UMMBILA EMOYENI RENEWABLE ENERGY FACILITY
MPUMALANGA, SOUTH AFRICA
BAT (CHIROPTERA) SCOPING REPORT

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Produced for

Windlab Developments South Africa (Pty) Ltd

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Produced by

Camissa Sustainability Consulting

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CONTENTS

1 INTRODUCTION 1
- 1.1 Scope and Objective 1
- 1.2 Project Technical Description 1

2 ASSUMPTIONS AND LIMITATIONS 2

3 LEGAL REQUIREMENTS AND GUIDELINES 3

4 ASSESSMENT METHODOLOGY 4

5 SPECIALIST FINDINGS 5
- 5.1 Ecological Baseline 5
- 5.2 Summary of Pre-Construction Bat Monitoring 7

6 IDENTIFICATION OF IMPACTS 11
- 6.1 Wind Energy Facility 11
- 6.2 Solar PV Facility 14
- 6.3 Grid Connection 17

7 MITIGATION AND MONITORING REQUIREMENTS 20

8 CONCLUSION 22
- 8.1 Summary of Findings 22
- 8.2 Plan of Study for EIA 22

9 REFERENCES 23

List of Appendices

Appendix 1: Figures
Appendix 2: Specialist CV
Appendix 3: Specialist Declaration of Interest

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, Section 7
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 7
h) a map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	Appendix 1 (Figure 5, Figure 6, Figure 7)
i) a description of any assumptions made and any uncertainties or gaps in knowledge;	Section 2
j) a description of the findings and potential implications of such findings on the impact of the proposed activity, (including identified alternatives on the environment) or activities;	Section 5.2, Section 8.1

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 7
l) any conditions for inclusion in the environmental authorisation;	Section 7
m) any monitoring requirements for inclusion in the EMPr or environmental authorisation;	Section 7
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 8
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.	NA

1 INTRODUCTION

Emoyeni Renewable Energy Farm (Pty) Ltd is proposing the development of renewable energy facilities, collectively known as the Ummbila Emoyeni Renewable Energy Facility ("the project"), consisting of a commercial wind farm, a solar PV facility, and associated grid infrastructure, including a battery energy storage system, located approximately 6 km southeast of Bethal in the Mpumalanga Province of South Africa.

1.1 Scope and Objective

This report presents a Bat (Chiroptera) Specialist Assessment for the Ummbila Emoyeni Renewable Energy Facility. Collisions with wind turbine blades are one of the leading causes of bat mortality globally (Cryan, 2011; O'Shea et al., 2016). In contrast, there is notably less knowledge on the impacts of solar energy and powerline infrastructure on bats. 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 (MacEwan et al. 2020b, SANBI 2020, Bennun et al. 2021). This assessment forms part of the Scoping phase for Environmental Authorisation of the project. The specialist assessment presented here is therefore preliminary and will be updated with additional data being collected as part of the baseline 12-month monitoring program to assess risk to bats.

The objectives of this assessment are to present the baseline ecological condition of the project 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; and
- Identify potential mitigation or enhancement measures to minimise impacts to bats.

1.2 Project Technical Description

A preferred project focus area with an extent of 27,000 hectares has been identified by Emoyeni Renewable Energy Farm (Pty) Ltd as a technically suitable area for the development of the Ummbilla Emoyeni Renewable Energy Farm with a contracted capacity of up to 666 MW of wind energy and 150 MW of solar energy. The layout, and project capacity, will reduce as the scoping and EIA process identifies environmental constraints that exclude areas for development. The project Area of Interest (AoI) comprises the following farm portions:

Parent Farm Number	Farm Portions
Farm 261 - Naudesfontein	15, 21
Farm 264 - Geluksplaats	0, 1, 3, 4, 5, 6, 8, 9, 11, 12
Farm 268 - Brak Fontein Settlement	6,7,10,11,12
Farm 420 - Rietfontein	8,9,10,11,12,15,16,18,19,22,32
Farm 421 - Sukkelaar	2, 2, 7, 9, 9 10, 10 11, 11 12, 12 22 ,25, 34, 35, 36, 37, 37, 38, 39, 40, 42, 42
Farm 422 - Klipfontein	0, 2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 13, 14, 16, 17, 18, 19, 20, 21, 22, 23
Farm 423 - Bekkerust	0, 1, 2, 4, 5, 6, 10, 11, 12, 13 14, 15, 17, 19, 20, 22, 23, 2425
Farm 452 - Brakfontein	5
Farm 454 - Oshoek	4, 13, 18
Farm 455 - Ebenhaezer	0, 1, 2, 3
Farm 456 - Vaalbank	1, 2, 3, 4, 7, 8, 13, 15, 16, 17, 18, 19

Parent Farm Number	Farm Portions
Farm 457 – Roodekrans	0, 1, 4, 7, 22, 23, 23
Farm 458 – Goedgedacht	0, 2, 4, 4, 5, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 21, 21, 22, 25, 26, 27, 28, 29, 31, 32, 33, 34, 35, 37, 39
Farm 467 – Twee Fontein	0, 1, 4, 5, 6, 7, 8, 10
Farm 469 – Klipkraal	5, 6, 7, 8
Farm 548 – Durabel	0

The wind farm is proposed to accommodate the following infrastructure:

- Up to 111 wind turbines with a maximum hub height of up to 200 m. The tip height of the turbines will be up to 300 m.
- 33 kV / 132 kV onsite collector substations
- Battery Energy Storage System (BESS)
- Cabling between turbines, to be laid underground where practical
- Laydown and O&M hub (approximately 300 m x 300 m):
    - Batching plant of 4 ha to 7 ha
    - Construction compound (temporary) of 6 Ha approximately
    - Operation and Maintenance office of 1.5 Ha approximately ,
- Laydown and crane hardstand areas (approximately 75 m x 120 m)
- Access roads of 12-13 m wide, with 12 m at turning circles.

The solar PV facility is proposed to accommodate the following infrastructure:

- PV modules and mounting structures with a capacity per panel of 350 W to 450 W and dependent on optimization and cost.
- Inverters and transformers
- 33 kV/132 kV onsite collector substation
- Battery Energy Storage System (BESS)
- Cabling between project components
- Laydown and O&M hub (approximately 300 m x 300 m):
    - Construction compound (temporary)
    - Maintenance office
- Access roads (up to 12 m wide)

The project will include associated grid infrastructure that is required to connect the Ummbila Emoyeni Renewable Energy Facility to the national grid. The grid connection solution entails establishing a 400/132 kV MTS, between Camden and SOL Substations, which will be looped in and out of the existing Camden-Sol 400 kV line[1]. The location of the MTS will be refined through an ongoing process of communication with Eskom Planning but will be within close proximity to the 400 kV line in order to cut into this line.

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. (2007) and fundamentally, include that acoustic monitoring cannot provide an indication of bat

[1]The LILO corridor will intersect with either the Camden-Zeus 1 400 kV, Camden-Zeus 2 400 kV or Camden-Tutuka 400 kV power line.

abundance or population size at a site. In addition, population demographics such as age and sex of bats cannot generally be determined from echolocation data. 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. Developing such libraries is challenging given the variation individual species display in their echolocation call structure and because of overlap in echolocation call structure and parameters between species. This study used the Wildlife Acoustics library “Bats of South Africa Version 5.4.0”, but this excludes reference calls for most South African species thus these may have been overlooked. 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 such as that which might occur during the lifespan of the facility once operational 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 tree clumps) even if bats were not located given their potential role in supporting roosting bats.

Risk to bats was determined based on median bat activity per night derived from the bat activity dataset collected with acoustic monitoring. Median values were compared to those in Table 5 in MacEwan et al. (2020b) which provides height-specific fatality risk categories (high, medium, low) based on bat activity sampled in different South African terrestrial ecoregions. The PAOI is situated in the Highveld Grasslands ecoregion (Dinerstein et al. 2019) however reference values are not available for this ecoregion in MacEwan et al. (2020b). Instead, median values were compared to reference values for the Drakensberg Grasslands, Woodlands and Forest ecoregion. While bat activity levels differ between these two ecoregions this difference is small (MacEwan et al. 2020a). The lack of a direct reference for the Highveld Grasslands ecoregion is therefore not a major limitation and the comparison is suitable to provide an evaluation of risk.

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. These include:

- 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)
- Mpumalanga Nature Conservation Act (Act No. 10 of 1998)
- The Equator Principles (2013)
- The Red List of Mammals of South Africa, Swaziland and Lesotho (2016)
- National Biodiversity Strategy and Action Plan (2005)
- South African Good Practise Guidelines for Surveying Bats in Wind Energy Facility Developments – Pre-Construction (2020)
- South African Good Practise Guidelines for Operational Monitoring for Bats at Wind Energy Facilities (2020)

4 ASSESSMENT METHODOLOGY

The Project Area of Influence (PAOI) was defined as the AoI 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 field surveys in the AoI. Bat activity was sampled at eight locations (Figure 1, Table 1) within the AoI with Wildlife Acoustics, Inc. SM4 bat detectors. At six locations (UE1 – UE6), SMM-U2 microphones were positioned at the top of a 10 m aluminium mast. At the remaining two locations (UE7 and UE8), microphones were positioned on meteorological towers at 60 m and 120 m respectively.

Sampling took place nightly from sunset to sunrise, commencing 18 May 2021 and will continue for 12 months. This report is based on data collected between 18 May 2021 and 31 January 2022 (259 nights). The monitoring period therefore spans late autumn, winter, spring, and two-thirds of summer and as such provides a representative sample of annual bat activity patterns and how this changes seasonally. Therefore, this assessment is based on an appropriate dataset with which to understand bat activity and assess risk.

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

Bat Detector	Coordinates	# Sample Nights	Vegetation Type	Altitude (m)	Nearest Habitat Features
UE1	-26.661737°S 29.654723°E	257	Soweto Highveld Grassland	1,629	10 m west of small stream, 110 m west from woodland patch, grassland vegetation
UE2	-26.691674°S 29.639374°E	208	Soweto Highveld Grassland	1,653	220 m southwest of small stream, 300 m west from woodland patch, grassland vegetation, CBA (Irreplaceable)
UE3	-26.562662°S 29.608323°E	208	Soweto Highveld Grassland	1,691	380 m south of seep wetland, 750 m from farm dam, within grassland but adjacent to cultivated areas
UE4	-26.598876°S 29.612947°E	176	Soweto Highveld Grassland	1,685	within woodland patch, 140 m north of farm dam, 160 m from seep wetland, 400 m north of farm buildings
UE5	-26.507918°S 29.548908°E	166	Soweto Highveld Grassland	1,668	95 m northeast of farm dam, 140 m west of farm dam, grassland vegetation, 260 m east of farmstead, 340 m north of cultivated areas, 300 m west of farm buildings
UE6	-26.501742°S 29.613135°E	155	Soweto Highveld Grassland	1,694	180 m southeast of seep wetland, 670 m south of farm dam, 300 m southeast of cultivate fields, 885 m southwest of farm buildings, grassland vegetation
UE7 (60 m +120 m)	-26.614954°S 29.606512°E	60 m = 207 120 m = 129	Soweto Highveld Grassland	1,697 (+ 60 m and 120 m)	240 m north of cultivated areas, 245 m west of livestock kraal with trees, 330 m northwest of channeled valley-bottom wetland, grassland vegetation
UE8 (60 m +120 m)	-26.739593°S 29.659108°E	60 m = 196 120 m = 115	Soweto Highveld Grassland	1,665 (+ 60 m and 120 m)	160 m north of seep wetland, 380 m west of cultivated areas, grassland vegetation

To locate features on site where bats maybe/are roosting, surveys were undertaken which first entailed discussions with landowners to locate any known roosts, or potential roosts with evidence of bats. In addition, buildings at two of the farmsteads within the AoI (Figure 1) were systematically surveyed on 3 August 2021 and 16 September 2021 respectively. 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 potential for each building to support bats. Additional systematic surveys will take place at other farmsteads within the AoI during the remainder of the 12-month monitoring program.

