsonderwater Wind Energy Facility (WKN Windcurrent SA)
- Zingesele Wind Energy Facility (juwi Renewable Energies)

- Highlands Wind Energy Facility (WKN Windcurrent SA)
- Kap Vley Wind Energy Facility (juwi Renewable Energies)
- Universal and Sonop Wind Energy Faculties (JG Afrika)
- Kolkies and Karee Wind Energy Facility (Mainstream Renewable Power South Africa)
- Komsberg East and West Wind Energy Facility (African Clean Energy Developments)
- Spitskop West Wind Energy Facility (RES Southern Africa/Gestamp)
- Spitskop East Wind Energy Facility (RES Southern Africa)
- Patryshoogte Wind Energy Facility (RES Southern Africa)
- Elliot Wind Energy Facility (Rainmaker Energy)
- Pofadder Wind Energy Facility (Mainstream Renewable Power South Africa)
- Swartberg Wind Energy Facility (CSIR)
- Clover Valley and Groene Kloof Wing Energy Facility (Western Wind Energy)

Ecological Surveys

- Mokolo Bat Cave Assessment for water pipeline development (GIBB)
- Killean Wind Farm Bat acoustic surveys for this proposed site in Scotland, UK. (Renewable Energy Systems)
- Maple Road, Tankersely. Bat acoustic surveys including a walked transect for this proposed site near Barnsley, UK (Rula Developments).
- Wild Bird Global Avian Influenza Network for Surveillance (Percy Fitzpatrick Institute of African Ornithology)
- Tree-Grass Dynamics Research Project (University of Cape Town)
- Zululand Tree Project (University of Cape Town)

Environmental Due Diligence Projects

- Klawer Wind Farm (SLR Consulting)
- Excelsior Wind Farm (IBIS Consulting)
- Golden Valley Wind Farm (IBIS Consulting)
- Perdekraal Wind Farm (IBIS Consulting)
- Copperton Wind Energy Facility (SLR Consulting)
- Roggeveld Wind Farm (IBIS Consulting)
- Kangas Wind Farms (ERM)
- Excelsior Wind Farms (ERM)
- Golden Valley Wind Farms (ERM)

Amendment Applications for Wind and Solar Farms

- Bokpoort Solar Amendment (Royal HaskoningDHV)
- Haga Haga (CES - Environmental and social advisory services)
- Paulputs (Arcus Consultancy Services South Africa)
- Suurplaat (Savannah Environmental)
- Kap Vley (juwi)
- San Kraal (Arcus Consultancy Services South Africa)
- Phezukomoya (Arcus Consultancy Services South Africa)
- Gemini (Savannah Environmental)
- Castle Wind Farm (juwi)
- Namas (Savannah Environmental)
- Zonnequa (Savannah Environmental)
- Ukomeleza (CES - Environmental and social advisory services)
- Great Kei (CES - Environmental and social advisory services)
- Motherwell (CES - Environmental and social advisory services)
- Dassiesridge (CES - Environmental and social advisory services)
- Great Karoo (Savannah Environmental)
- Gunstfontein (Savannah Environmental)

- Komserberg East and West (Aurecon South Africa)
- Soetwater (Savannah Environmental)
- Karusa (Savannah Environmental)
- Zen (Savannah Environmental)

Screening Studies

- Feasibility assessment for four potential wind farms in the Northern Cape (ABO Wind renewable energies)
- Feasibility assessment for four potential wind farms in Mozambique (Ibis Consulting)
- Assessment of the Feasibility of a Wind Farm in the Northern Cape (juwi Renewable Energies)
- Assessment of the Feasibility of two Wind Farms in the Eastern Cape (WKN Windcurrent SA)

6 PUBLICATIONS

Aronson, J.B. (2022). Current State of Knowledge of Wind Energy Impacts on Bats in South Africa. Acta Chiropterologica, 24(1):221-238.

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Sowler, S. and S. Stoffberg (2014). South African Good Practise Guidelines for Surveying Bats in WindEnergy Facility Developments - Pre-Construction (3rd Edition). Kath Potgieter, K., MacEwan, K., Lötter,C., Marais, M., Aronson, J.B., Jordaan, S., Jacobs, D.S, Richardson, K., Taylor, P., Avni, J., Diamond,M., Cohen, L., Dippenaar, S., Pierce, M., Power, J. and Ramalho, R (eds).

Aronson, J.B., Thomas, A. and Jordaan, S. 2013. Bat fatality at a Wind Energy Facility in the Western Cape, South Africa. African Bat Conservation News 31: 9-12.

