MAINSTREAM RENEWABLE POWER

Amendment Report for the Application of a Substantive Amendment to the Environmental Authorisation issued for the development of the 140 MW Sutherland Wind Energy Facility, Sutherland, Northern and Western Cape Provinces

Sutherland

FINAL AMENDMENT REPORT

APPENDIX C:

Specialist inputs and Specialist's Declaration of Interest

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APPENDIX C.1:

Specialist inputs

C.1.1 Terrestrial Ecology
C.1.2 Avifauna
C.1.3 Bats
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APPENDIX C.1.1:

Terrestrial Ecology

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Attention: CSIR EMS Manager
Minnelise Levendal
11 Jan Celliers Road
Stellenbosch
P O Box 320
7599

Attention : Ms M Levendal

Sent via email

17 September 2019

Dear Minnelise,

AMENDMENT 3. COMMENT & OPINION ON THE ECOLOGICAL IMPACTS ASSOCIATED WITH AMENDMENTS TO THE TURBINE SPECIFICATIONS FOR THE SUTHERLAND WIND ENERGY FACILITY NEAR SUTHERLAND IN THE NORTHERN AND WESTERN CAPE PROVINCE.

We have been requested by CSIR to consider the proposed amendments to the turbine specifications and amended layout of turbines for the proposed Sutherland Wind Energy Facility (WEF) in the Sutherland area of the Northern and Western Cape. South Africa Mainstream Renewable Power Developments (PTY) Ltd (hereinafter referred to as Mainstream) has already obtained an Environmental Authorisation for the Sutherland Renewable Energy Facility in 2012 (DEA Ref: 12/12/20/1782). This facility included the Rietrug, Sutherland and Sutherland 2 WEFs. The larger facility has subsequently been split into the three separate WEFs following an amendment process. These wind farms are known as the Rietrug, Sutherland and Sutherland 2 WEFs.

The hub height and rotor diameter of the Sutherland WEF has been amended to 150 m with the latest Environmental Authorisation issued on 25 August 2017 (DEA Reference: 12/12/20/1782/2/AM2).

Mainstream is now applying for an additional amendment to increase the hub height and rotor diameter from 150 m to up to 200 m.

It is our opinion that these amendments will not result in any change to our opinions, findings, assessment ratings and recommendations as contained in our Terrestrial Ecological report dated December 2016. The significance of impacts identified in this report are provided below.

Sutherland	1.Change in structure of vegetation at a physical level 2. Change in propagule dispersion modes and habitat species composition.	1.Physiological changes in smaller mammals and invertebrates leading to ousting of species from some areas to the lee of the WEF. 2.Behavioural change in animals in and around turbines due to noise.	Low to Very low

The salient mitigation measures provided in the previous Terrestrial Ecology Report (Bundy, 2016) as indicated below are still applicable to the current Amendment application and should be adhered to:

- The turbines should not be sited at points below the 1600m amsl; and
- The final footprint of each turbine, as well as support infrastructure should be subject to specific site evaluation.

Kind regards

Simon Bundy (Pr.Sci. Nat)

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APPENDIX C.1.2:

Avifauna (Birds)

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ADDENDUM TO THE AVIFAUNAL IMPACT ASSESSMENT CONDUCTED FOR THE PROPOSED SUTHERLAND WIND ENERGY FACILITY (WEF) NEAR SUTHERLAND, NORTHERN CAPE PROVINCE

APPLICATION FOR AMENDMENT OF ENVIRONMENTAL AUTHORISATION

Addendum report compiled by:

Chris van Rooyen and Albert Froneman

August 2019

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EXECUTIVE SUMMARY

The purpose of this addendum report is to revisit the avifaunal impact assessment for the proposed Sutherland Wind Energy Facility (WEF) near Sutherland in the Northern Cape (Jenkins 2011, Van Rooyen *et al*. 2016), based on a proposed amendment application to the environmental authorisation in 2019. The proposed changes are provided in **Table 2** below.

Table 1: Proposed turbine dimensions amendments

Aspect	Authorised	Proposed amendment
Hub height	Up to 150m	Up to 200m
Rotor diameter	Up to 150m	Up to 200m

Given the potential changes to the turbine specifications, a re-assessment of the potential turbine collision impact was carried out in light of the proposed amendment, in order to establish if the original pre-mitigation assessments (Jenkins 2011, Van Rooyen *et al*. 2016) should be revised, and if the original mitigation measures need to be revised.

The original Bird Specialist Study (Jenkins 2011) identified one suspected Verreaux's Eagle nest and recommended a 1.5km turbine free buffer area around the nest. This study further recommended a 500m turbine free buffer along the edge of the escarpment and also that one blade of each turbine be painted black in an experimental approach on a sample of high risk turbines to test the efficiency of this mitigation measure. The subsequent pre-construction bird monitoring (Van Rooyen *et al*. 2016) confirmed the presence of two active Verreaux's Eagle nests and recommended 3km turbine free buffer areas around these in accordance with the BLSA guidelines specific to Verreaux's Eagles (Ralston-Paton 2017). A 2km turbine free buffer area was recommended around an inactive Verreaux's Eagle nest. The 500m no-turbine buffer area along the escarpment was also recommended.

