ADDENDUM TO THE AVIFAUNAL IMPACT ASSESSMENT CONDUCTED FOR THE PROPOSED HAGA HAGA WIND ENERGY FACILITY (WEF)

EASTERN CAPE PROVINCE

APPLICATION FOR AMENDMENT OF ENVIRONMENTAL AUTHORISATION

Addendum report compiled by:

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EXECUTIVE SUMMARY

WKN Windcurrent received an Environmental Authorisation (EA) for the 150 MW Haga Haga Wind Farm in July 2019. Due to improvements in turbine technology, WKN Windcurrent is pursuing a Part II Amendment Process to, amongst others, increase the authorised turbine hub height and rotor diameter specifications. Given the potential changes to the turbine specifications and layout, a re-assessment of the potential impacts of the proposed 150MW Haga Haga WEF was carried out to establish if the original pre-mitigation assessment by Arcus (2018) should be revised, in light of the proposed changes.

It is concluded that the proposed changes will not result in any new impacts over and above what was identified in the original Avifaunal Impact Assessment Report (Arcus 2018). Two identified impacts' ratings could potentially be affected by the proposed changes, namely habitat loss and collisions with turbines. However, in both cases, after studying the extent of the proposed changes, it is concluded that the ratings will not change because the extent of the proposed changes is such that it will not affect the impact significance.

The proposed changes will not trigger any additional requirements as per the Cape Vulture best practice guidelines, which were published in August 2018, which would require additional fieldwork to be conducted, over and above what was already conducted. The mitigation measures proposed by Arcus (2018) would also not have to be adapted in light of the current published best practice guidelines, except in the case of Southern Ground Hornbill. Mitigation measures 1 - 5 (see Section 3.3 below) supersede all existing Environmental Authorisation conditions relating to the Southern Ground Hornbill. The proposed amendment is not expected to increase the overall risk of impact to the Southern Ground Hornbill presented by the wind farm. The reduction in the number of turbines and the commitment to maintaining a lower blade sweep of at least 40m is seen as positive.
The last fieldwork for the project was completed in May 2018, which is within the three-year envelope required by the best practice guidelines.

The proposed changes in the layout and turbine dimensions should not result in additional cumulative impacts.

Finally, it is concluded that Condition 42 in the Environmental Authorisation needs to be removed as it seems to have been added by mistake. In addition, Conditions 43 – 46 and Condition 58 need to be amended to make them more project-specific and capable of effective implementation.

1 Background

WKN Windcurrent received an Environmental Authorisation (EA) for the 150 MW Haga Haga Wind Farm in July 2019. Due to improvements in turbine technology WKN Windcurrent is pursuing a Part II Amendment Process to, amongst others, increase the authorised turbine hub height and rotor diameter specifications.

The proposed changes are listed in **Error! Reference source not found.** below.

Table 1: Proposed changes to the authorised specifications

COMPONENT	CURRENTLY AUTHORISED	PROPOSED AMENDMENT
Facility Output	*150 MW*	No change requested
Number of Turbines	*42*	36 turbines
Hub Height	*134 m*	Up to 180 m
Rotor Diameter	*150 m*	Up to 200 m
Tip Height	*200 m*	Up to 280 m
Turbine Output	*3.2 MW to 5 MW*	No limit
Turbine Base Footprint (per turbine)	*996 m^2*	No change requested
Hard Stand Area (per turbine)	*3 700 m^2*	No change requested
Storage Area	*140 000 m^2*	No change requested
Roads	*410 000 m^2 (6 m wide roads)*	425 000m^2 (8 m wide roads)
Substation	*11 000 m^2*	No change requested
Laydown Area	*10 000 m^2*	No change requested
Permanent Office Space and Workshop Space	*5 000 m^2*	No change requested
Temporary Construction Areas	*10 000 m^2*	No change requested
Remainder of Storage Area	*104 000 m^2*	No change requested
Total Footprint	*74.7232 ha*	73.4056 ha
Battery Storage	*None*	**New Addition on "Remainder of Storage Area" Footprint

2 Terms of Reference

Due to the proposed changes in **Error! Reference source not found.**, and in accordance with the National Environmental Management Act, 1988 (No. 107 of 1998) (NEMA), a re-assessment of potential impacts on the associated avifauna is required to be undertaken before an Amendment to Environmental Authorisation can be granted for the revised WEF development.