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, whereby each file was considered one bat pass of the microphone.

5 SPECIALIST FINDINGS

5.1 Ecological Baseline

The Project Area of Influence (PAOI) is situated in the Grassland Biome, and comprises predominantly Soweto Highveld Grassland vegetation (Figure 1) supporting short to medium-high, dense, tufted grassland (Mucina and Rutherford 2006). Eastern Highveld Grassland and Amersfoort Highveld Clay Grassland occur in the north and southeast of PAOI respectively. Both Soweto Highveld Grassland and Eastern Highveld Grassland are classified as Vulnerable while Amersfoort Highveld Clay Grassland is classified as Least Concern (SANBI 2018). The vegetation has limited structural heterogeneity since grasses dominate the landscape, but isolated trees and clumps of trees are also scattered across the PAOI. The landscape consists of slightly to moderately undulating plains with some low hills and wetland depressions and has largely been transformed by cultivation (the primary land use in the PAOI), urban sprawl, mining, and road infrastructure. The PAOI is in a summer rainfall region and has a cool-temperate climate with dry winters, frequent occurrence of frost and large differences in both diurnal and seasonal temperature extremes (Mucina and Rutherford 2006).

Critical Biodiversity Areas (CBA), areas of high biodiversity value that must be maintained in a natural state, are located throughout the PAOI (Figure 1), classified as either “CBA Irreplaceable” and “CBA Optimal”. The former category comprises 1) areas required to meet conservation targets and those with irreplaceability values greater than 80 %, 2) areas which represent critical linkages or pinch-points in the landscape that must remain natural, and 3) Critically Endangered ecosystems (MTPA 2014). The latter category comprises areas that are not ‘irreplaceable’, but they are the most optimal land configuration to meet all biodiversity targets. Ecological Support Areas (ESA), not essential for meeting biodiversity targets but important in supporting the functioning of CBAs and delivering important ecosystem services, are also located throughout the PAOI (Figure 1). While there are no protected areas inside the PAOI, 44 protected areas are located within 100 km.

Based on current taxonomic information and bat occurrence data, 24 species could occur within the AoI (Table 2). The majority have a low likelihood of occurrence and acoustic monitoring has confirmed the presence in the AoI of six species. This includes four species classified as high risk from wind energy development: Natal Long-fingered bat, Cape Serotine, Little Free-tailed bat, and Egyptian Free-tailed bat.

Table 2: Bat Species Potentially Occurring within the Ummbila Emoyeni PAOI

Common Name *Species Name*	Key Habitat Requirements*	Prob. of Occurrence	Conservation Status		WEF Risk[δ]
			IUCN[†]	RSA[!]	
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 (1,828 passes)**	LC/U	LC	High
Cape Serotine *Laephotis capensis*	Arid semi-desert, montane grassland, forests, savanna and shrubland. Roosts in vegetation and human-made structures. Clutter-edge forager.	**Confirmed (65,374 passes)**	LC/S	LC	High
Mauritian tomb bat *Taphozous mauritianus*	Savanna woodland preferring open habitat. Roosts on rock faces, the outer bark of trees or on the outer walls of buildings under the eaves of roofs. Forages in urban areas and over cultivation. Open-air forager.	High	LC/U	LC	High
Little Free-tailed bat *Chaerephon pumilus*	Semi-arid savannah, forested regions, woodland habitats. Roosts in narrow cracks in rock and trees but also in buildings. Open-air forager. Forages in urban areas and over cultivation.	**Confirmed (1,188 passes)**	LC/U	LC	High
Midas Free-tailed bat *Mops midas*	Hot low-lying savanna and woodland. Roosts in narrow cracks in rock and trees but also in buildings. Open-air forager.	Low	LC/D	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 (18,184 passes)**	LC/U	LC	High
Wahlberg's Epauletted fruit bat *Epomophorus wahlbergi*	Roost in dense foliage of large, leafy trees. Associated with forest and forest-edge habitats but will forage in urban environments.	Low	LC/S	LC	High
African Straw-coloured fruit bat *Eidolon helvum*	Non-breeding migrant in the PAOI.	Low	NT/D	LC	High
Egyptian Rousette *Rousettus aegyptiacus*	Distribution influenced by availability of suitable caves roosts.	Low	LC/S	LC	High
Temminck's Myotis *Myotis tricolor*	Montane forests, rainforests, coastal forests, savannah woodlands, arid thicket, and fynbos. Roosts communally in caves (and mines) and closely associated with mountainous terrain. Migratory. Clutter-edge forager.	Low	LC/U	LC	Medium-High
Welwitsch's Myotis *Myotis welwitschii*	Mainly open woodland and savannah but also high-altitude grassland, tropical dry forest, montane tropical moist forest, savannah and shrublands. Clutter-edge forager.	Low	LC/U	LC	Medium-High
Yellow-bellied house bat *Scotophilus dinganii*	Occurs throughout the Savannah Biome but avoids open habitats such as grasslands and Karoo scrub. Roosts in hollow trees and buildings. Clutter-edge forager.	**Confirmed (321 passes)**	LC/U	LC	Medium-High
Green House bat *Scotophilus viridis*	Savannah woodland species: restricted to low-lying, hot savannahs and avoids open habitats such as grasslands. Roosts in hollow trees and buildings. Clutter-edge forager.	Low	LC/U	LC	Medium-High
Dusky Pipistrelle *Pipistrellus hesperidus*	Woody habitats, such as riparian vegetation and forest patches. Recorded roosting in narrow cracks in rocks and under the loose bark of dead trees. Clutter-edge forager.	Low	LC/U	LC	Medium-High
Rusty Pipistrelle *Pipistrellus rusticus*	Savannah woodland and associated with open water bodies. Roosts in trees and old buildings. Clutter-edge forager.	Low	LC/U	LC	Medium-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 (357 passes)**	LC/U	LC	Medium
Egyptian Slit-faced bat *Nycteris thebaica*	Savannah, desert, arid rocky areas, and riparian strips. Gregarious and roosts in	Medium	LC/U	LC	Low

Common Name *Species Name*	Key Habitat Requirements*	Prob. of Occurrence	Conservation Status IUCN[†]	RSA[!]	WEF Risk[δ]
	caves but also in mine adits, Aardvark holes, rock crevices, road culverts, roofs, and hollow trees. Clutter forager.				
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.	Medium	LC/U	LC	Low
Bushveld Horseshoe bat *Rhinolophus simulator*	Occurs in caves within areas of moist savannah, adjacent to rivers and savannah woodland, montane habitats, and coastal mosaics. Commonly associated with riparian forest and along wooded drainage lines. Roosts in caves and mines. Clutter forager.	Medium	LC/D	LC	Low
Blasius's Horseshoe bat *Rhinolophus blasii*	Savannah woodlands and are dependent on the availability of daylight roosting sites such as caves, mines, or boulder piles. Clutter forager.	Low	LC/D	NT	Low
Darling's Horseshoe bat *Rhinolophus darlingi*	Mesic woodland savannahs. Roosts in caves, boulder piles, mines, culverts, large hollow trees and disused buildings. Clutter forager.	Low	LC/U	LC	Low
Sundevall's Leaf-nosed bat *Hipposideros caffer*	Savannah, bushveld and/or coastal forests, near to rivers and other water sources. Roosts in caves, sinkholes, rock fissures, hollow trees, mines, and culverts. Clutter forager.	Low	LC/D	LC	Low
Percival's Short-eared Trident bat *Cloeotis percivali*	Savannah and woodland areas. Roosts in caves and mine tunnels. Clutter forager.	Low	LC/U	EN	Low
Botswana Long-eared bat *Laephotis botswanae*	Dry and moist savannah, grassland, and heathland habitats. Often found in the vicinity of rivers or in association with rocky outcrops. No information on roosting sites.	Low	LC/U	LC	Low

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

Bat roosting sites in the PAOI are relatively limited and unlikely to support large congregations of bats, with no underground sites (e.g., caves, mines, sinkholes) present. The closest known major bat roost is approximately 75 km north of the PAOI. Although occasional ridges and rocky outcrops are features of the landscape (Mucina and Rutherford 2006), none are present in the PAOI. Bats are 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). The building inspections on site did not reveal any roosting bats but evidence (e.g., fur-oil-stained exit/entry points) suggests that bats are using these features. Trees growing at these farmsteads and elsewhere on site where they form clumps, could also provide roosting spaces for bats.

Sensitive features in the PAOI at which bat foraging activity may be concentrated include farm buildings (and within built up areas for some species) where they would forage for insects attracted to lighting (Rydell 1992, Jung and Kalko 2010), dams and wetland areas (Sirami et al. 2013), within and along the edge of woodland/tree patches, and over cultivated areas (Bohmann et al. 2011, Noer et al. 2012).

5.2 Summary of Pre-Construction Bat Monitoring

A total of 87,252[2] bat passes were recorded across 259 sample nights, 75 % of which were attributed to Cape serotine. Twenty percent of total activity was attributed to Egyptian free-tailed bat. The remaining four species accounted for 5 % of all activity.

[2] This excludes an additional 15,098 bat passes that were unable to be assigned to any particular species by the Wildlife Acoustics library “Bats of South Africa Version 5.4.0”, and were thus classified as No ID. These calls were excluded from all analyses but are reported on here to highlight that they may include call fragments from species not confirmed for the site, and hence, the species list for the AoI may not be complete.

Approximately 70 % of all activity was recorded at UE4 and 80 % of this activity was attributed to Cape serotine. Across all species and time periods, median bat passes per night at UE4 was 0.1 (Figure 1). This varied by species; median bat passes per night for Cape serotine at UE4 was 20.7, while for Egyptian free-tailed bat this was 0.6 (Figure 2). Cape serotine activity was also elevated at UE5 relative to the other monitoring locations, where a median of 1.7 passes per hour per night was recorded (Figure 2).

