Comparative Bat Impact Assessment for the Umsinde Emoyeni Wind Energy Facility

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Declaration of Independence

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Signed for Inkululeko Wildlife Services (Pty) Ltd by:

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1. Introduction

Windlab Developments South Africa (Pty) Ltd (Windlab) intends to develop the Umsinde Emoyeni Wind Energy Facility (WEF) approximately 7 km north-east of Murraysburg in the north-eastern corner of the Western Cape Province.

Potential impacts of the proposed WEF on local bats were first assessed from long-term monitoring performed by the Natural Scientific Services' (NSS') bat division (directed and managed by Kate MacEwan), in accordance with the then "South African Good Practice Guidelines for Surveying Bats in Wind Farm Developments" editions 2 and 3 (Sowler & Stoffberg 2012 and 2014). The monitoring was performed from mid-July 2013 to mid-July 2014, and results of the monitoring, along with an assessment of potential impacts of the proposed WEF on bats, and recommended measures to mitigate these, were included in a final report submitted in September 2014 (NSS 2014).

In October 2014 the bat division of NSS separated and established itself as Inkululeko Wildlife services (Pty) Ltd (IWS), to which all NSS bat monitoring projects were transferred. IWS was then appointed in 2015 and 2018 to, respectively, assess potential impacts on bats of the proposed Umsinde Emoyeni WEF and adjoining proposed Khangela Emoyeni WEF (then referred to as, respectively, Phases 1 and 2 of the Umsinde Emoyeni WEF), in combination (comprising up to 110 turbines), and treated separately (comprising 35 turbines each - with the reduced number of turbines a result of the improved turbine technology applied for). As part of the 2018 amendment, IWS performed a site visit to ground truth the new turbine locations and perform some additional acoustic recording. In September 2018 both Phases 1 and 2 of the Umsinde Emoyeni WEF received Environmental Authorisation (EA). For an EA amendment, IWS was appointed in May 2020 by Aurecon, on behalf of Windlab, to compile this report.

2. Scope of work

Presented herein is a comparison of potential impacts on bats, from the authorised, versus the presently proposed, infrastructure and layout of the Umsinde Emoyeni (Umsinde) WEF (as described in **Section 4**). The assessment was limited to a desktop review of pertinent information, and did not involve field work.

The desktop review was compiled in accordance with what was, at the time of IWS's appointment in May 2020, the latest edition (4.1) of the South African best practice guidelines for pre-construction bat monitoring at WEFs (Sowler *et al.* 2017). According to these guidelines:

- This present assessment was completed within the maximal 6-year validity period of the 12-month preconstruction bat monitoring study by NSS (2014), which expires in July 2020.
- The NSS (2014) study fully met the requirements of the (Sowler & Stoffberg 2012) guidelines, which were applicable at the time when fieldwork for that pre-construction monitoring commenced.
- The NSS (2014) study was performed when weather conditions for the area were more or less average (https://www.worldweatheronline.com/).
- There has been no noteworthy change in land-use or habitat conditions in situ, or in the adjacent surrounding landscape, based on:
    - A habitat survey, roost searching, and acoustic recording of bat activity in situ, during a brief visit to the area from 5 to 7 December 2017 for the IWS (2018) assessment.
    - Inspection of available post-2014 Bing and Google Earth satellite imagery.

3. Assessment team

IWS team members have conducted over 35 long-term pre-construction bat monitoring studies, and 10 current or recently completed long-term operational bird and bat monitoring studies for wind energy development in southern Africa. IWS team members were also involved with the bat sensitivity analysis of the Strategic Environmental Assessment for South Africa's Renewable Energy Development Zones (REDZs), and have performed numerous other bat specialist assessments and inventories for mines and protected areas.

3.1 Kate MacEwan

Kate, the founding director of IWS, is a SACNASP registered zoologist and environmental scientist with a BSc Honours in Zoology from Wits University. She has over 22 years of zoological and practical bat conservation experience, and wide diversity of contacts with various African bat academics and biologists. Kate is currently the chairperson for the South African Bat Assessment Association (SABAA), and a member of the Gauteng and Northern Regions Bat Interest Group (GnorBIG). Kate is a co-author on several bat species accounts in the latest southern African Red Data mammal listings (Child *et al*. 2016), and a co-author of the latest South African Best Practice Guidelines for bat monitoring studies at WEF developments both pre-construction (edition 5; MacEwan *et al*. 2020) and during operation (edition 2; Aronson *et al*. 2020). Kate has First Aid Level 1 certification.

3.2 Dr Caroline Lötter

Caroline has worked with Kate on multiple long-term bat monitoring studies for proposed WEFs, and is also a co-author of the latest South African Good Practice Guidelines for bat monitoring studies at WEF developments pre-construction (edition 5; MacEwan *et al*. 2020). Caroline is SACNASP accredited as a Professional Natural Scientist in the field of Zoology, and obtained a PhD in Zoology on the conservation biology of the rare Giant Bullfrog (*Pyxicephalus adspersus*). Working for nearly 8 years as a Senior Faunal Specialist and project manager at NSS, Caroline has performed numerous impact assessments on vertebrate and invertebrate fauna throughout South Africa and as far afield as Sierra Leone. Caroline is a member of the SABAA, GnorBIG, and the Zoological Society of Southern Africa, and has First Aid Level 1 certification.

3.3 Trevor Morgan

Trevor has worked with Kate for over 7 years as the senior technical specialist on all the various bat projects. He has served as an active member on the Executive Committee of the GNorBIG for several years. He is very knowledgeable on South African bats and has extensive experience with bat detectors, their related software, mist-netting and harp-trapping. By trade, Trevor is an electrician and an inventor, and has constructed his own harp trap and heterodyne bat detector. Trevor's considerable field-based involvement in all long-term bat monitoring studies performed by NSS and IWS has been invaluable. Trevor has First Aid Level 1 certification.