7 TRAINING

- Conference on Wildlife and Wind Energy Impacts, Netherlands, April 2022.
- National Wind Coordinating Collaborative (NWCC) Wind Wildlife Research Meeting, December 2020.
- Conference on Wildlife and Wind Energy Impacts, Stirling, August 2019.
- GenEst Carcass Fatality Estimator Workshop, Stirling, August 2019.
- GenEst Carcass Fatality Estimator Workshop, Kirstenbosch Research Centre (KRC), October 2018.
- Windaba Conference and Exhibition - Africa's Premier Wind Energy Conference; Cape Town, 2013 – 2019
- Bats & Wind Energy Workshop, The Waterfront Hotel & Spa, Durban, July 2016.
- Endangered Wildlife Trust (EWT) Bats & Wind Energy Training Course, Oct 2013.
- Endangered Wildlife Trust (EWT) Bats & Wind Energy Training Course, Jan 2012.

Appendix 3: 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

Proposed construction of the Loxton 2 Wind Energy Facility, Northern Cape Province.

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:	Camissa Sustainability Consulting			
B-BBEE	Contribution level (indicate 1 to 8 or non-compliant)	4	Percentage Procurement recognition	100%
Specialist name:	Jonathan Aronson			
Specialist Qualifications:	MSc (Zoology), MSc (Environment and Resource Management)			
Professional affiliation/registration:	SACNASP			
Physical address:	Wenslauerstraat 4 3, Amsterdam, Netherlands			
Postal address:	Wenslauerstraat 4 3, Amsterdam, Netherlands			
Postal code:	1053 BA	Cell:	+31 62 797 1247	
Telephone:	+31 62 797 1247	Fax:	NA	
E-mail:	jonathan@camissaconsulting.com			

2. DECLARATION BY THE SPECIALIST

I, Jonathan Aronson, declare that –

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

Signature of the Specialist

Camissa Sustainability Consulting

Name of Company:

13/03/2023

Date

3. UNDERTAKING UNDER OATH/ AFFIRMATION

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

Signature of the Specialist

Camissa Sustainability Consulting

Name of Company

12/03/2023

Date

Signature of the Commissioner of Oaths

Date

Appendix 4: SACNASP Certificate

SACNASP

South African Council for Natural Scientific Professions

herewith certifies that

Jonathan Barry Aronson

Registration number: 400238/14

is registered as a

Professional Natural Scientist

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

Ecological Science	**23 July 2014**

CUSTOS SCIENTIARUM NATURALIUM

23 July 2014

Pretoria

President

Executive Director

Appendix 5: Site Sensitivity Verification Report

SITE SENSITIVITY VERIFICATION
(IN TERMS OF PART A OF THE ASSESSMENT PROTOCOLS PUBLISHED IN GN 320 ON 20 MARCH 2020

1 INTRODUCTION

In accordance with Regulation 16(1)(b)(v) of the EIA Regulations, a Screening Report is required to accompany any application for Environmental Authorisation. The National Web based Environmental Screening Tool was used to generate this Screening Report for the Loxton WEF 2. Subsequently, this document presents a site sensitivity verification (SSV) to confirm the current land use and environmental sensitivity of the proposed project area as identified by Screening Tool.

2 SITE SENSITIVITY VERIFICATION FRAMEWORK

The SSV was undertaken at the desktop level as well as using on-site information collected as part of the 12-month pre-construction bat acoustic monitoring being undertaken for the project in accordance with best practise standards for wind energy projects (MacEwan et al. 2020).

Desktop resources included published scientific articles, texts (Monadjem et al. 2010, Child et al. 2016, Monadjem et al. 2020), and databases (ACR 2020, IUCN 2021) on South African bats. These were used to determine which bat species (i.e., impact receptors) are likely to occur at the project as well as to provide information on their natural history and conservation status. Bat activity data were collected from the field using acoustic monitoring. Field work also included inspection of rocky crevices and buildings which may be used as roosts by bats. See **Sections 4 and 5** of the EIA Report for detail description of methodology and survey findings.

As per the Species Environmental Assessment Guideline (SANBI 2020), the best practise bat guidance was used to assign sensitivity to the impact receptors (specifically bat species) in the PAOI. Sensitivity was obtained by calculating the median number of bat passes/hour per night (n = 237 sample nights). These were then compared to the reference values in the bat guidelines to assign a sensitivity rating to the PAOI (Table 1).

Table 1: Height-specific bat activity (passes/hour) and fatality risk for the Nama Karoo Biome

Height Category	Fatality Risk (Sensitivity)		
	Low	Medium	High
Ground level	< 0.18	0.18 - 1.01	> 1.01
Rotor sweep	< 0.03	0.03 – 0.42	> 0.42

3 SITE SENSITIVITY VERIFICATION OUTCOME

Based on current taxonomic information and field data, no threatened species were recorded or expected to occur on site. The acoustic monitoring results show that the median number of bat passes/hour per night at height (50 m and 100 m) would classify the PAOI as high sensitivity for Egyptian free-tailed bat (except during winter) and moderate to low sensitivity for Cape serotine and Roberts's flat-headed bat depending on season (Table 2).