Most bat activity (98 %) was recorded by microphones at ground level (10 m) compared to at higher altitudes (60 m or 120 m). Approximately 80 % of activity at 60 m and 120 m was attributed to Egyptian free-tailed bat, with Cape serotine and Little free-tailed bat accounting for ca. 8 % each. All three species were recorded across both heights. Long-tailed serotine and Yellow-bellied house bat were not recorded at 120 m, while Natal long-fingered bat was recorded at 120 m (and 10 m) but not 60 m.

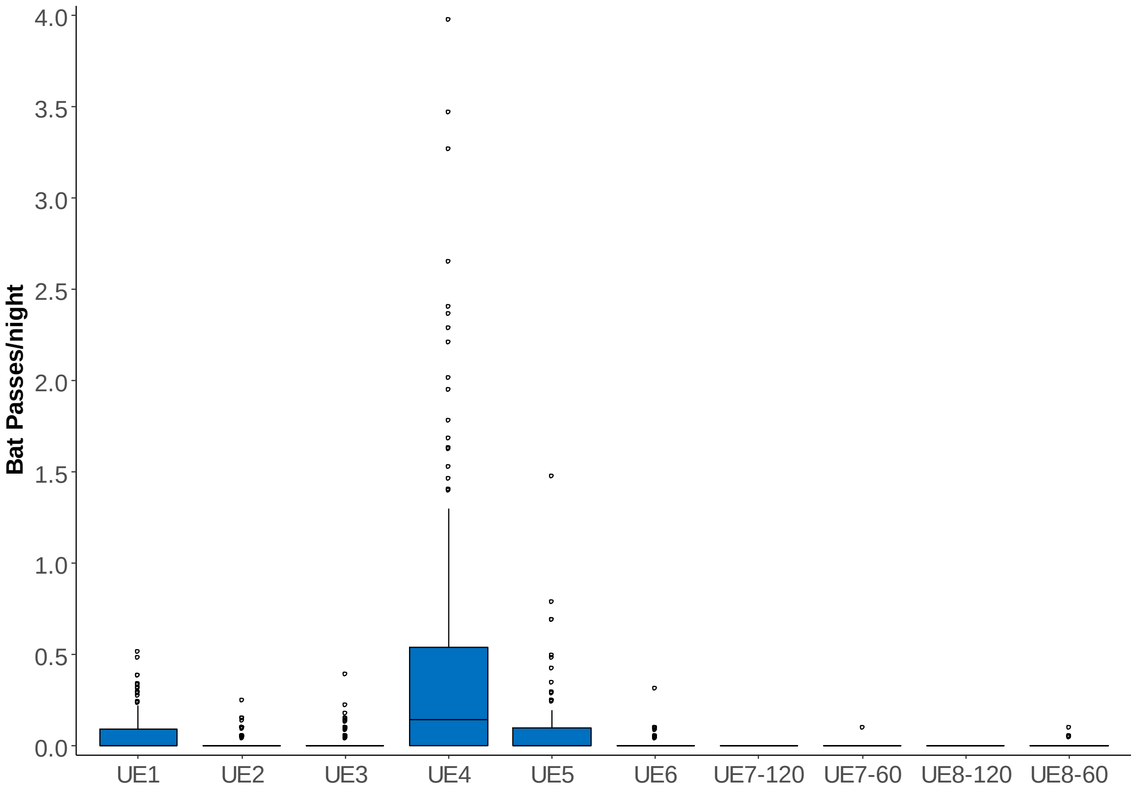

Figure 1: Boxplot showing the number of bat passes per night at each monitoring location.

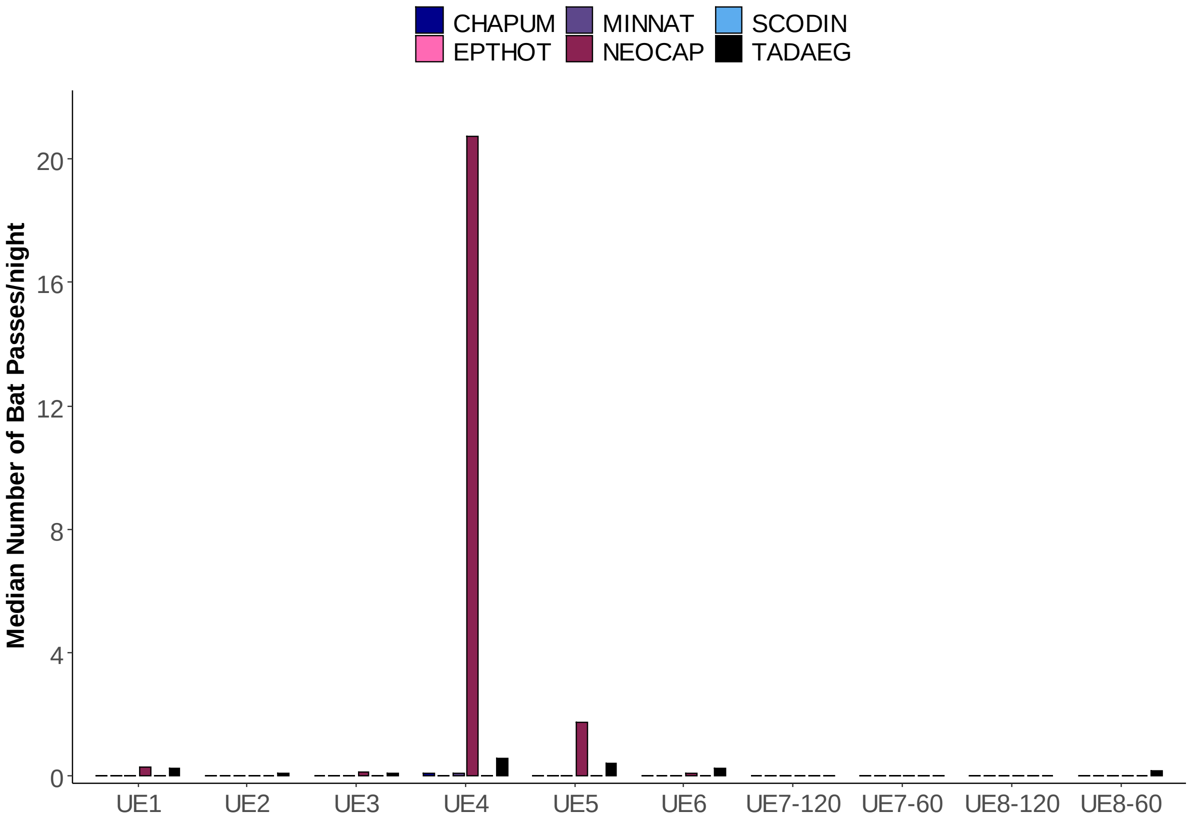

Figure 2: Bar chart showing the medium number of bat passes per night at each monitoring location per species.

A clear spatial pattern in bat activity is evident with notably higher activity recorded at UE4, which is within a stand of Eucalyptus trees, near several large dams, and a series of buildings. The increased activity at this part of the site suggests that bats (especially Cape serotine which had high activity levels here) could be roosting in the trees or buildings near this bat detector, as well as using this part of the site for foraging presumably because the trees, water and possibly lights associated with the buildings would attract insect prey. Similarly, UE5 was also situated near these landscape features (Table 2) and showed elevated activity of Cape serotine and Egyptian free-tailed bats. Bat detectors in areas away from such features and located in more open areas (e.g., UE3 and UE6) had lower activity levels. Spatial risk in the AoI therefore varies with location (including across altitudes) and species (Table 3).

Table 3: Spatial risk profile of the AoI based on median bat passes/night (Risk = High, Medium, Low)

Bat Detector	Cape serotine	Egyptian free-tailed bat	All other bat species
UE1	0.3	0.2	< 0.1
UE2	0.0	0.1	< 0.1
UE3	0.1	0.1	< 0.1
UE4	20.7	0.6	< 0.1
UE5	1.7	0.4	< 0.1
UE6	0.1	0.2	< 0.1
UE7-120	0.0	0.0	< 0.1
UE7-60	0.0	0.0	< 0.1
UE8-120	0.0	0.0	< 0.1
UE8-60	0.0	0.2	< 0.1

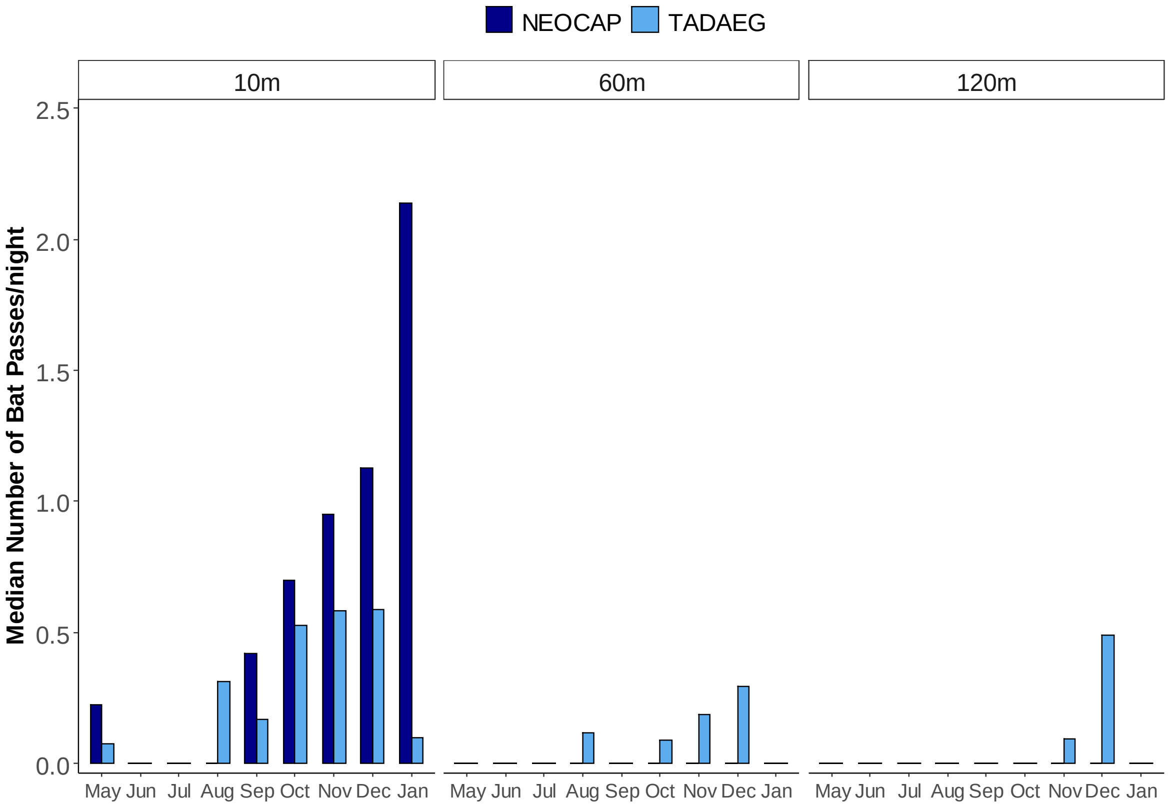

Figure 3: Bar chart showing bat passes/night by month for Cape serotine and Egyptian free-tailed bat

Bat activity varied seasonally with lowest activity in winter and activity increasing through spring and summer. Egyptian free-tailed bat activity at 10 m peaked in December (summer) with a median of 0.6 bat passes per night while Cape serotine activity peaked in January (summer) with a median of 2.1 bat passes per night (Figure 3). At 60 m and 120 m, median activity of Cape serotine was 0 for all months while for Egyptian free-tailed bats, activity was highest in December with 0.5 bat passes per night at 120 m. This species was not recorded at height in all months, and activity was highest in December across all heights. Based on the median number of bat passes at height, Egyptian free-tailed bats are expected to be at high risk in December, medium risk between August and November and low risk during winter. Cape serotine, and all other bat species, are expected to be at low collision risk at height across all months. Additional baseline data currently being collected will inform the magnitude of risk to bats during late summer and early autumn, which will be included in the Final ESIA.