4. Amendments to WEF infrastructure

The layout of infrastructure for the Umsinde WEF as authorised in 2018, and as presently proposed for the EA amendment, are both shown in **Figure 4-1**. Provided in **Table 4-1** is a summary (supplied by Aurecon) of details (most applicable to this assessment) for the authorised, versus the presently proposed, infrastructure for the Umsinde WEF. In essence, Windlab intends to request a reduction in the overall number of turbines, and an increase in turbine height and rotor diameter for all remaining turbines based on the wind turbine technology available at the time of development. Consequently, larger turbine hard stand (and crane boom) areas, and in certain places wider internal roads during construction, but not operation, will be required. The internal road network will have a different configuration, and will be reduced from 35.8 km to 30.7 km in length. Substations, construction laydown areas, other buildings, internal powerlines and fencing will remain as authorised.

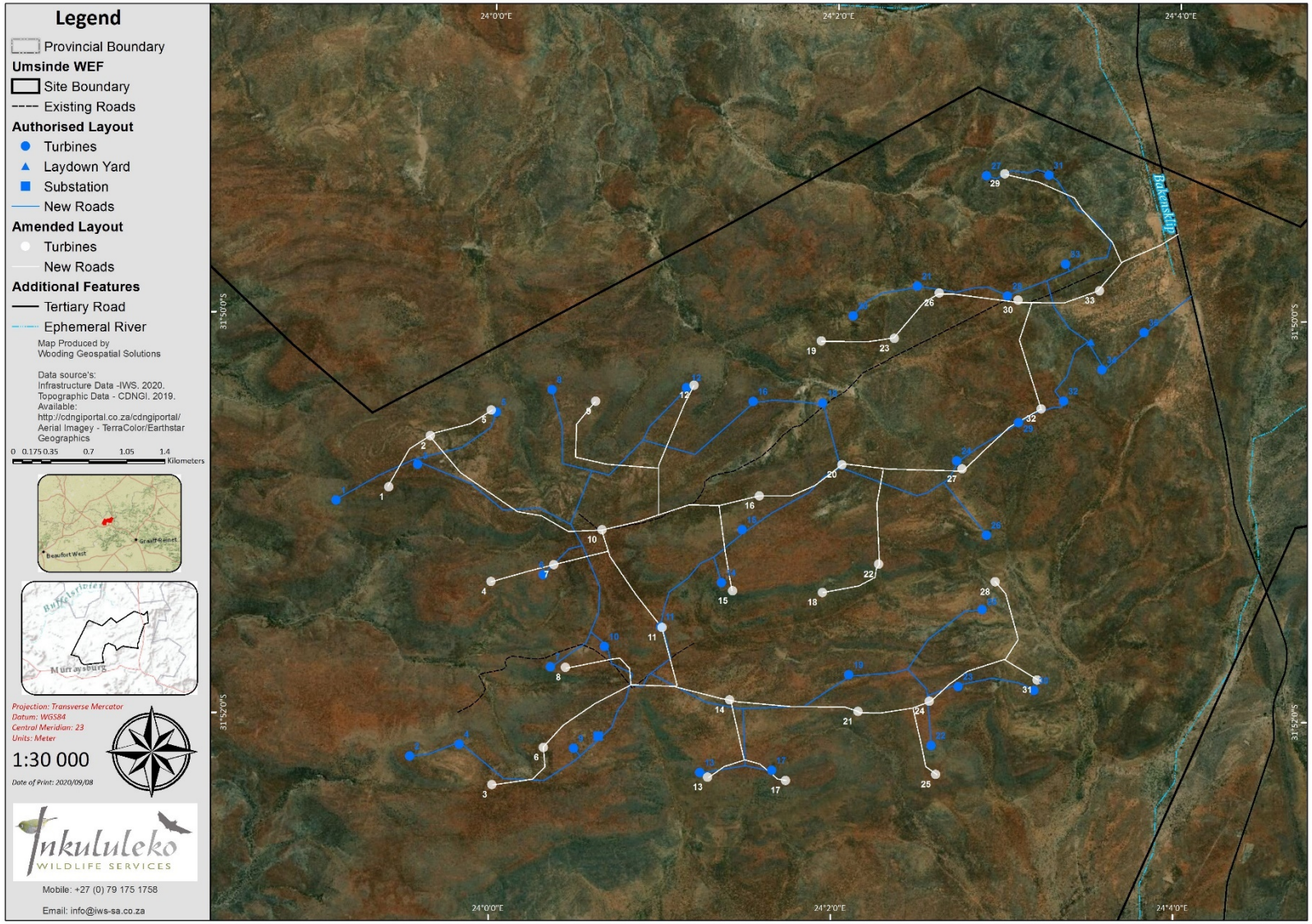

Figure 4-1 **Umsinde WEF layout, as authorised in 2018 (blue), and as presently proposed for the EA amendment (white)**

Table 4-1 Summary (from Aurecon) of relevant details for the authorised vs. the proposed Umsinde WEF