The Terms of Reference (ToR) for this addendum report are as follows:

- Assess the effect that the proposed changes will have on the following aspects:
  - the identified impacts;
  - the authorised mitigation measures (taking into account new best practice guidelines which have been published since the EA was granted);
  - the current EA conditions, taking into account new best practice guidelines which have been published since the EA was granted; and
  - cumulative impacts.

3 The effect of the proposed changes on the identified impacts

The impacts identified in the original Avifaunal Impact Assessment Report (Arcus 2018) are the following (see Table 2):

Table 2: Identified impacts and ratings

Impact	Rating pre-mitigation	Rating post-mitigation
Collision with turbines	High	Medium
Collision with power lines	Medium	Low
Electrocution	Low	Low
Disturbance and displacement	Medium	Low
Disruption of bird movements	Low	Low
Habitat loss	Medium	Low

3.1 Potential new impacts

The proposed changes will not result in any new impacts over and above what was identified in the original Avifaunal Impact Assessment Report (Arcus 2018).

3.2 Potential changes in the impact ratings

There are two impacts of which the ratings could potentially be affected by the proposed changes, namely habitat loss and collisions with turbines:

3.2.1 Habitat loss

The total footprint of the project will decrease by 1%. This reduction is not enough to affect the original rating, therefore the rating for this impact will remain unchanged at Medium pre-mitigation and Low post-mitigation. It should be noted that the applicant increased the buffer sizes applied to bird features to accommodate the larger blade when determining a Buildable Area for the amended layout.

3.2.2 Collisions with turbines

3.2.2.1 The relevance of turbine numbers and dimensions in avifaunal mortality risk

Most of the studies to date found turbine dimensions to play a relatively unimportant role in the magnitude of the collision risk relative to other factors such as topography, turbine location, morphology, behaviour and a species' inherent ability to avoid the turbines, and may only be relevant in combination with other factors, particularly wind strength and topography (see Howell 1997, Barrios & Rodriguez 2004; Barclay *et al.* 2007, Krijgsveld *et al.* 2009, Smallwood 2013; Everaert 2014). Three (3) studies found a correlation between hub height and mortality (De Lucas *et al.* 2008; Loss *et al.* 2013 and Thaxter *et al*. 2017).

The summary below provides a list of published findings on the topic:

- Howell *et al.* 1997 states on p.9: "*The evidence to date from the Altamont Pass does not support the hypothesis that the larger rotor swept area (RSA) of the KVS–33 turbines contributes proportionally to avian mortality, i.e. larger area results in more mortalities. On the contrary, the ratio of K-56 turbines to KVS-33 turbines rather than RSA was approximately 3.4:1 which as consistent with the 4.1:1*

mortality ratio. It appears that the mortality occurred on a per-turbine basis, i.e. that each turbine simply presented an obstacle."

- Barrios & Rodriguez 2004 states on p. 80: "*Most deaths and risk situations occurred in two rows at PESUR with little space between consecutive turbines. This windwall configuration (Orloff & Flannery 1992) might force birds that cross at the blade level to take a risk greater than in less closely spaced settings. However, little or no risk was recorded for five turbine rows at PESUR having exactly the same windwall spatial arrangement of turbines. Therefore, we conclude that physical structures had little effect on bird mortality unless in combination with other factors*."
- Barclay *et al.* 2007 states on p. 384: "*Our analysis of the data available from North America indicates that this has had different consequences for the fatality rates of birds and bats at wind energy facilities. It might be expected that as rotor swept area increased, more animals would be killed per turbine, but our analyses indicate that this is not the case. Rotor-swept area was not a significant factor in our analyses. In addition, there is no evidence that taller turbines are associated with increased bird fatalities. The per turbine fatality rate for birds was constant with tower height*."
- De Lucas *et al.* 2008 states on p. 1702: "*All else being equal, more lift is required by a griffon vulture over a taller turbine at a higher elevation and we found that such turbines killed more vultures compared to shorter turbines at lower elevations*".
- Krijgsveld *et al.* 2009 states on p. 365: "*The results reported in this paper indicate that collision risk of birds with larger multi-MW wind turbines is similar to that with smaller earlier-generation turbines, and much lower than expected based on the large rotor surface and high altitude-range of modern turbines. Clearly, more studies of collision victims are needed before we can confidently predict the relationship between size and configuration of wind turbines and the risk for birds to collide with a turbine*."
- Smallwood *et al*. 2013 states on p.26 – 27 (see also Fig 9 on p.30): "*Red-tailed hawk (Buteo jamaicensis) and all raptor fatality rates correlated inversely with increasing wind-turbine size (Figs. 9A, B). Thousands of additional MW of capacity were planned or under construction in 2012, meaning that the annual toll on birds and bats will increase. However, the expected increase of raptor fatalities could be offset by reductions of raptor fatalities as older wind projects are repowered to new, larger wind turbines, especially if the opportunity is taken to carefully site the new wind turbines (Smallwood and Karas 2009, Smallwood et al. 2009)."*
- Loss *et al.* 2014 states on p. 208: "*The projected trend for a continued increase in turbine size coupled with our finding of greater bird collision mortality at taller turbines suggests that precaution must be taken to reduce adverse impacts to wildlife populations when making decisions about the type of wind turbines to install*."
- Everaert, 2014 states on p. 228: "*Combined with the mortality rates of several wind farms in the Netherlands (in similar European lowland conditions near wetlands or other areas with water), no significant relationship could be found between the number of collision fatalities and the rotor swept area of the turbines (Fig. 4). In contrast to more common landscapes, Hötker (2006) also found no significant relationship between mortality rate and the size of wind turbines near wetlands and mountain ridges*."
- In the most recent paper on the subject by Thaxter *et al*. (2017), the authors conducted a systematic literature review of recorded collisions between birds and wind turbines within developed countries. They related collision rate to species-level traits and turbine characteristics to quantify the potential vulnerability of 9 538 bird species globally. For birds, larger turbine capacity (megawatts) increased collision rates; however, deploying a smaller number of large turbines with greater energy output reduced total collision risk per unit energy output. In other words, although there was a positive relationship between wind turbine capacity and collision rate per turbine, the strength of this relationship was insufficient to offset the reduced number of turbines required per unit energy