On a nightly level, bat activity is concentrated during the first few hours of the night. For most hourly time periods across seasons at 10 m, the median number of bat passes per hour was 0 and as such risk is expected to be low (Figure 4). High risk periods are currently restricted to summer between 19:00 and 20:00 during which a median of 2 bat passes per night was recorded (Figure 4). Medium risk periods include summer between 20:00 and 23:00, and during spring between 19:00 and 20:00 when median activity was 1 bat pass per night. At 60 m and 120 m, the median number of bat passes per night was 0 for all hourly time periods and seasons monitored thus far and accordingly risk is expected to be low at higher altitudes.

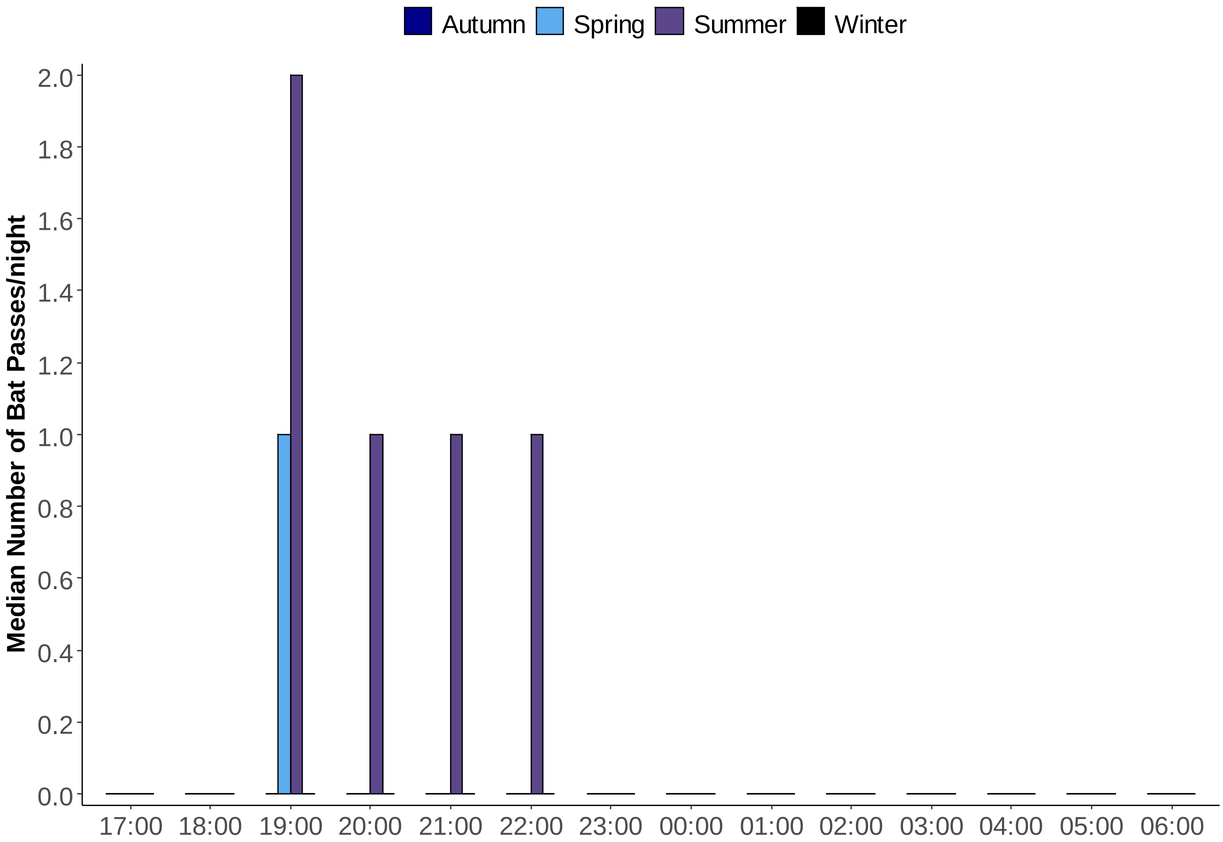

Figure 4: Median number of bat passes per night across nightly time periods. 17:00 represents bat activity between 17:00 and 18:00 etc.

6 IDENTIFICATION OF IMPACTS

Impacts to bats that are likely to occur because of the construction, operation and decommissioning of a wind and solar PV energy facility in the AoI are identified and discussed in the following sections. Each impact will be assessed upon completion of the 12 months of baseline monitoring using the methodology described in Section 8.2.

6.1 Wind Energy Facility

Wind farms impact bats directly because bats collide with spinning wind turbine blades (Horn et al. 2008), and indirectly through the modification of habitats, including disturbance or destruction of roosting, foraging and commuting spaces (Kunz et al. 2007b; Millon et al. 2018).

6.1.1 Construction Phase

Impacts

Vegetation clearing for access roads, turbines and their service areas and other infrastructure, as well as noise and dust generated during the construction phase, will impact bats by removing habitat used for foraging/commuting and through disturbance.

Construction of WEF infrastructure could result in destruction of, and disturbance to, bat roosts potentially resulting in roost abandonment. Bats may also roost in project infrastructure potentially attracting them to risky locations.

Issue	Nature of Impact	Extent of Impact	No-Go Areas

Modification of bat foraging/commuting habitat	Indirect impacts: • Removal of vegetation can reduce foraging opportunities and modify commuting spaces for bats • Noise and dust generated through construction activities can disturb bats	Local	Key Habitat Features have been buffered (Table 5, Figure 5)
Destruction of/Disturbance to bat roosts	Direct impacts: • Destruction of bat roosts (trees, buildings) Indirect impacts: • Disturbance of bat roosts (trees, buildings) resulting in roost abandonment • Installation of new infrastructure in the landscape (e.g., buildings, turbines, road culverts) can inadvertently provide new roosting spaces for some bat species, attracting them to areas with wind turbines and potentially increasing the likelihood of collisions.	Local	Key Habitat Features have been buffered (Table 5, Figure 5)
Description of expected significance of impact • These impacts are expected to be low and negative with mitigation. No major bat roosts are located in the AoI although it is likely that bats are roosting in buildings based on roost surveys on site, as well as in trees. These features have been buffered by 200 m inside which no turbines may be installed which will reduce this impact.			
Gaps in knowledge • Although roost surveys have been undertaken at two farmsteads, locating bats in roosts is challenging especially if the roost contains a few individuals. This study assumes that all buildings are potentially roosts and must be buffered since numerous species (Table 2) use buildings for roosting. • Bats are likely roosting in trees on site however surveying all individual trees in the AoI is impractical due to the large number of trees in the AoI. This study assumes that all trees are potential roosting spaces and must be buffered since numerous species (Table 2) use trees for roosting. **Recommendations with regards to general field surveys** • Undertake roost surveys at additional buildings in the AoI to locate roosting bats or evidence of roosting bats.			

6.1.2 Operational Phase

Issue	Nature of Impact	Extent of Impact	No-Go Areas
Impacts The major impact of wind turbines on bats is direct mortality resulting from collisions with turbine blades.			
Bat mortality	Direct impacts: • Mortality through collisions with wind turbine blades	Local	Key Habitat Features have been buffered (Table 5, Figure 5)
Description of expected significance of impact • With mitigation, the impact of bat mortality is expected to be moderate to low, and negative			
Gaps in knowledge • Best practise monitoring for bats at wind farms requires 12 months of monitoring (MacEwan et al. 2020b). This scoping study is based on nine months of data and excludes data from late summer and most of autumn. Thus, the expected significance of impacts is not based on a full annual cycle of activity and will be updated upon completion of the baseline monitoring in May 2022. **Recommendations with regards to general field surveys** • Current field surveys are fit for purpose and based on best practise thus no additional surveys are planed beyond the completion of the 12 months of baseline data collection.			

6.1.3 Decommissioning Phase

Impacts

Disturbance to bats due to decommissioning activities through noise and dust, and damage to vegetation

Issue	Nature of Impact	Extent of Impact	No-Go Areas
Disturbance to bats	Indirect impacts: • Disturbance to bats due to decommissioning activities through noise and dust, and damage to vegetation	Local	Key Habitat Features have been buffered (Table 5, Figure 5)

Description of expected significance of impact

- Provided decommissioning activities are restricted to daylight hours, the impact to bats are likely to be low and negative. Restoration of all disturbed areas will reduce the impact of habitat modification.

Gaps in knowledge

- None

Recommendations with regards to general field surveys

- None

6.1.4 Cumulative Impacts

Impacts

Cumulative impacts will be assessed during the EIA by considering impacts to bats at other wind energy facilities within a 35 km radius from the PAOI. With reference to the Renewable Energy Application database (Q4, 2021), currently no wind energy projects are located within the cumulative impact region. The closest facilities are located 50 km south and 70 km northeast of the PAOI respectively. An updated application database (Q1, 2022) should be available at the time impacts will be assessed so it is possible wind energy projects will be located within the cumulative impact region even though none currently do.

Issue	Nature of Impact	Extent of Impact	No-Go Areas
Alteration of bat foraging/commuting habitat	Indirect impacts: • Removal of vegetation can reduce foraging opportunities and alter commuting spaces for bats • Noise and dust generated through construction activities can disturb bats	Regional	Key Habitat Features have been buffered (Table 5, Figure 5)
Destruction of/Disturbance to bat roosts	Direct impacts: • Destruction of bat roosts (trees, buildings) Indirect impacts: • Disturbance of bat roosts (trees, buildings) resulting in roost abandonment • Installation of new infrastructure in the landscape (e.g., buildings, turbines, road culverts) can inadvertently provide new roosting spaces for some bat species, attracting them to areas with wind turbines and potentially increasing the likelihood of collisions.	Regional	Key Habitat Features have been buffered (Table 5, Figure 5)
Bat mortality	Direct impacts: • Mortality through collisions with wind turbine blades.	Regional	Key Habitat Features have been buffered (Table 5, Figure 5)
Disturbance to bats	Indirect impacts:	Regional	Key Habitat Features

	• Disturbance to bats due to decommissioning activities through noise and dust, and damage to vegetation		have been buffered (Table 5, Figure 5)
Description of expected significance of impact • Cumulative impacts are expected to be low and negative because there are currently no wind farms within 35 km of the PAOI.			
Gaps in knowledge • There is limited published information on the cumulative impacts of wind farms on bats. **Recommendations with regards to general field surveys** • Current field surveys are fit for purpose and based on best practise thus no additional surveys are planed beyond the completion of the 12 months of baseline data collection.			