Component	Authorised	Proposed amendment
Facility area	• Hard standing area: Up to 45 m x 25 m • Turbine foundation: 30 m x 30 m, with a depth of 3 m • Onsite office compound, including site offices, parking, an operation and maintenance facility and a control room: • Anemometer masts • CCTV monitoring towers	• Hard standing area: Up to 55 m x 35 m • Turbine foundation: 30 m x 30 m, with a depth of 3 m • Onsite office compound, including site offices, parking, an operation and maintenance facility and a control room: • Anemometer masts • CCTV monitoring towers
Site access	Existing farm access tracks and watercourse crossing will be upgraded. • Internal roads: 9 m width during construction. • Reduced to 4 - 6 m during operations. • Internal road length: 35.8 km	Existing farm access tracks and watercourse crossing will be upgraded. • Internal roads: up to 12 m width during construction. • Reduced to 4 - 6 m width during operations. • Internal road length: 30.7 km
Export capacity	147 MW	147 MW
Number of turbines	Up to a maximum of 35	Up to a maximum of 33
Turbine generation capacity	1.5 – 4.5 MW	Up to 10 MW
Hub height from ground level	Up to 135 m	Up to 160 m
Rotor diameter	Up to 150 m	Up to 180 m
Blade length	75 m	Up to 90 m
Blade tip height	210 m	Up to 250 m
Area occupied by substations	200 x 250 m single storey substation compound	No amendment required.
Capacity of substation	33/132 kV	No amendment required.
Area occupied by construction laydown areas	Temporary laydown area: Up to three laydown areas of 9 000 m² each (150 m x 60 m)	No amendment required.
Location of construction camps/ laydown areas	As per layout map included in the Final EIA Report.	No amendment required.
Temporary construction hardstand area per turbine	60 x 30 m (1,800 m^2)	95 x 23 m (2,185 m^2)
Crane pad	14,000 m^2	(Not applicable[1])
Area occupied by buildings	200 x 250 m	No amendment required.
Internal powerline/cables	All power lines linking wind turbines to each other and to the internal substation must be buried (Condition 35 of the EA)	Condition remains applicable. No amendment required.
Height of fencing	2 – 2.5 m	No amendment required.
Type of fencing	Steel palisade fencing around construction camp. Concrete palisade around substation.	No amendment required.
Validity extension	5 years from 6 September 2018	10 years from 6 September 2018.

[1] Note that the crane pad described in the original reports has been confirmed by the design engineers as not being required in addition to the temporary construction hardstand areas required for the amended layout.

The dimensions and footprints of the different infrastructure components as authorised, versus, as presently proposed, are provided in **Table 4-2** (modified from a table supplied by Aurecon). **Impacts of the presently proposed Umsinde WEF were assessed according to the "worst-case scenario" values in Table 4-2**.

Table 4-2 Size (from Aurecon) of different infrastructure components as authorised vs. as presently proposed

Component	Authorised		Proposed amendment	
	No. and/or dimensions	Footprint (m^2)	No. and/or dimensions	Footprint (m^2)
Turbine rotor swept area	35 x (17 671 m^2)	618 485	33 x (25 447 m^2)	839 751
AERIAL DISTURBANCE		**618 485**		**839 751**
Hard standing areas	35 x (45 m x 25 m)	39 375	33 x (55 m x 35 m)	63 525
Crane boom areas	35 x (60 m x 30 m)	63 000	33 x (95 m x 23 m)	72 105
Crane pad	35 x (20 m x 20 m)	14 000	n/a	-
Temporary laydown areas	3 x (150 m x 60 m)	27 000	3 x (150 m x 60 m)	27 000
Turbine foundations	35 x (30 m x 30 m)	31 500	33 x (30 m x 30 m)	29 700
Construction roads	35.8 km x 9 m wide	322 200	30.7 km x 12 m wide	368 400
Operational roads	35.8 km x 6 m wide	214 800	30.7 km x 4-6 m wide	184 200
Substation, etc.	1 x (200 m x 250 m)	50 000	1 x (200 m x 250 m)	50 000
TERRESTRIAL DISTURBANCE		**547 075**		**610 730**

Presented in **Table 4-3** (as requested and supplied by Aurecon), **for demonstration only**, are the anticipated disturbance footprints associated with four different turbine sizes. The values in **Table 4-3 demonstrate** that areas of disturbance and thus impacts of the proposed Umsinde WEF, could be reduced if fewer than 33 turbines, with a 180 or smaller rotor diameter, are developed in accordance with the capped project maximum generation capacity of 147 MW.

Table 4-3 For demonstration only (from Aurecon): disturbance footprints associated with four different turbine sizes

Turbine size (MW)	10	8	6.5	4.5
Number of turbines installed for a 147 MW project	15	18	23	33
Rotor diameter (m)	180	180	180	150
Total rotor swept area (m^2)	374 070.9	467 588.6	575 493.7	577 252.7
Increase/ reduction of rotor swept area (m^2) relative to that authorised	-244 414	-150 896	-42 991.3	-41 232.3
Hard stand dimensions (m)	55 x 35	50 x 30	50 x 30	45 x 25
Total area required for hard stands (ha)	2.83	2.76	3.39	3.71
Crane boom & blade laydown area (ha)	3.21	4.01	4.94	7.21
Temporary laydown areas (ha)	2.7	2.7	2.7	2.7
Turbine foundations (ha)	1.32	1.65	2.04	2.97
Construction roads (ha)	36.84	36.84	36.84	36.84
Operational roads (ha)	18.42	18.42	18.42	18.42
Substation, etc. (ha)	5	5	5	5
Total construction footprint (ha)	51.9	52.96	54.91	58.43
Total operational footprint (ha)	27.57	27.83	28.85	30.1
Increase/ reduction of disturbance footprint (ha) – relative to that authorised	-24.28	-23.22	-21.28	-17.75

Infrastructure amendments, which are expected to reduce potential impacts on bats include the:

- Fewer number of (up to 33, not 35) turbines.
- Higher reach of the lowest blade tip (70 m, not 60 m above ground level) – which is expected to reduce the fatality risk of clutter and clutter-edge foraging bat species – for proposed turbines with a hub height of 160 m above ground level.
- Smaller operational road surface area (184 200 m^2, not 214 800 m^2).

Infrastructure amendments, which are expected to increase potential impacts on bats include the:

- Potentially wider rotor diameter (up to 180 m, not 150 m), and greater rotor swept area of individual turbines (up to 25 447 m^2, not 17 671 m^2), and potentially for all turbines combined (up to 839 751 m^2, not 618 485 m^2), though unlikely due to the capped 147 MW project size.
- Potentially larger permanent hand stand area of individual turbines (up to 1 925 m^2, not 1 125 m^2), and potentially for all turbines combined (up to 63 525 m^2, not 39 375 m^2).
- Larger temporary construction hard stand area (including crane boom area) of individual turbines (2 185 m^2, not 1 800 m^2), and potentially for all turbines combined (up to 72 105 m^2, not 63 000 m^2).
- Greater (12 m, not 9 m) widening of internal roads at certain places during construction.