generation with larger turbines. *Therefore, to minimize bird collisions, wind farm electricity generation capacity should be met through deploying fewer, large turbines, rather than many, smaller ones*.

3.2.2.2 Re-assessment of collision mortality impact

Thaxter *et al*. (2017) analysed the relationship between the number and size of turbines, and the collision risk to birds. They found that the number of turbines is the most important factor as far as the collision risk is concerned, more so than the size of the turbine. In other words, even if the total output remains the same, by employing fewer, larger turbines, the collision risk will be reduced. They also found that the relationship between the total number of turbines and the collision risk is non-linear, with the collision risk exponentially higher for more, smaller turbines vs. fewer larger turbines (see Figure 1 below, taken from their 2017 paper).

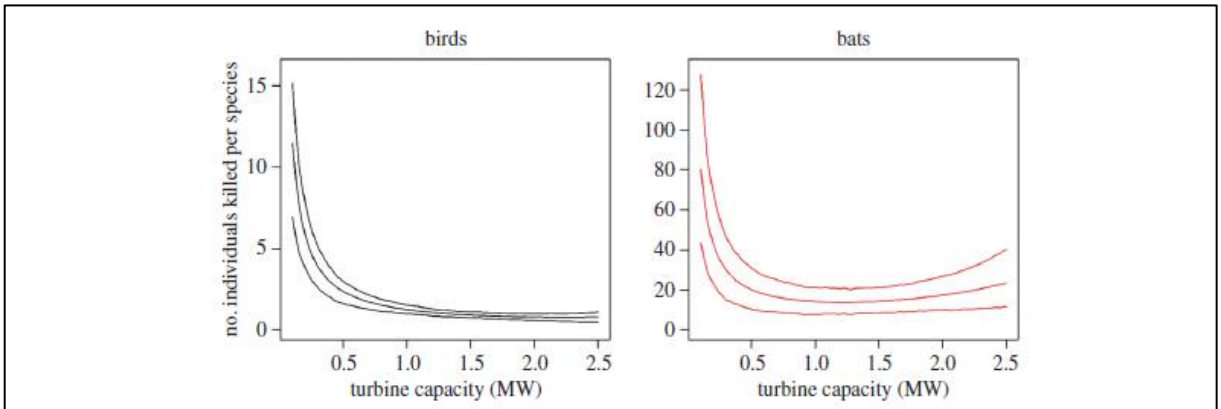

Figure 4. The mean total mortality rate across species for a hypothetical 10 MW wind farm, shown in relation to individual turbine capacities (which in turn require different numbers of wind turbines to meet the same capacity). Lines represent posterior means and 95% upper and lower credible intervals.