6.2 Solar PV Facility

Although birds fatally collide with solar PV panels (Visser et al. 2019, Bennun et al. 2021), there is limited evidence that this occurs with bats. Instead, impacts of solar PV infrastructure to bats are largely indirect and include destruction and modification of habitat, habitat fragmentation, barrier effects, and polarized light pollution (Horváth et al. 2010, Lovich and Ennen 2011, Bennun et al. 2021).

6.2.1 Construction Phase

Impacts

Vegetation clearing for access roads, solar PV panels and their service areas and other infrastructure, as well as noise and dust generated during the construction phase, will impact bats by removing habitat used for foraging/commuting and through disturbance.

Construction of the solar PV infrastructure could result in destruction of, and disturbance to, bat roosts potentially resulting in roost abandonment. Bats may also roost in project infrastructure potentially attracting them to risky locations[3].

Issue	Nature of Impact	Extent of Impact	No-Go Areas
Modification of bat foraging/commuting habitat	Indirect impacts: • Removal of vegetation can reduce foraging opportunities and modify commuting spaces for bats • Noise and dust generated through construction activities can disturb bats	Local	Key Habitat Features have been buffered (Figure 6)
Destruction of/Disturbance to bat roosts	Direct impacts: • Destruction of bat roosts (trees, buildings) Indirect impacts: • Disturbance of bat roosts (trees, buildings) resulting in roost abandonment • Installation of new infrastructure in the landscape (e.g., buildings, road culverts) can inadvertently provide new roosting spaces for some bat species, attracting them to areas with wind turbines and potentially increasing the likelihood of collisions.	Local	Key Habitat Features have been buffered (Figure 6)
Description of expected significance of impact			

[3] Although the solar PV panels do not present a collision risk to bats, should bats search for roosting opportunities associated with this new infrastructure this may bring them into the vicinity of wind turbines since the solar PV and wind energy facilities will be installed within the same AoI.

- These impacts are expected to be low and negative with mitigation. No major bat roosts are located in the AoI although it is likely that bats are roosting in buildings based on roost surveys on site, as well as in trees.

Gaps in knowledge

- There is a lack of knowledge on the impacts of solar PV facilities on bats, both globally and in South Africa.
- Although roost surveys have been undertaken at two farmsteads, locating bats in roosts is challenging especially if the roost contains a few individuals. This study assumes that all buildings are potentially roosts and must be buffered since numerous species (Table 2) use buildings for roosting.
- Bats are likely roosting in trees on site however surveying all individual trees in the AoI is impractical due to the high number of trees in the AoI. This study assumes that all trees are potential roosting spaces and must be buffered since numerous species (Table 2) use trees for roosting.

Recommendations with regards to general field surveys

- Undertake roost surveys at additional buildings in the AoI to locate roosting bats or evidence of roosting bats.

6.2.2 Operational Phase

Impacts

Solar panels and their supporting infrastructure are thought to have a barrier effect on normal bat foraging behaviour, which can exclude bats from accessing areas of suitable habitat.

Solar PV infrastructure causes polarized light pollution, potentially altering bat-insect interactions. Polarized light attracts polarotactic insects which may in turn attract bats, bringing them into the vicinity of the project and indirectly increase the risk of collision with wind turbines[4].

Issue	Nature of Impact	Extent of Impact	No-Go Areas
Barrier Effects	<u>Indirect impacts:</u> • Exclusion of bats from foraging and commuting habitat.	Local	Key Habitat Features have been buffered (Figure 6)
Polarized Light Pollution	<u>Indirect impacts:</u> • The reflection of horizontally polarized light by solar panels can attract insects and in turn foraging bats, bringing them into the vicinity of wind turbines increasing the probability of collisions.	Local	Key Habitat Features have been buffered (Figure 6)

Description of expected significance of impact

- The impact of barrier effects is expected to be low, and negative. Bats are volant mammals, thus these effects should not be major as bats should still be able to maintain sufficient foraging areas between and above solar panels. Little research has been done on this regard for bats, but it is assumed that bats will be able to adjust their commuting routes if needed.
- The impact of polarized light pollution is expected to be low with mitigation. Buffers of 200 m have been placed around water bodies (Figure 6). Bennun et al. (2021) recommend placing non-polarising white tape around and/or across panels to minimise reflection which can attract aquatic insects.

Gaps in knowledge

- There is a lack of knowledge on the impacts of solar PV facilities on bats, both globally and in South Africa, including the impact of polarized light pollution.

Recommendations with regards to general field surveys

- Current field surveys are fit for purpose and based on best practise thus no additional surveys are planed beyond the completion of the 12 months of baseline data collection.

[4] Although the solar PV panels do not present a collision risk to bats, should insects be attracted to the panels this may bring bats into the vicinity of wind turbines since the solar PV and wind energy facilities will be installed within the same AoI.

6.2.3 Decommissioning Phase

Impacts

Disturbance to bats due to decommissioning activities through noise and dust, and damage to vegetation

Issue	Nature of Impact	Extent of Impact	No-Go Areas
Disturbance to bats	Indirect impacts: • Disturbance to bats due to decommissioning activities through noise and dust, and damage to vegetation	Local	Key Habitat Features have been buffered (Figure 6)

Description of expected significance of impact
- Provided decommissioning activities are restricted to daylight hours, the impact to bats are likely to be low and negative. Restoration of all disturbed areas will reduce the impact of habitat modification.

Gaps in knowledge
- None

Recommendations with regards to general field surveys
- None

6.2.4 Cumulative Impacts

Impacts

Cumulative impacts will be assessed during the EIA by considering impacts to bats at other solar PV facilities within a 35 km radius from the PAOI. With reference to the Renewable Energy Application database (Q4, 2021), currently three approved solar PV projects located within the cumulative impact region. An updated application database (Q1, 2022) should be available at the time impacts will be assessed so it is possible additional solar PV facilities will be located within the cumulative impact region.

Issue	Nature of Impact	Extent of Impact	No-Go Areas
Modification of bat foraging/commuting habitat	Indirect impacts: • Removal of vegetation can reduce foraging opportunities and modify commuting spaces for bats • Noise and dust generated through construction activities can disturb bats	Regional	Key Habitat Features have been buffered (Figure 6)
Destruction of/Disturbance to bat roosts	Direct impacts: • Destruction of bat roosts (trees, buildings) Indirect impacts: • Disturbance of bat roosts (trees, buildings) resulting in roost abandonment • Installation of new infrastructure in the landscape (e.g., buildings, road culverts) can inadvertently provide new roosting spaces for some bat species, attracting them to areas with wind turbines and potentially increasing the likelihood of collisions.	Regional	Key Habitat Features have been buffered (Figure 6)
Barrier Effects	Indirect impacts: • Exclusion of bats from foraging and commuting habitat.	Regional	Key Habitat Features have been buffered (Figure 6)
Polarized Light Pollution	Direct impacts: • Mortality of insects and reduction in prey base for bats Indirect impacts:	Regional	Key Habitat Features have been buffered (Figure 6)

	• Horizontally polarized light by solar panels can attract insects and in turn foraging bats, bringing them into the vicinity of wind turbines increasing the probability of collisions.		
Disturbance to bats	Indirect impacts: Disturbance to bats due to decommissioning activities through noise and dust, and damage to vegetation	Regional	Key Habitat Features have been buffered (Figure 6)
Description of expected significance of impact • Cumulative impacts are expected to be low and negative because there are currently only three solar PV facilities within 35 km of the PAOI.			
Gaps in knowledge • There is limited published information on the cumulative impacts of solar PV facilities on bats. **Recommendations with regards to general field surveys** • Current field surveys are fit for purpose and based on best practise thus no additional surveys are planed beyond the completion of the 12 months of baseline data collection.			

6.3 Grid Connection

The direct impact of grid connection infrastructure is collisions with powerlines. Insectivorous bats are unlikely to collide with powerlines since they can avoid these obstacles using echolocation but fruit bats do collide with powerlines (Tella et al. 2020), although the likelihood of occurrence for fruit bats species in the AoI is low (Table 2). Indirect impacts include loss of habitat to construct substations and OHL pylons, and ecological light pollution (Longcore and Rich 2004).

6.3.1 Construction Phase

Impacts Vegetation clearing for grid connection infrastructure (access roads, substation buildings, pylons), as well as noise and dust generated during the construction phase, will impact bats by removing habitat used for foraging/commuting and through disturbance. Construction of grid connection infrastructure (access roads, substation buildings, pylons) could result in destruction of, and disturbance to, bat roosts potentially resulting in roost abandonment. Bats may also roost in project infrastructure potentially attracting them to risky locations.			
Issue	**Nature of Impact**	**Extent of Impact**	**No-Go Areas**
Modification of bat foraging/commuting habitat	Indirect impacts: • Removal of vegetation can reduce foraging opportunities and modify commuting spaces for bats • Noise and dust generated through construction activities can disturb bats	Local	Key Habitat Features have been buffered (Figure 7)
Destruction of/Disturbance to bat roosts	Direct impacts: • Destruction of bat roosts (trees, buildings) Indirect impacts: • Disturbance of bat roosts (trees, buildings) resulting in roost abandonment • Installation of new infrastructure in the landscape (e.g., buildings, road culverts) can inadvertently provide new roosting spaces for some bat species, attracting them to areas with wind turbines and	Local	Key Habitat Features have been buffered (Figure 7)

<table>
<tr><td></td><td>potentially increasing the likelihood of collisions.</td><td></td><td></td></tr>
<tr><td colspan="4">Description of expected significance of impact
• These impacts are expected to be low and negative with mitigation. No major bat roosts are located in the AoI although it is likely that bats are roosting in buildings based on roost surveys on site, as well as in trees. These features have been buffered by 200 m inside which OHL pylons may be constructed which will reduce this impact (Figure 7).</td></tr>
<tr><td colspan="4">Gaps in knowledge
• Although roost surveys have been undertaken at two farmsteads, locating bats in roosts is challenging especially if the roost contains a few individuals. This study assumes that all buildings are potentially roosts and must be buffered since numerous species (Table 2) use buildings for roosting.
• Bats are likely roosting in trees on site however surveying all individual trees in the AoI is impractical due to the high number of trees in the AoI. This study assumes that all trees are potential roosting spaces and must be buffered since numerous species (Table 2) use trees for roosting.
Recommendations with regards to general field surveys
• Undertake roost surveys at additional buildings in the AoI to locate roosting bats or evidence of roosting bats.</td></tr>
</table>