However, as demonstrated in Table 4-3:

If 33, size 4.5 MW turbines, with a rotor diameter of 150 m, are developed, potential impacts on bats are expected to be further reduced by the:

- (7 % or 4.12 ha) smaller total rotor swept area (577 253 m^2, not 618 485 m^2).
- (7 % or 0.26 ha) smaller total area required for hard stands (3.68 ha, not 3.94 ha).

Or, if 15, size 10 MW turbines, with a rotor diameter of 180 m, are developed, potential impacts on bats are expected to be further reduced by the:

- (40 % or 24.44 ha) smaller total rotor swept area (374 071 m^2, not 618 485 m^2).
- (28 % or 1.11 ha) smaller total area required for hard stands (2.83 ha, not 3.94 ha).
- (49 % or 3.09 ha) smaller total area required for temporary hard stands, including crane boom areas (3.21 ha, not 6.30 ha).
- (5 % or 2.81 ha) smaller total construction footprint (51.90 ha, not 54.71 ha).

5. Amended WEF layout in relation to bat sensitive areas

Shown in **Figure 5-1** is the layout of the Umsinde WEF, as presently proposed for the EA amendment, in the context of the relative sensitivity of different habitats and buffers for bats as described in **Table 5-1.** The habitat and buffer sensitivity ratings are the same as those last reported by IWS (2018). However, in accordance with editions 4.1 and 5 of the pre-construction bat monitoring guidelines (Sowler *et al*. 2017 and MacEwan *et al.* 2020), the buffer around High sensitive ephemeral streams and dams has been increased from 50 m to 200 m. On this basis, **the applicant has revised the layout to ensure avoidance of these high sensitivity areas.** Under both the authorised, and the presently proposed, layout for the Umsinde WEF, all turbines and new roads are more than 2 km away from the nearest confirmed or potential bat roost. As detailed in **Table 5-2**, under the authorised layout, three and two turbines encroach, respectively, into High and Medium sensitive habitat(s) and/or buffer(s). **Under the proposed layout, no turbines encroach into High sensitive habitat(s) and/or buffer(s), and seven turbines into Medium sensitive habitat(s) and/or buffer(s).**

Figure 5-1 **Presently proposed layout of the Umsinde WEF in relation to sensitive areas for bats (remaining in situ areas have Low-Medium sensitivity)**

Table 5-1 Relative sensitivity of different habitats and buffers for bats in and around the Umsinde WEF

Sensitivity	Description
High	• Confirmed bat roosts, and a 1 km buffer around these. • FEPA (Nel *et al.* 2011) rivers and wetlands, and a 500 m buffer around these. • Ephemeral streams and dams rated as High sensitive after ground-truthing by IWS (2017), and a 200 m (NOT 50 m) buffer around these.
Medium-High	• Upper Karoo Hardeveld vegetation (Mucina & Rutherford 2006).
Medium	• Potential bat roosts, and a 500 m buffer around these. • Ephemeral streams and dams rated as Medium sensitive after ground-truthing by IWS (2017), and a 50 m buffer around these. • Rocky gullies rated as Medium sensitive after ground-truthing by IWS (2017), and a 50 m buffer around these. • All areas below 1 440 m a.s.l., which are not rated as Medium-High or High sensitive.
Low-Medium	• All areas above 1 440 m a.s.l., which are not rated as Medium-High or High sensitive. • All remaining areas, which are not rated as Medium, Medium-High or High sensitive. These remaining areas mostly represent higher-lying plateau areas, which were rated with Low-Medium (not Low) sensitivity because here, the risk of bat fatality is not necessarily low. Whilst high activity does normally equate to high fatality, low activity does not necessarily equate to low fatality (IWS pers. comm. Chris Hein, 28 August 2014). Indeed, in this region, IWS suspects that although bats pre-occupy the lower valleys for most of the year, during harsher conditions they move and forage along the higher lying plateaus in optimal low wind speed and warm conditions.

Table 5-2 Encroachment of turbine towers and/or blades (in meters) into sensitive areas for bats

Sensitivity	Turbine	Authorised	Proposed amendment
High	1	Blades (10-75 m)	-
	5	Blades (66-75 m)	-
	18	Tower and blades (0-75 m)	-
Medium	7	Blades (63-75 m)	-
	8	-	Blades (50-90 m)
	17	-	Blades (41-90 m)
	23	-	Tower possibly, and blades (3-90 m)
	27	-	Blades (41-90 m)
	28	-	Blades (18-90 m)
	31	Blades (43-75 m)	-
	32	-	Blades (36-90 m)
	33	-	Blades (86-90 m)

Layout amendments, which are expected to reduce potential impacts on bats include the:

- Zero encroachment of turbines into High sensitive areas. (Under the authorised layout, three turbines *viz.* 1, 5 and 18, encroached into High sensitive areas).

Layout amendments, which are expected to increase potential impacts on bats include the:

- Encroachment of seven (i.e. five additional turbines) into Medium sensitive areas. (Under the authorised layout, only two turbines encroached into Medium sensitive areas).

Note that if a wind energy project requires an amendment or new environmental process, it is stipulated in the pre-construction bat monitoring guidelines that *"In the case of a turbine dimension or specification change causing turbine blade tips to further encroach on bat sensitive areas/ buffers:*

- the layout should be adjusted to move turbines (including the full rotor swept area) out of the bat sensitive areas/ buffers" (Sowler et al. 2017).
- the layout must be adjusted to move turbines (including the full rotor swept area) out of the bat sensitive areas/ buffers" (MacEwan et al. 2020).