Figure 1: Exponential curve indicating the relationship between collision mortality and number of turbines

By visually assessing the graph in Figure 1, it was deduced that the collision risk (number of birds killed) reduces by approximately half the percentage points reduction in turbines i.e. if the number of turbines are reduced by 50%, the number of birds killed will reduce by approximately 25%. In this instance, the reduction in turbines amounts to 14%, which gives an estimated reduction in mortality of around 7%. Thus the proposed changes will result in a slight decrease in the collision risk due to the use of fewer turbines, however, the reduction is not enough to warrant a change in the original pre-mitigation impact significance rating potential collision mortality of High pre-mitigation, and Medium post-mitigation.

Since the original Avifauna Impact Assessment Report was compiled in June 2018, the Cape Vulture best practice guidelines[1] were formally released in August 2018. However, the draft vulture guidelines were taken into account when the report was compiled in June 2018, and the report was informed by specific fieldwork that was conducted in response to the requirements of the vulture guidelines. The proposed changes will not trigger any additional requirements brought about by the Cape Vulture best practice guidelines, which would necessitate additional fieldwork to be conducted, over and above what was already conducted.

3.3 Mitigation measures

[1] Pfeiffer M & Ralston-Paton S. 2018. Cape Vultures and Wind Farms. Guidelines for impact assessment, monitoring and mitigation. BirdLife South Africa, August 2018.

An assessment was undertaken to determine if the mitigation measures originally proposed for the Haga Haga WEF by Arcus (2018) require any changes in the authorised mitigation measures. In doing this, cognisance was taken of the following factors:

- The time that had lapsed since the field work was completed for the project. The "Best Practice Guidelines for Avian Monitoring and Impact Mitigation at Proposed Wind Energy Development Sites in Southern Africa", (Jenkins *et al*. 2011) revised in 2015, requires that either all, or part of the pre-construction monitoring is repeated if there is a time period of three (3) years or more between the data collection and the construction of the wind farm. This re-assessment is necessary in order to take cognisance of any changes in the environment which may affect the risk to avifauna, and to incorporate the latest available knowledge into the assessment of the risks. The last fieldwork for the project was completed in May 2018, which is within the three-year envelope required by the best practice guidelines.
- The publication of the Cape Vulture best practice guidelines in August 2018. The mitigation measures proposed by Arcus (2018) need not be adapted in the light of these guidelines.
- An updated set of recommendations dated 2 November 2020 from Dr Lucy Kemp for the management of the potential impacts on Southern Ground Hornbills (see Appendix 1).

Based on the above, the following changes to the mitigation measures originally proposed by Arcus (2018) for Southern Ground Hornbill will be required:

- Table 9: Impact Rating Table for Collisions with Wind Turbines – Operational Phase: *Turbines should be set back 300 m from rivers and 280 m from drainage lines and large alien stands of trees (possible roost sites), and wherever possible turbines should avoid wide open grass plains (preferred foraging areas). Placement may also be at least 300m within patches of denser ground cover unattractive to SGH, as an alternative to use of open <50cm ground cover that they prefer.* **This recommendation falls away and is replaced by the following set of recommendations:**

    1. The minimum number of turbines for the required MW output should be constructed.
    2. Turbine positions should be a minimum distance of 1 km from existing nest locations.
    3. Where nest locations are located within 1km of a turbine position prior to construction, a suitable alternative man-made nest site must be identified by a suitable specialist (from or approved by the manager of the Mabula Ground Hornbill Project). In the instance where a suitable alternative nest site cannot be identified, the high-risk turbine/s, where possible, should be moved, or an alternative solution must be agreed upon with the avifaunal specialist.
    4. The minimum clearance distance of the turbine blade tip should not be less than 40m from the ground.
    5. A detailed research study, of one year minimum (involving tracking using a suitable, safe, tail-mounted tracking device) and funded by the wind farm, should be undertaken prior to the commencement of operations of the wind farm, the results of which could, for example, be used to further inform the nest management plan, an overall habitat management plan and species guidelines for wind farm development.

Mitigation measures 1-5 supersede all existing Environmental Authorisation conditions relating to the Southern Ground Hornbill. The proposed amendment is not expected to increase the overall risk of impact to the Southern Ground Hornbill presented by the wind farm. The reduction in the number of turbines and the commitment to maintaining a lower blade sweep of at least 40m is seen as positive.

3.4 Conditions of the Environmental Authorisation

It is recommended that Condition 42 is removed as it refers to a non-existing Verreaux's Eagle nest. It seems this condition was added by mistake.