6.3.2 Operational Phase

<table>
<tr><td colspan="4">Impacts

Construction of grid infrastructure will increase ecological light pollution, potentially altering bat-insect interactions. 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.</td></tr>
<tr><th>Issue</th><th>Nature of Impact</th><th>Extent of Impact</th><th>No-Go Areas</th></tr>
<tr><td>Ecological Light Pollution</td><td><u>Direct impacts:</u>
• Mortality of insects and reduction in prey base for bats
<u>Indirect impacts:</u>
• Project lighting can attract insects and in turn foraging bats, bringing them into the vicinity of wind turbines increasing the probability of collisions. Light-phobic species may be excluded from previous habitat.</td><td>Local</td><td>Key Habitat Features have been buffered (Figure 7)</td></tr>
<tr><td colspan="4">Description of expected significance of impact
• With mitigation, the impact of light pollution is expected to be low and negative.</td></tr>
<tr><td colspan="4">Gaps in knowledge
• There is limited published research on the degree to which bat-insect interactions are impacted due to light pollution in the context of renewable energy projects, as well as the degree to which this influences collision risk.
Recommendations with regards to general field surveys
• Current field surveys are fit for purpose and based on best practise thus no additional surveys are planed beyond the completion of the 12 months of baseline data collection.</td></tr>
</table>

6.3.3 Decommissioning Phase

<table>
<tr><td colspan="4">Impacts

Disturbance to bats due to decommissioning activities through noise and dust, and damage to vegetation</td></tr>
<tr><th>Issue</th><th>Nature of Impact</th><th>Extent of Impact</th><th>No-Go Areas</th></tr>
<tr><td>Disturbance to bats</td><td><u>Indirect impacts:</u>
• Disturbance to bats due to decommissioning activities through noise and dust, and damage to vegetation</td><td>Local</td><td>Key Habitat Features have been buffered (Figure 7)</td></tr>
</table>

Description of expected significance of impact • Provided decommissioning activities are restricted to daylight hours, the impact to bats are likely to be low and negative. Restoration of all disturbed areas will reduce the impact of habitat modification.
Gaps in knowledge • None **Recommendations with regards to general field surveys** • None

6.3.4 Cumulative Impacts

Impacts

Cumulative impacts will be assessed during the EIA by considering impacts to bats due to grid connection infrastructure at other wind and solar PV facilities within a 35 km radius from the PAOI. With reference to the Renewable Energy Application database (Q4, 2021), currently there are no wind energy projects, but three solar PV projects, located within the cumulative impact region. An updated application database (Q1, 2022) should be available at the time impacts will be assessed this will be confirmed during the EIA phase.

Issue	Nature of Impact	Extent of Impact	No-Go Areas
Modification of bat foraging/commuting habitat	Indirect impacts: • Removal of vegetation can reduce foraging opportunities and modify commuting spaces for bats • Noise and dust generated through construction activities can disturb bats	Regional	Key Habitat Features have been buffered (Figure 7)
Destruction of/Disturbance to bat roosts	Direct impacts: • Destruction of bat roosts (trees, buildings) Indirect impacts: • Disturbance of bat roosts (trees, buildings) resulting in roost abandonment • Installation of new infrastructure in the landscape (e.g., buildings, road culverts) can inadvertently provide new roosting spaces for some bat species, attracting them to areas with wind turbines and potentially increasing the likelihood of collisions.	Regional	Key Habitat Features have been buffered (Figure 7)
Barrier Effects	Indirect impacts: • Exclusion of bats from foraging and commuting habitat.	Regional	Key Habitat Features have been buffered (Figure 7)
Ecological Light Pollution	Direct impacts: • Mortality of insects and reduction in prey base for bats Indirect impacts: • Project lighting can attract insects and in turn foraging bats, bringing them into the vicinity of wind turbines increasing the probability of collisions. Light-phobic species may be excluded from previous habitat.	Regional	Key Habitat Features have been buffered (Figure 7)
Disturbance to bats	Indirect impacts: • Disturbance to bats due to decommissioning activities through noise and dust, and damage to vegetation	Regional	Key Habitat Features have been buffered (Figure 7)
Description of expected significance of impact			

• Cumulative impacts are expected to be low and negative because there are currently no wind energy projects, and only three solar PV facilities, within 35 km of the PAOI.
Gaps in knowledge • There is limited published information on the cumulative impacts of grid connection infrastructure at wind and solar PV facilities on bats. **Recommendations with regards to general field surveys** • Current field surveys are fit for purpose and based on best practise thus no additional surveys are planed beyond the completion of the 12 months of baseline data collection.

7 MITIGATION AND MONITORING REQUIREMENTS

For each impact identified in Section 6, the respective mitigation measures were categorised into those aimed at first avoiding impacts, then minimising impacts, and finally restoring areas impacted.

The primary mechanism to mitigate risks of the project to bats is to avoid impacts, achieved with different mitigation measures depending on the specific impact (Table 4). To mitigate bat mortality and polarized light pollution, areas of higher risk within the AoI needed to be identified. The monitoring data showed that there is higher bat activity in proximity to habitat features such as tree clumps, buildings, dams/wetlands, and rivers/streams. Therefore, to avoid collision impacts at turbines, buffers of 200 m have been placed around these features as per best practice (Table 5). These buffered areas are No-Go for turbine placement; no part of the turbine, including the blade tips, shall intrude into these buffers. To mitigate the impact of polarized light pollution due to solar PV panels, buffers of 200 m were placed around waterbodies (Figure 6). Solar PV panels inadvertently attract aquatic insects by the horizontally polarized light they reflect because they appear to be bodies of water (Horváth et al. 2010, Fritz et al. 2020). This can have negative impacts on ecological processes including on bat-insect interactions, especially those feeding on aquatic insects, if critical life-history functions of these insects (e.g., egg deposition) is disrupted. For this reason, Száz et al. (2016) suggest that the strategic development of solar panels away from water bodies may be beneficial. Additional buffers were also placed around bat roosts to mitigate impacts of other infrastructure, specifically roads (200 m), OHL pylons (200 m) and operation and maintenance buildings (200 m) as per best practise (Figure 7).

To align with regional conservation and integrated development planning, the Mpumalanga Biodiversity Sector Plan Handbook (MTPA 2014) was consulted to further define spatial risk in the AoI. The handbook includes a map of terrestrial areas that are important for conserving biodiversity and ecological processes – Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs) respectively. CBA Irreplaceable Areas were categorised as high risk because the conservation goals for these areas are to maintain them in a natural state with no loss of ecosystems, functionality or species, and with no flexibility in land-use options (MTPA 2014). To confirm this, CBA Irreplaceable Areas will be ground truthed and the risk level of these areas updated in the final EIA. The remaining areas were assigned low or medium risk where all infrastructure development should be prioritized. These included modified land, ESA, CBA optimal, and other Natural Areas (Table 5).

Table 4: Description of mitigation measures for each impact identified for the Ummbila Emoyeni Renewable Energy Facility

Impact	Mitigation Category		
	Avoid	Minimise	Restore
Modification of bat foraging/commuting habitat	-	Minimise clearing of vegetation and removal of trees.	Rehabilitate all areas disturbed during construction, operation, and decommissioning (including aquatic habitat).
Destruction of/Disturbance to bat roosts	Limit potential for bats to roost in project infrastructure (e.g.,	Minimise disturbance and destruction of trees and buildings on site,	-

Impact	Mitigation Category		
	Avoid	Minimise	Restore
	buildings, turbines, road culverts) by ensuring these are properly sealed so bats cannot gain access.	and where this is required, these features should be examined for roosting bats.	
Bat Mortality	No placement of turbines within No-Go areas. Maximise the minimum blade sweep height.	Implement post-construction fatality monitoring at wind turbines based on best practice standards and apply curtailment or deterrents if fatality thresholds are exceeded.	-
Disturbance to bats	Avoid construction and decommissioning activities at night.	-	-
Ecological Light Pollution	Use as little lighting as possible.	Maximise use of motion-sensor lighting, minimise sky-glow by using hoods, use low pressure sodium and warm white LED lights.	-
Polarized Light Pollution	No placement of solar panels in No-Go areas.	Non-polarising white tape can be used around and/or across panels to minimise reflection	-
Barrier Effects	-	Minimise the clearance of vegetation underneath solar panels.	Rehabilitate all areas disturbed during construction, operation, and decommissioning (including aquatic habitat).

Table 5: Features used to assign spatial risk categories in the AoI for bats (Chiroptera)

Risk Level			
Low	Medium	High	No Go
Heavily modified land	CBA Optimal	CBA Irreplaceable Areas	Farm Dams
Moderately modified land	ESA Landscape corridor		Wetlands
	ESA Local corridor		Trees
	Other Natural Areas		Buildings
			Rivers/Streams
			Wetlands

An additional mitigation measure that is recommended to mitigate bat mortality is to maximise the minimum blade sweep. The species principally at risk from the proposed wind farm is Cape serotine since the other five species were recorded much less. High risk periods were identified for this species at ground level (represented by 10 m). However, high risk for this species at ground level might not result in high risk in the rotor swept zone which is typically higher than 10 m. For example, at 60 m risk to Cape serotine is low (Table 3). This species is typically a clutter-edge species meaning it is adapted to use airspaces near the edge of vegetation, in vegetation gaps, near the ground, and above water (Schnitzler and Kalko 2001). This species does show flexibility in its behaviour and was recorded at 60 m and 120 m, away from these habitat features, albeit at a significantly lower magnitude than at 10 m (Figure 3). Activity is likely to decrease exponentially with height (Wellig et al. 2018) meaning risk would decrease from high at 10 m to low at 60 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 maximise the minimum blade sweep height. The specific height will be evaluated during the EIA phase once the candidate turbines and their dimensions are known.

Since at least some habitat will need to be removed during construction, this must be minimised (Table 4). For example, although evidence of barrier effects at solar PV facilities is largely unquantified (Bennun et al. 2021), this impact could be mitigated by limiting the removal of vegetation beneath solar panels to maintain habitat that would be attractive to bats. In addition, since the use of lighting at the project cannot be avoided, the impact of ecological light pollution can be minimised by using motion-sensor lighting, minimising sky-glow by using hoods, and by using low pressure sodium and warm white LED lights. To minimise the impact of polarized light pollution, it is recommended to use non-polarising white tape around and/or across panels to minimise reflection which can attract aquatic insects (Bennun et al. 2021). During operation, bat fatality monitoring must be undertaken to search for bat carcasses beneath wind turbines to measure the observed impact of the WEF on bats for a minimum of two years (Aronson et al. 2020). Mitigation measures that are known to reduce 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). 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.