As the layout of turbines has been amended to ensure that no turbine towers or blades encroach into any High sensitive area, IWS is satisfied that the above guideline requirements have been sufficiently met.

6. Comparative assessment of direct impacts on bats

Provided here is a comparative assessment of the (extent, intensity, duration, consequence, probability, and overall significance of) potential direct impacts on bats from the authorised, versus the presently proposed, infrastructure and layout of the Umsinde WEF, both without, and with mitigation. The impact assessment methodology is described under **Appendix 1**. Within each impact table, a number of recommended impact mitigation measures are described.

6.1 Roost disturbance or destruction

There is no difference in the significance of the potential impact on bat roosts between the authorised, versus the presently proposed infrastructure and layout of the Umsinde WEF, without or with, mitigation (**Table 6-1**). This is because no turbine or road under the authorised or amended layout will encroach into the respective 1 km and 500 m buffers around nearby confirmed and potential bat roosts (shown in **Figure 5-1**), and there will be no change in the authorised infrastructure and layout of laydown areas, buildings, substations and powerlines (**Table 4-1**).

The mitigation measures recommended in **Table 6-1**, replace those that were previously prescribed by IWS (2015 and 2018) for roost disturbance and destruction, which have been slightly refined and expanded here. This is to ensure that roosts are protected from traffic, noise, dust and general habitat degradation during construction and operation.

Table 6-1 Comparative assessment of the impact on bat roosts from the authorised vs. the proposed WEF

Roost disturbance or destruction								
WITHOUT MITIGATION	Extent	Intensity	Duration	Consequence	Probability	Significance	Status	Confidence
Authorized	Regional	High	Short-term	Medium	Probable	MEDIUM	– ve	High
	3	3	1	7				
Proposed	Regional	High	Short-term	Medium	Probable	**MEDIUM**	– ve	High
	3	3	1	7				
ESSENTIAL mitigation:								
Avoid High and Medium-High sensitive areas. Ensure that all laydown areas, turbine bases, blades and hardstands, offices and sub-stations are only situated in Low-Medium or otherwise (but preferably not) Medium sensitive areas.								
Minimize road impacts. Do not construct roads within 500 m of a confirmed roost. Minimize the clearing and degradation of all natural (especially wetland and riparian) and agricultural areas, and obtain a water use licence for each watercourse crossing.								
Avoid blasting within 2 km of a confirmed roost.								
Minimize artificial lighting. Apart from compulsory civil aviation lighting, minimize artificial lighting especially high-intensity, steady-burning, sodium vapour, quartz, halogen, and other bright lights at sub-stations, offices and turbines. All non-aviation lights should be hooded downward, and directed to minimise horizontal and skyward illumination.								
Minimize degradation of terrestrial habitat and water resources (especially near bat roots). Implement and maintain effective invasive alien plant, stormwater, erosion, sediment and dust control measures.								
Report any newly discovered roosts, and incorporate their protection into the WEF's adaptive management plan.								
BEST PRACTICE mitigation:								
Continue performing roost searches during construction and operation.								
WITH MITIGATION	Extent	Intensity	Duration	Consequence	Probability	Significance	Status	Confidence
Authorized	Local	Medium	Short-term	Very Low	Possible	INSIGNIFICANT	– ve	High
	1	2	1	4				
Proposed	Local	Medium	Short-term	Very Low	Possible	**INSIGNIFICANT**	– ve	High
	1	2	1	4				

6.2 Fragmentation of and displacement from foraging habitat

Compared to the authorised infrastructure and layout, **if 33 turbines with a 180 m rotor diameter are developed for the proposed Umsinde WEF, this will have a slightly greater impact on the fragmentation of, and displacement of bats from, suitable foraging habitat (Table 6-2)**. This is because under this worst-case scenario, 63 655 m^2 or 6.37 ha more terrestrial habitat will be lost or degraded with construction of the:

- 24 150 m^2 or 2.42 ha larger combined hard stand areas.
- 9 105 m^2 or 0.91 ha larger combined temporary hard stand areas (including crane boom areas).
- 46 200 m^2 or 4.62 ha larger construction road surface area.

More "safe" aerial foraging space will also be lost during operation by the 221 266 m^2 or 22.13 ha larger rotor swept areas. In addition, although no turbine will encroach into a High sensitive area, seven (five additional) turbines will encroach into Medium sensitive areas.

This slight increase in the extent of this impact is, however, not substantial enough to effect a change in the significance of this impact (**Table 6-2**). **As demonstrated in Table 4-3, should 33 turbines with a 150 m rotor, or as few as 15 turbines with a 180 m rotor be developed, for example, the significance of this impact could be reduced.**

The mitigation measures recommended in **Table 6-2**, replace those that were previously prescribed by IWS (2015 and 2018) for fragmentation of and displacement from foraging habitat, which have been slightly refined and expanded here. This is to ensure that foraging habitat is protected from general habitat degradation associated with construction (particularly the clearing of 12 m-wide roads in certain places) and operation.