It is further recommended that the following conditions are amended in the following manner to make them more specific to the project, and capable of effective implementation:

- Condition 43: If a priority species nest is found during the construction phase, the avifaunal specialist must be contacted immediately for further assessment of the situation and instructions to proceed.
- Condition 44: The applicant must make financial provision for the implementation of operational phase monitoring as required by the latest edition of the "Best Practice Guidelines for Avian Monitoring and Impact Mitigation at Proposed Wind Energy Development Sites in Southern Africa", (Jenkins *et al.* 2011). The applicant must also make financial provision for a research study on Southern Ground Hornbills, aimed at locating all active nests on the site, establishing the movement patterns of any resident birds and formulating procedures to be followed to minimise any disturbance to breeding birds.
- Conditions 45 and 46: In the unlikely event that high passage rates for Cape Vultures are recorded during the operational monitoring, measures must be implemented in consultation with the avifaunal specialist to prevent birds from being exposed to collision risks. This may include the timeous removal of live-stock carcasses from the site.
- Condition 58: The results of the pre-construction bird and bat monitoring assessments including all recommendations proposed by the addendum report dated November 2020, must inform the final lay-out and the construction schedule of the facility.

3.5 Cumulative impacts

The proposed changes in the layout and turbine dimensions should not result in additional cumulative impacts.

4 Conclusions

It is concluded that the proposed changes will not result in any new impacts over and above what was identified in the original Avifaunal Impact Assessment Report (Arcus 2018). Two identified impacts' ratings could potentially be affected by the proposed changes, namely habitat loss and collisions with turbines. However, in both cases, after studying the extent of the proposed changes, it is concluded that the ratings will not change because the extent of the proposed changes is such that it will not affect the impact significance.

The proposed changes will not trigger any additional requirements as per the Cape Vulture best practice guidelines, which were published in August 2018, which would require additional fieldwork to be conducted, over and above what was already conducted. The mitigation measures proposed by Arcus (2018) would also not have to be adapted in light of the current published best practice guidelines, except in the case of Southern Ground Hornbill. Mitigation measures 1 - 5 supersede all existing Environmental Authorisation conditions relating to the Southern Ground Hornbill. The proposed amendment is not expected to increase the overall risk of impact to the Southern Ground Hornbill presented by the wind farm. The reduction in the number of turbines and the commitment to maintaining a lower blade sweep of at least 40m is seen as positive.

The last fieldwork for the project was completed in May 2018, which is within the three-year envelope required by the best practice guidelines.

The proposed changes in the layout and turbine dimensions should not result in additional cumulative impacts.

Finally, it is concluded that Condition 42 in the Environmental Authorisation need to be removed as it seems to have been added by mistake. In addition, Conditions 43 – 46 and 58 need to be amended to make them more project - specific and capable of effective implementation.

5 References

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APPENDIX 1

MABULA
GROUND HORNBILL
PROJECT

Home: Mabula Private Game Reserve
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Cell: +27 (0) 83 289 8610
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2 November 2020,

To whom it may concern,

RE: Amendment to the current Haga Haga Wind Farm environmental authorisation

I have been requested to reassess the mitigation measures for Southern Ground-Hornbills at the proposed Haga Haga wind farm site, in light of the following proposed amendments for:

- Reduction in turbine number from 42 up to 36;
- Increase in Rotor Diameter up to 200m;
- Increase in Hub Height up to 180m;
- Increase in Tip Height up to 280m;
- Battery Storage.

In light of this, the following mitigation measures are required:

1. The minimum number of turbines for the required MW output should be constructed.
2. Turbine positions should be a minimum distance of 1 km from existing nest locations.
3. Where nest locations are located within 1km of a turbine position prior to construction, a suitable alternative man-made nest site must be identified by a suitable specialist (from or approved-by the manager of the Mabula Ground Hornbill Project). In the instance where a suitable alternative nest site cannot be identified, the high-risk turbine/s, where possible, should be moved, or an alternative solution agreed upon with the specialist.
4. The minimum clearance distance of the turbine blade tip should not be less than 40m from the ground.
5. A detailed research study, of one year minimum (involving tracking using a suitable, safe, tail-mounted tracking device) and funded by the wind farm, should be undertaken prior to the commencement of operations of the wind farm, the results of which could, for example, be used to further inform the nest management plan, an overall habitat management plan and species guidelines for wind farm development.

The above proposed measures supersede all existing Environmental Authorisation conditions relating to the Southern Ground Hornbill. The proposed amendment is not expected to increase the overall risk of impact to the Southern Ground Hornbill presented by the wind farm. The reduction in the number of turbines and the commitment to maintaining a lower blade sweep of at least 40 m is seen as positive.

Yours sincerely,

Dr Lucy Kemp
Project Manager: Mabula Ground Hornbill Project
Chair: South African Southern Ground-Hornbill Action Group