8 CONCLUSION

8.1 Summary of Findings

At this preliminary stage, most identified impacts are expected to present a low risk to bats with mitigation but this will be further assessed in the final EIA. The principle risk associated with the project is bat mortality, and collision risk appears to be low apart from during specific periods when, and at specific locations where, risk is medium or high for particular species. Risk is expected to be low at higher altitudes for all bat species, at least for the period reported on during this scoping study. At ground level (represented by the 10 m microphones) high risk periods, principally for Cape serotine, are currently restricted to summer between 19:00 and 20:00. Medium risk periods include summer between 20:00 and 23:00, and during spring between 19:00 and 20:00.

To reduce bat mortality risks, habitat features such as tree clumps, buildings, dams/wetlands, and rivers/streams have been buffered and classified as No-Go areas for turbine placement since activity around these features was higher. Turbine placement should be prioritised for low sensitivity areas (i.e., open grassland and cultivated areas), and only if needed, then in medium sensitivity areas (Figure 5). It is also recommended to maximise the minimum blade sweep height. However, since bats may be attracted to turbines (Horn et al. 2008, Cryan and Barclay 2009, Guest et al. 2022), additional mitigation measures (e.g., curtailment or acoustic deterrents) may be needed depending on the magnitude of bat fatality during operation. Estimated bat fatality must be compared to bat fatality thresholds (MacEwan et al. 2018) to ensure population level impacts to bat species do not occur or exceed acceptable levels of change.

Based on the preliminary bat activity data, the proposed project does not pose an excessive risk to bats assuming all mitigation measures are adhered to. This will be confirmed during the EIA phase once a full 12 months of bat baseline data have been collected.

8.2 Plan of Study for EIA

Nine of the 12 months of pre-construction bat monitoring have been completed for the project thus far. No changes will be made to the methodology described in this Scoping study (Section 4) since this currently meets best practise standards for obtaining sufficient baseline bat data with which to assess impacts of the project. The monitoring will cease in May 2022 at which time the final EIA will be undertaken, and the significance of impacts to bats determined for each impact identified in this scoping study. The significance of impacts will be assessed based on the following formula:

$$S = (E + D + M)P$$

S = Significance weighting
E = Extent
D = Duration
M = Magnitude
P = Probability

Each of the above terms is quantified using a standard scale (Table 6) and used to determine the significance weighting for each impact as follows:

- < 30 points: Low (i.e. where this impact would not have a direct influence on the decision to develop in the area)
- 30 - 60 points: Medium (i.e. where the impact could influence the decision to develop in the area unless it is effectively mitigated)
- > 60 points: High (i.e. where the impact must have an influence on the decision process to develop in the area).

Table 6: Assessment Criteria and Description to be used to quantify significance of impacts to bats during the EIA phase

Assessment Criteria	Criteria Description
Extent	Whether the impact will be local (limited to the immediate area or site of development) or regional, and a value between 1 and 5 will be assigned as appropriate (with 1 being low and 5 being high)
Duration	• Very short duration (0-1 years) - assigned a score of 1 • Short duration (2-5 years) - assigned a score of 2 • Medium-term (5-15 years) - assigned a score of 3 • Long term (> 15 years) - assigned a score of 4 • Permanent - assigned a score of 5
Magnitude	• 0 is small and will have no effect on the environment • 2 is minor and will not result in an impact on processes • 4 is low and will cause a slight impact on processes • 6 is moderate and will result in processes continuing but in a modified way • 8 is high (processes are altered to the extent that they temporarily cease) • 10 is very high and results in complete destruction of patterns and permanent cessation of processes
Probability	Estimated on a scale of 1-5, where 1 is very improbable (probably will not happen), 2 is improbable (some possibility, but low likelihood), 3 is probable (distinct possibility), 4 is highly probable (most likely) and 5 is definite (impact will occur regardless of any prevention measures)

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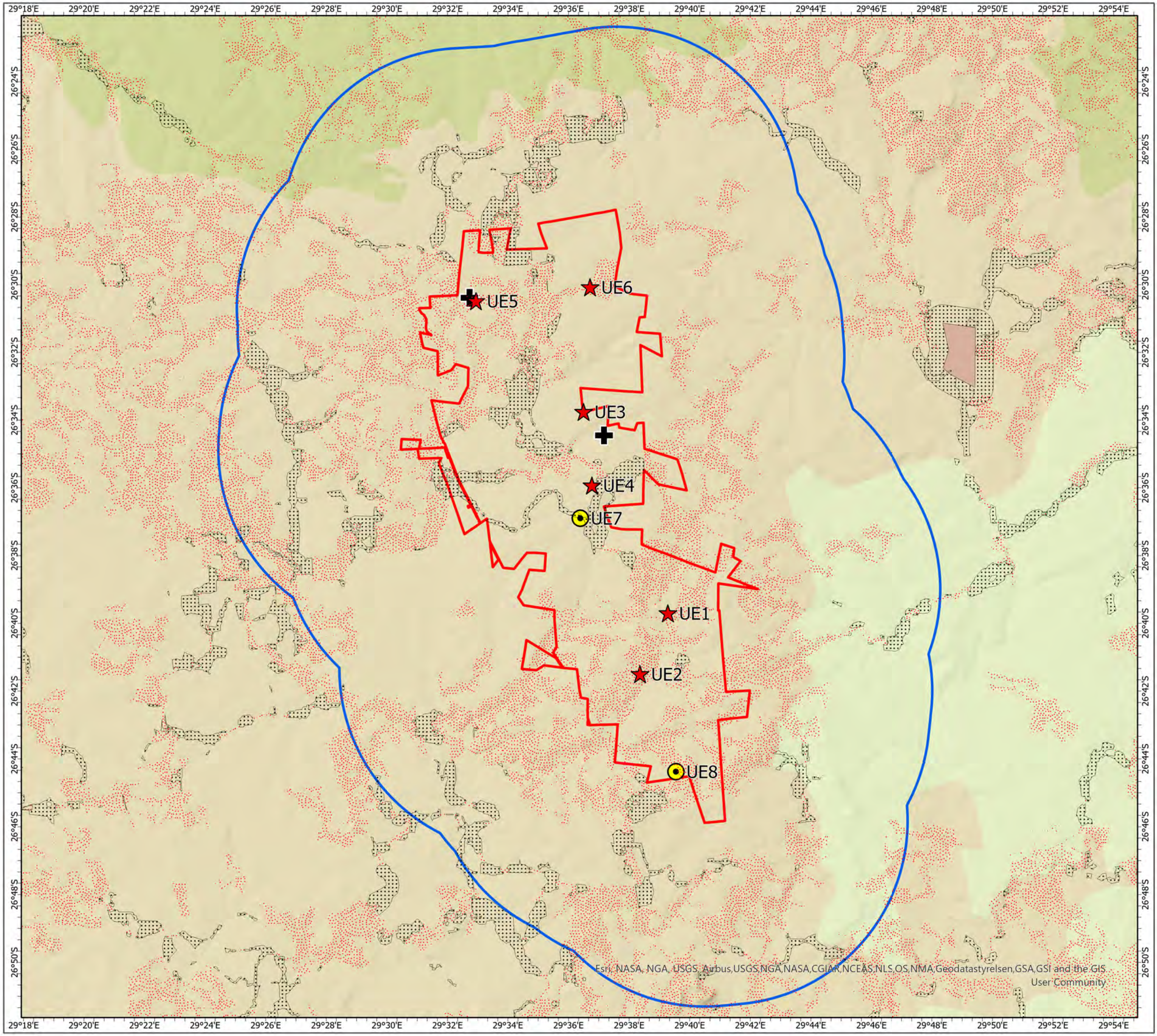
Appendix 1: Figures

CAMISSA
SUSTAINABILITY CONSULTING

Project Area of Influence (PAOI)
Area of Interest (AoI)
Bat Detector Locations
Short Mast
Met Mast
Roost Survey Location
Critical Biodiversity Area
Ecological Support Area
Protected Area
Vegetation Types
Amersfoort Highveld Clay Grassland
Eastern Highveld Grassland
Soweto Highveld Grassland

0 2,5 5 10 Km
N
09/Mar/2022



Ummbila Emoyeni Renewable Energy Facility
Bat Monitoring Locations
Figure 1

CAMISSA
SUSTAINABILITY CONSULTING

Project Area of Influence (PAOI)
Area of Interest (AoI)

Bat Sensitivity - Wind Turbines

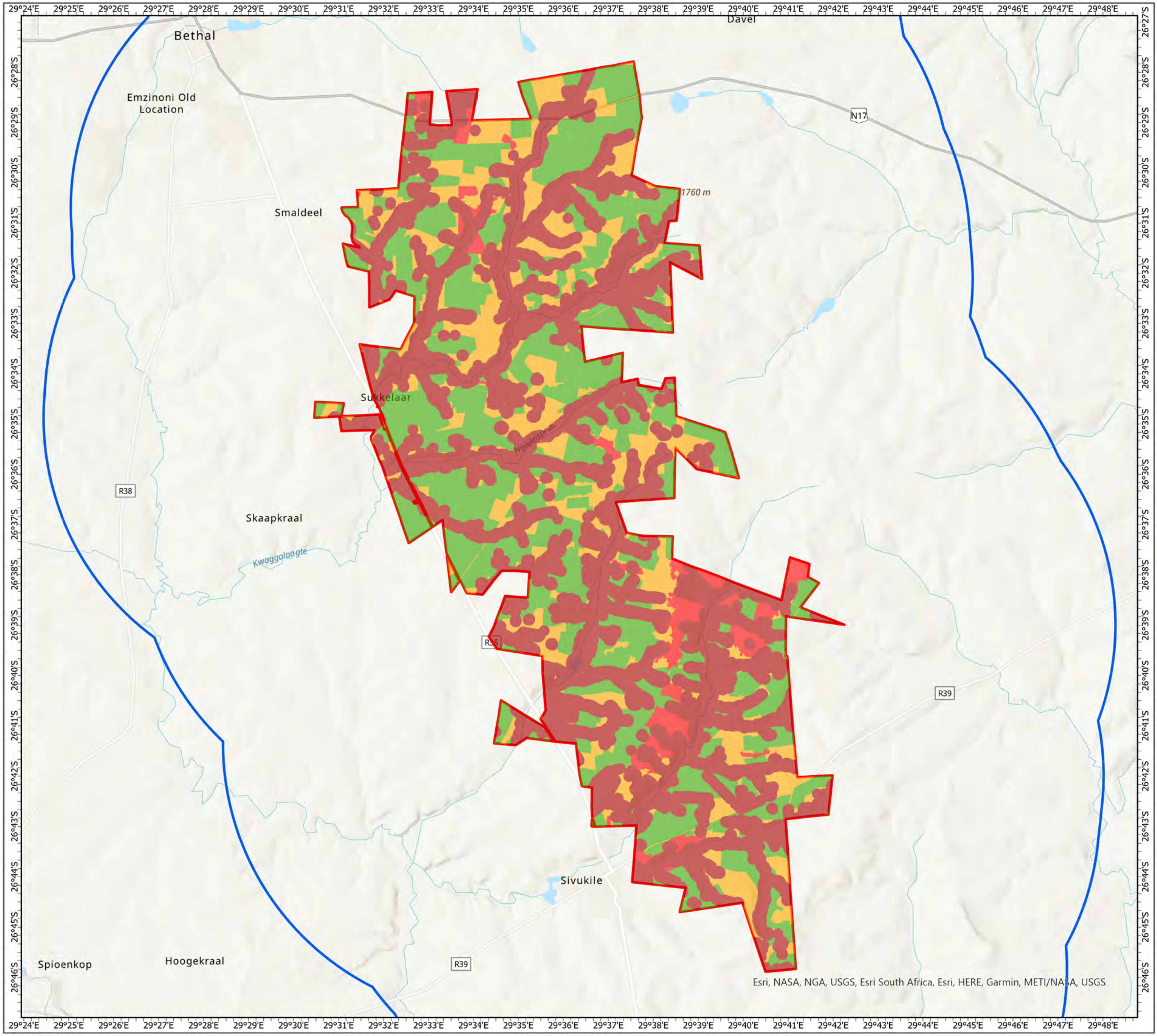
- Low
- Medium
- High
- No Go

0 1,25 2,5 5 Km

N

24/Mar/2022

Ummbila Emoyeni Renewable Energy Facility
Bat Constraints - Wind Turbines
Figure 5