Table 6-2 Comparative assessment of the impact on bat foraging habitat from the authorised vs. the proposed WEF

Fragmentation of and displacement from foraging habitat								
WITHOUT MITIGATION	Extent	Intensity	Duration	Consequence	Probability	Significance	Status	Confidence
Authorized	Study area	Medium	Long-term	Medium	Definite	MEDIUM	– ve	High
	2	2	3	7				
Proposed	Study area	Medium	Long-term	Medium	Definite	**MEDIUM**	– ve	High
	2	2	3	7				
ESSENTIAL mitigation:								
Avoid High and Medium-High sensitive areas. Ensure that all laydown areas, turbine bases, blades and hardstands, offices and sub-stations are only situated in Low-Medium or otherwise (but preferably not) Medium sensitive areas.								
Prioritize dropping turbines in closest proximity to High, Medium-High and Medium sensitive areas (in descending priority), and/or on the periphery of the WEF (to reduce its overall footprint), if fewer than 33 turbines are developed.								
Minimize road impacts. Minimize the clearing and degradation of all natural (especially wetland and riparian) and agricultural areas, and obtain a water use licence for each watercourse crossing. Effectively rehabilitate all 12 m wide roads to 6 m after construction.								
Minimize artificial lighting. Apart from compulsory civil aviation lighting, minimize artificial lighting especially high-intensity, steady-burning, sodium vapour, quartz, halogen, and other bright lights at sub-stations, offices and turbines. All non-aviation lights should be hooded downward, and directed to minimise horizontal and skyward illumination.								
Minimize degradation of terrestrial habitat and water resources (used by bats during foraging). Implement and maintain effective invasive alien plant, stormwater, erosion, sediment and dust control measures.								
WITH MITIGATION	Extent	Intensity	Duration	Consequence	Probability	Significance	Status	Confidence
Authorized	Local	Medium	Long-term	Medium	Probable	LOW	– ve	High
	1	2	3	6				
Proposed	Local	Medium	Long-term	Medium	Probable	**LOW**	– ve	High
	1	2	3	6				

6.3 Bat fatalities from collision or barotrauma

For the proposed Umsinde WEF, since no turbine will encroach into High sensitive areas (Figure 5-1; Table 5-2), the impact of bat fatalities from collision or barotrauma was rated with High, not Very High significance, as was the case for the authorised project (Table 6-3). This is because, the probable reduced fatality of bats from the zero encroachment of turbines into High sensitive areas, and the higher reach of the lowest blade tip is expected to outweigh the probable increased fatality of bats from the greater total rotor swept area under the worst-case scenario of 33 turbines with a 180 m rotor diameter.

As demonstrated in Table 4-3, should 33 turbines with a 150 m rotor, or as few as 15 turbines with a 180 m rotor be developed, for example, the significance of this impact could be further reduced.

With diligent mitigation, the impact of the Umsinde WEF on bat fatalities can be reduced from High to Low significance. The mitigation measures recommended in **Table 6-3**, replace those that were previously prescribed by IWS (2015 and 2018) for bat fatalities from collision or barotrauma, which here have been slightly refined and expanded based on IWS's growing experience with bat fatality monitoring and mitigation at operational WEFs.

7. Indirect and cumulative impacts on bats

The potential direct impacts of the Umsinde WEF on bat roosting, foraging and fatality will, without effective mitigation as prescribed in **Table 6-1**, **Table 6-2**, and **Table 6-3**, have the following potential indirect impacts:

- Reduced size, genetic diversity, resilience and persistence of impacted bat populations.
- Decline or loss of conservation important bat species.
- Decline or loss of bat ecosystem services.

Table 6-3 Comparative assessment of the impact of bat fatalities from the authorised vs. the proposed WEF

Bat fatalities from collision or barotrauma								
WITHOUT MITIGATION	Extent	Intensity	Duration	Consequence	Probability	Significance	Status	Confidence
Authorized	National 4	High 3	Long-term 3	Very High 10	Definite	VERY HIGH	– ve	High
Proposed	National 4	Medium 2	Long-term 3	High 9	Definite	HIGH	– ve	High
ESSENTIAL mitigation:								
Avoid High and Medium-High sensitive areas. Ensure that all laydown areas, turbine bases, blades and hardstands, offices and sub-stations are only situated in Low-Medium or otherwise (but preferably not) Medium sensitive areas.								
Do not contruct turbines within 200 m of any building or substation.								
Prioritize dropping turbines in closest proximity to High, Medium-High and Medium sensitive areas (in descending priority), and/or on the periphery of the WEF (to reduce its overall footprint), if fewer than 33 turbines are developed.								
Ensure that turbines can be fitted with bat detectors and deterrent devices. Turbine engineers must consult with bat specialists to incorporate the necessary turbine adaptations for this during the design phase, so there are no unexpected surprises or concerns after the turbines are built.								
Perform acoustic bat monitoring during construction. A detector(s) should be installed on at least one meteorological mast just before construction commences, and monitoring should occur throughout construction (and into operation).								
Minimize artificial lighting. Apart from compulsory civil aviation lighting, minimize artificial lighting especially high-intensity, steady-burning, sodium vapour, quartz, halogen, and other bright lights at sub-stations, offices and turbines. All non-aviation lights should be hooded downward, and directed to minimise horizontal and skyward illumination.								
Implement curtailment as outlined in Box 1 in this report.								
Perform operational bat monitoring according to the latest SABAA guidelines for this (Aronson *et al.* 2020, or later).								
Adaptively manage bat fatalities by consulting the latest SABAA guidelines for this (Aronson *et al.* 2018 or later), and the best available relevant scientific information.								
BEST PRACTICE mitigation:								
Forward all (live and fatality) bat monitoring data to SANBI's database for this, or the database recommended by SABAA, to expand the scientific knowledge base for more informed decision making and mitigation.								
Submit quarterly carcass searching reports to SABAAP.								
Submit quarterly progress and annual operational bat monitoring reports to SABAAP, EWT and the DEFF.								
WITH MITIGATION	Extent	Intensity	Duration	Consequence	Probability	Significance	Status	Confidence
Authorized	Regional 3	Low 1	Long-term 3	Medium 7	Possible	LOW	– ve	High
Proposed	Regional 3	Low 1	Long-term 3	Medium 7	Possible	LOW	– ve	High