Table 2: Risk Profile based on Median Bat Passes/hour at the Loxton WEFs (Risk = High, Medium, Low)

	Egyptian free-tailed bat			Cape serotine			Roberts's flat-headed bat		
	10m	50m	100m	10m	50m	100m	10m	50m	100m
Summer	2.02	0.82	0.61	3.84	0	0	0	0.18	0.1
Autumn	1.2	0.79	0.52	1.61	0	0	0	0	0
Winter	0.07	0	0	0.145	0	0	0	0	0
Spring	2.27	0.87	0.195	1.68	0	0	0	0	0

The Screening Tool classified areas within the site boundary as high sensitivity according to the Bats theme (Figure 1). High sensitivity features were wetlands and rivers buffered by 500 m. As a result, the PAOI is classified as high sensitivity overall. The tool did not reveal the presence of any species of conservation concern (SSC).

The outcome of the SSV is that the overall sensitivity of the site varies by bat species and season, linked to their relative activity levels. However, the two sensitivities are based on different data types. The Screening Tool is based on broad scale habitat data whereas the SSV is based on bat collision risk with wind turbines derived from activity data collected within the project boundary and is therefore a better approximation of the project sensitivity because collision is the primary impact. As such the SSV disputes the current environmental sensitivity of the proposed project area, arguing that the sensitivity should be reduced to medium-high for Cape serotine, low-medium for Roberts's flat-headed bat and high for Egyptian free-tailed bat (Table 2).

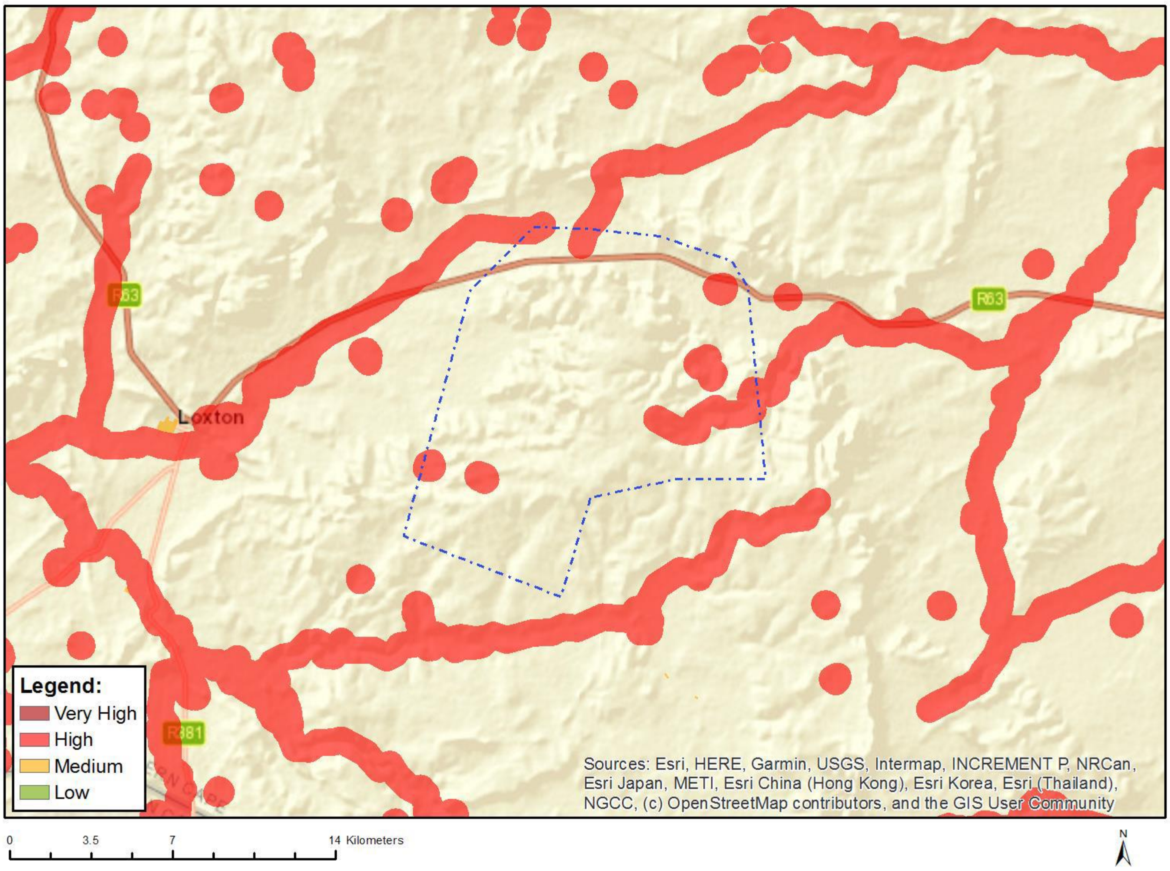

Figure 1: Map of Bats (Wind) Theme Sensitivity

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