CAMISSA
SUSTAINABILITY CONSULTING

- Project Area of Influence (PAOI)
- Area of Interest (AoI)

Bat Constraints - Solar PV Panels

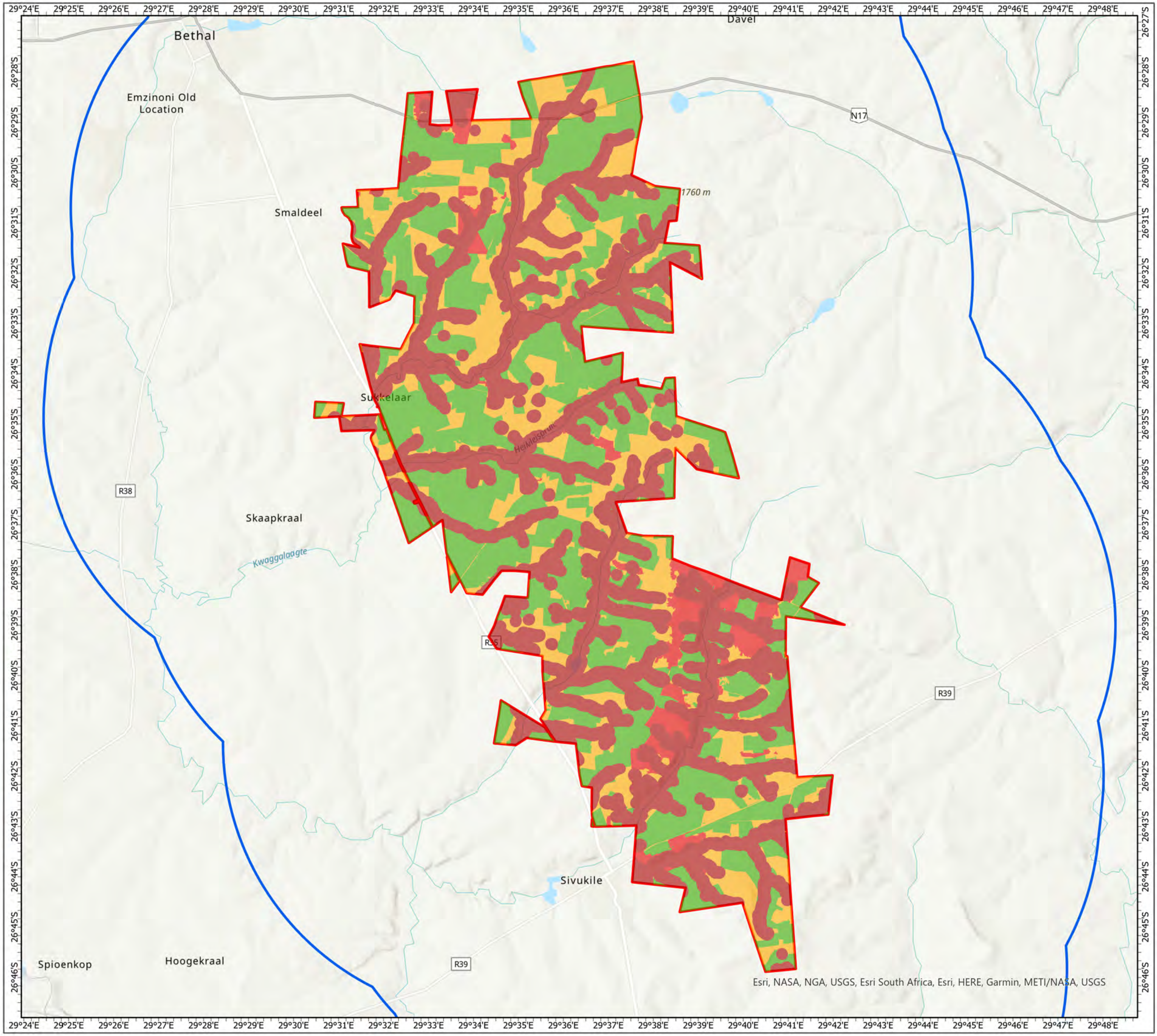
- Low
- Medium
- High
- No Go

0 1,25 2,5 5 Km

N

29/Mar/2022

Ummbila Emoyeni Renewable Energy Facility
Bat Constraints - Solar PV Panels
Figure 6



CAMISSA
SUSTAINABILITY CONSULTING

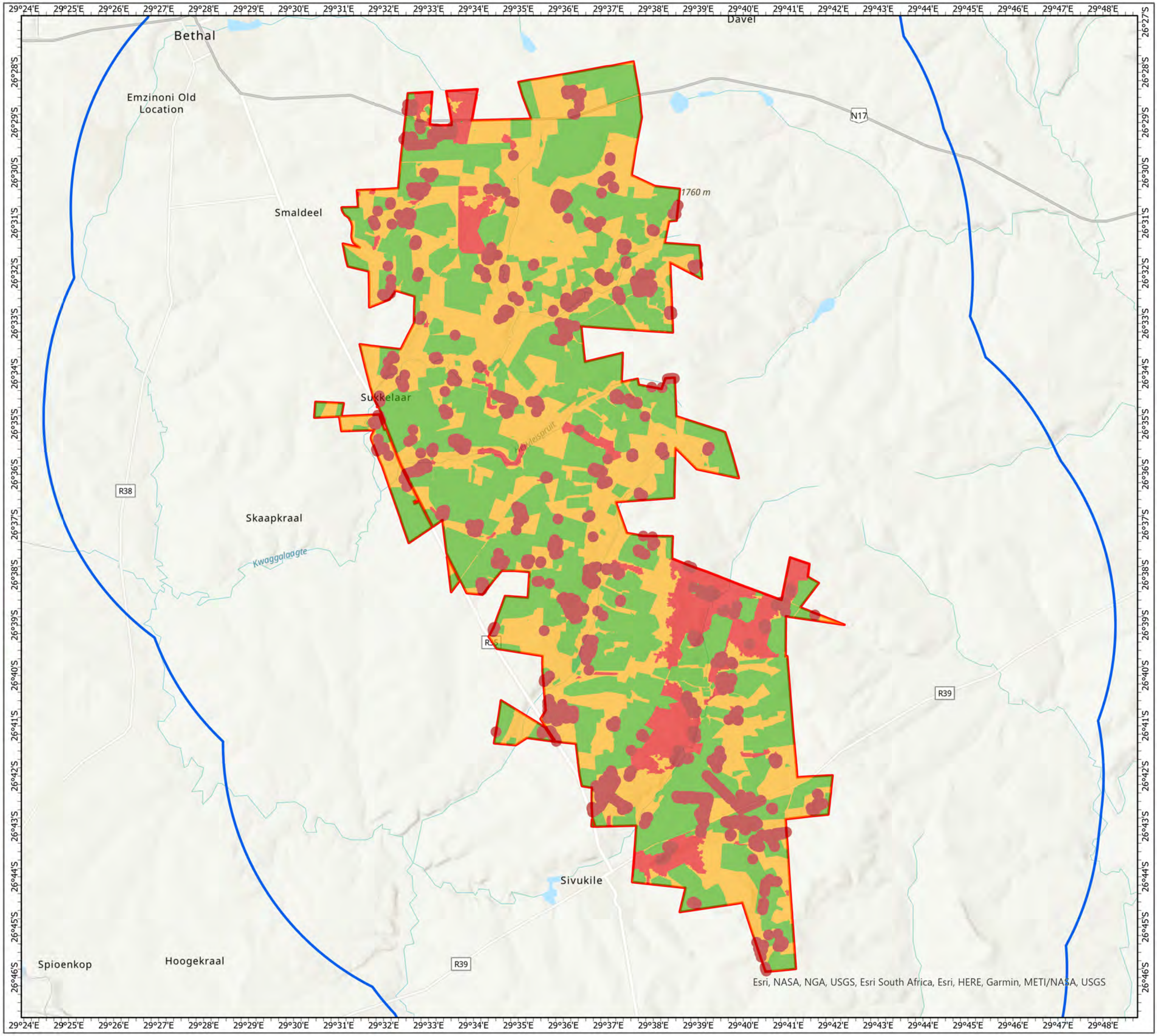
Project Area of Influence (PAOI)
Area of Interest (AoI)
Bat Constraints - Other Infrastructure
Low
Medium
High
No Go

0 1,25 2,5 5 Km

N

29/Mar/2022

Ummbila Emoyeni Renewable Energy Facility
Bat Constraints - Other Infrastructure
Figure 7



Appendix 2: Specialist CV

CURRICULUM VITAE JONATHAN ARONSON

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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

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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)

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- 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., Shackleton, S., and Sikutshwa, L. (2019). Joining the puzzle pieces: reconceptualising ecosystem-based adaptation in South Africa within the current natural resource management and adaptation context. Policy Brief, African Climate and Development Initiative.

MacEwan, K., Aronson, J.B, Richardson, E., Taylor, P., Coverdale, B., Jacobs, D., Leeuwner, L., Marais, W., Richards, L. South African Bat Fatality Threshold Guidelines for Operational Wind Energy Facilities – South African Bat Assessment Association (1st Edition).

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Aronson, J.B., Richardson, E.K., MacEwan, K., Jacobs, D., Marais, W., Aiken, S., Taylor, P., Sowler,S. and Hein, C (2014). South African Good Practise Guidelines for Operational Monitoring for Bats atWind Energy Facilities (1st Edition).

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

- 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 of Interest 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 Ummbila Emoyeni Renewable Energy Facility, near Bethal in the Mpumalanga 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

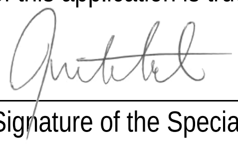
Name of Company:

17/03/2022

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

17/03/2022

Date

Signature of the Commissioner of Oaths

Date