Although the significance of indirect impacts was not previously (IWS 2015 and 2018), and can still not, be rated with confidence never mind accuracy, these are expected to be similar for the (worst-case scenario of 33 turbines with a 180 m rotor diameter under the) EA amendment, due to the slightly greater impact on bat foraging, but the slightly reduced impact on bat fatality of the proposed, versus the authorised, project. Impacts from the Umsinde WEF also cannot be considered in isolation. **Of growing concern is the cumulative effect of the afore-mentioned potential direct and indirect impacts from all the various authorised and proposed WEFs in the broader region**. Without effective bat impact mitigation (e.g. curtailment), operational bat monitoring, and adaptive management of bat fatalities *at all WEFs in the region*, local and regional (and possibly even national) bat populations, species and ecosystem services could be significantly impacted. To avoid this, IWS strongly encourages the Umsinde Emoyeni WEF and all other WEFs to:

- Forward all (live and fatality) bat monitoring data to SANBI's database for this, or the database recommended for this by SABAA, to expand the scientific knowledge base for more informed decision making and mitigation.
- Submit quarterly carcass searching reports to the SABAA Panel (SABAAP).
- Submit quarterly progress and annual operational bat monitoring reports to SABAAP, the Endangered Wildlife Trust (EWT) and the national Department of Environment, Forestry and Fisheries (DEFF).

BOX 1: BAT FATALITY MINIMIZATION STRATEGY

The importance of mitigating bat fatalities cannot be over-emphasised. Whilst acoustic deterrents are showing positive results for lowering bat fatalities at WEFs in some parts of the world, in South Africa, data are very limited, and deterrent devices are not readily available for installation. Therefore, curtailment is still the most effective and available bat fatality minimization strategy in this country.

For the Umsinde WEF, IWS recommends the following strategy:

1) All parts of all turbines (including the full rotor swept area) are not to encroach into any High and/or Medium-High sensitive areas. **The amended layout meets this requirement.**
2) Operational bat monitoring according to Aronson *et al.* 2020 (or later editions relevant at the time of the monitoring) must be implemented as soon as the wind turbines become operational. The quality of the operational monitoring and data analysis are to be conducted to a high standard so that there is confidence in the data and the fatality estimate results.
3) Where turbines encroach into **Medium sensitive areas**, implement curtailment of all these turbines as soon as each starts operating. Curtailment will require implementation of an initial cut-in speed of 4.5m/s between 1 September and 31 May, when temperatures are 12°C or higher, during the following seasonal time periods:
    a. Autumn: 18h30 to 04h00
    b. Spring: 19h00 to 04h00
    c. Summer: 20h00 to 04h00
4) If the bat fatality threshold (as determined according to the latest relevant SABAA guidelines *viz*. MacEwan *et al.* 2018 or later editions relevant at the time of the monitoring) is exceeded, further adaptive management and mitigation (possibly including greater curtailment) must be implemented (refer to Aronson *et al.* 2018 or later editions).
5) If the quality of the operational monitoring and data analysis is not conducted according to Aronson *et al.* 2020 (or later editions relevant at the time of the monitoring), the above-recommended curtailment strategy should be implemented at all turbines at the WEF.
6) The specialist conducting the Year 1 and Year 2 operational monitoring should provide recommendations for adaptive management of the above strategy after the second year of operational monitoring. Allowance should be made in the financial provision for such adaptive management and mitigation.

8. Conclusion and way forward

It can be concluded from this desktop comparison of impacts on bats from the authorised, versus the presently proposed, infrastructure and layout for the Umsinde Emoyeni WEF that:

- Without mitigation, the proposed infrastructure and layout **under the EA amendment is expected to have a Medium significant impact on bat roosts, and bat foraging, and a High significant impact on bat fatalities.**
- With diligent, effective mitigation as recommended in this report, the Umsinde WEFs' impact on bat roosts can be reduced to insignificant, and the impact on bat foraging and fatalities can be reduced to Low significance. Recommended mitigation measures include, but are not limited to: curtailment where and when necessary, operational bat monitoring, and adaptive management of bat fatalities.

Going forward, IWS advises that plans for the proposed WEF be established or further improved to ensure that:

- if 33 turbines are developed, where possible, turbine towers and blades are shifted to ideally avoid encroaching into Medium sensitive areas.
- if fewer than 33 turbines are developed, priority is given to dropping turbines, which are situated in closest proximity to High, Medium-High and Medium sensitive areas (in descending order of priority), and/or on the periphery of the WEF (to reduce its overall footprint).
- artificial lighting is minimized.
- the areas of road used during construction (up to 12 m wide in places), when reduced to the operational width of 6 m, are effectively rehabilitated.
- terrestrial habitats and water resources (in particular, where roads will be widened to 12 m in certain places during construction) are not degraded by uncontrolled invasive alien plants, stormwater, erosion, sediment and dust.
- turbines can be fitted with bat detectors and deterrent devices.
- curtailment is implemented as indicated above, *as soon as the first turbine starts operating*.
- operational bat monitoring is performed.

Although this present assessment was commissioned when edition 4.1 of the South African pre-construction bat monitoring guidelines (Sower *et al*. 2017) were applicable, edition 5 of the South Africa pre-construction bat monitoring guidelines (MacEwan *et al.* 2020), which was released on 8 June 2020, stipulates that:

> "*Should an application for environmental authorisation only be submitted 5 years or more after the completion of the fieldwork period:*
>
> *• For a =/>20 MW project, a bat specialist must conduct a minimum of an additional consecutive 6 months of on-site pre-construction bat monitoring sometime between October and May. The new data collected must be compared to the old data from the same period and an amended impact assessment must be conducted*."

Therefore, should further amendments for the Umsinde WEF be applied for, an additional six consecutive months of pre-construction bat monitoring (between October and May) will be required.

9. References

Aronson, J., Richardson, E., MacEwan, K., Jacobs, D., Marais, W., Taylor, P., Sowler, S., Hein. C. and Richards, L. 2020. South African Good Practice Guidelines for Operational Monitoring for Bats at Wind Energy Facilities. Edition 2. South African Bat Assessment Association, South Africa.

Child, M.F., Roxburgh, L., Do Linh San, E., Raimondo, D., and Davies-Mostert, H.T. 2016. *The Red List of Mammals of South Africa, Swaziland and Lesotho*. South African National Biodiversity Institute and the Endangered Wildlife Trust, South Africa.

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Sowler, S. & Stoffberg, S. 2012. *The South African Good Practice Guidelines for Surveying Bats in Wind Farm Developments.* Edition 2. Endangered Wildlife Trust, Johannesburg.

Sowler, S. & Stoffberg, S. 2014. *The South African Good Practice Guidelines for Surveying Bats at Wind Energy Facility Developments – Pre-construction*. Edition 3. Endangered Wildlife Trust, Johannesburg and the South African Bat Assessment Association, South Africa.

Sowler, S., Stoffberg, S., MacEwan, K., Aronson, J., Ramalho, R., Forssman, K., and Lötter, C. 2017. *South African Good Practice Guidelines for Surveying Bats at Wind Energy Facility Developments - Pre-construction*. Edition 4.1. South African Bat Assessment Association, South Africa.

MacEwan, K., Aronson, J., Richardson, E., Taylor, P., Coverdale, B., Jacobs, D., Leeuwner, L., Marais, W., Richards, L. 2018. *South African Bat Fatality Threshold Guidelines*. Edition 2. South African Bat Assessment Association, South Africa.

MacEwan, K., Sowler, S., Aronson, J., and Lötter, C. 2020. *South African Best Practice Guidelines for Pre-construction Monitoring of Bats at Wind Energy Facilities.* Edition 5. South African Bat Assessment Association, South Africa.

10. Appendix 1

Impact extent, intensity, duration, consequence, probability and significance were rated as indicated in **Table 10-1**. Impact consequence was calculated as the sum of impact extent, intensity and duration. Impact significance was calculated as the product of impact consequence and probability.

Table 10-1 Impact assessment criteria and their ratings

Extent		Intensity		Duration		Consequence		Probability		Significance	
Local	1	Low	1	Short-term	1	Very Low	3-4	Unlikely	1	Insignificant	3-11
Study area	2	Medium	2	Medium-term	2	Low	5-6	Possible	2	Low	12-20
Regional	3	High	3	Long-term	3	Medium	7-8	Probable	3	Medium	21-30
National	4	Very high	4	Permanent	4	High	9-10	Definite	4	High	31-39
						Very High	11-12			Very High	40-48

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 Amendment of the Phase 1 Umsinde Emoyeni Wind Energy Facility near Murraysburg, Western 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
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Private Bag X447
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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:	Inkululeko Wildlife Services (Pty) Ltd			
B-BBEE	Contribution level (indicate 1 to 8 or non-compliant)	4	Percentage Procurement recognition	100
Specialist name:	Kate MacEwan			
Specialist Qualifications:	BSc Honours Zoology			
Professional affiliation/registration:	PrSciNat 400123/05			
Physical address:	9074 Arrow Grass Way, Highlands Ranch, CO, 80126, USA			
Postal address:	Same as above			
Postal code:		Cell:	+1 720 201 7165	
Telephone:		Fax:		
E-mail:	kate@iws-sa.co.za			

2. DECLARATION BY THE SPECIALIST

I, ____Kate MacEwan_____, 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.

KMac.

Signature of the Specialist

Inkululeko Wildlife Services (Pty) Ltd

Name of Company:

23 July 2020.

Date

3. **UNDERTAKING UNDER OATH/ AFFIRMATION**

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

KMac.

Signature of the Specialist

Inkululeko Wildlife Services (Pty) Ltd

Name of Company

23 July 2020

Date

Sean Dy Foon

Signature of the Commissioner of Oaths

23rd July, 2020

Date

SEAN DY FOON
NOTARY PUBLIC
STATE OF COLORADO
NOTARY ID 20184043150
MY COMMISSION EXPIRES 11/06/2022

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)

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Kindly note the following:

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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
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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:	Inkululeko Wildlife Services (Pty) Ltd			
B-BBEE	Contribution level (indicate 1 to 8 or non-compliant)	Level 4	Percentage Procurement recognition	100%
Specialist name:	Dr Caroline Lötter			
Specialist Qualifications:	PhD (Zoology)			
Professional affiliation/registration:	South African Council for Natural Scientific Professions (SACNASP): Professional Natural Scientist (Pr.Sci.Nat.) in Zoology. Registration no.400182/09. South African Bat Assessment Association (SABAA). Membership no. 0055.			
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Postal address:	710 Penge Street, Faerie Glen, Pretoria			
Postal code:	0043	Cell:	079 313 3479	
Telephone:	N.a.	Fax:	N.a.	
E-mail:	caroline@iws-sa.co.za			

2. DECLARATION BY THE SPECIALIST

I, __Dr Caroline Lötter_____, 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.

CA Lötter

Signature of the Specialist

Inkululeko Wildlife Services (Pty) Ltd

Name of Company:

22 July 2020

Date

3. UNDERTAKING UNDER OATH/ AFFIRMATION

I, __Dr Caroline Lötter_____, 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

Inkululeko Wildlife Services (Pty) Ltd

Name of Company

22 July 2020

Date

Signature of the Commissioner of Oaths

22 July 2020

Date

SA POST OFFICE
BRANCH MANAGER
2020 -07- 22
FAERIE GLEN 0043
SA POST OFFICE

I certify that the DEPONENT has acknowledged that he/she knows and understands the contents of his affidavit, that he/she does not have an objection to taking the oath, and that he/she considers it to be binding on his/her conscience, and which was sworn to and signed before me and that the administering oath complied with the regulations contained in Government Gazette No. R 1258 of 21 July 1972, as amended

GLORIA MCHAWANE

SIGNATURE
Commissioner of Oaths

FULL NAMES

Designation ..... ex officio: Republic of South Africa Date: .....

Place ..... Business ...