Searches for new raptor nests were repeated by Chris van Rooyen Consulting during June and July 2019. A new active Verreaux's Eagle nest was located at 32°39'50.76"S, 20°51'16.02"E and an inactive alternate nest of the same pair located at 32°39'43.41"S, 20°51'49.07"E.

In order to retain a residual impact significance rating of "medium", the following additional mitigation measures need to be implemented, should the proposed amendment application be approved:

- The number of turbines needs to be reduced from the authorised 56 to a maximum of 39 turbines to reduce the collision risk for raptors.
- The 500m turbine-free buffer zone along the edge of the escarpment should be increased to a minimum of 660m.
- A 3km turbine-free buffer zone must be implemented around each of the two Verreaux's Eagle nests located at 32°39'50.76"S, 20°51'16.02"E and 32°39'43.41"S, 20°51'49.07"E.

The revised mitigation measures are subject to a walk-through by the avifaunal specialist prior to the construction commencing, to confirm the location and status of all priority species nests within the area of influence of the wind farm.

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1 Background

The purpose of this addendum report is to revisit the avifaunal impact assessment for the proposed Sutherland Wind Energy Facility (WEF) near Sutherland in the Northern Cape (Jenkins 2011, Van Rooyen *et al*. 2016), based on a proposed amendment application to the environmental authorisation in 2019. The proposed changes are provided in **Table 2** below.

Table 2: Proposed turbine dimensions amendments

Aspect	Authorised	Proposed amendment
Hub height	Up to 150m	Up to 200m
Rotor diameter	Up to 150m	Up to 200m

2 Terms of reference

Due to the proposed changes in **Table 2**, and in accordance with the National Environmental Management Act, 1998 (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 impact which is specifically relevant in this instance is the risk of priority species mortality due to collisions with the turbines.**

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

- Assess the impacts related to the proposed change from the authorised turbine specifications (if any);
- Assess advantages or disadvantageous of the proposed change in turbine specifications (comparative assessment between the authorised hub height and rotor diameter, versus the proposed specifications); and
- Identify additional or changes to the mitigation measures required to avoid, manage or mitigate the impacts associated with the proposed turbine specifications (if any).

3 The findings of the original bird impact assessment reports

The original Bird Specialist Study (Jenkins 2011) identified risks (**Table 3**) of bird collisions with the wind turbines.

Table 3: Original bird collision risk

Environmental parameter	Impact	Rating prior to mitigation	Rating post mitigation
Avifauna	Operational phase - mortality	Medium-high	Medium

The key species which were identified in the original Bird Specialist Study and the subsequent Pre-Construction Monitoring as being most at risk were Jackal Buzzard *Buteo rufofuscus*, Verreaux's Eagle *Aquila verreauxii*, and Martial Eagle *Polemaetus bellicosus*.

4 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. 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.*

The rotor diameter of 150m for the Sutherland WEF translates into a rotor swept area of approximately 17 671m² per turbine for each of the 56 authorised turbines. An increase of the rotor diameter to 200m will result in a rotor swept area of approximately 31 415m². This amounts to an increase of 77.8% in the rotor swept area per turbine.

5 Re-assessment of collision mortality impact

Given the proposed changes to the turbine specifications, a re-assessment of the potential collision impact was carried out for the proposed amendment. The increase of 77.8% in rotor swept area per turbine is significant, and unless the number of turbines is reduced, it will inevitably result in an increase in the overall residual collision risk for priority species from **"medium"** to **"high"**. However, should the number of turbines be reduced, it will result in the residual collision rating of **"medium"** remaining unchanged, depending on the extent of the reduction in the number of turbines.

6 Revised mitigation measures

The mitigation measures originally proposed for the Sutherland WEF by Jenkins (2011) and Van Rooyen *et al.* (2016) need to be revisited in light of two factors:

- The proposed increase in the rotor diameter will result in an increased risk of collisions for priority species (see Section 5 above).
- 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, require that either all, or part of the pre-construction monitoring is repeated if there is a time period of three 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. In order to give effect to this requirement, nest searches were repeated in June and July 2019 by Chris van Rooyen Consulting to ensure up to date information on the breeding status of priority species at the proposed Sutherland WEF.

Since the original Bird Specialist Studies were completed in 2011 and 2016, the local knowledge with regard to the impacts of wind turbines on avifauna in South Africa has increased significantly with the experienced gained from operational wind farms, see for example (Ralston-Patton *et al.* 2017). This

has also resulted in the publication of two new sets of guidelines, one for Cape Vultures (Pfeiffer *et al.* 2018) and one for Verreaux's Eagles (Ralston-Patton 2017), while work is almost finished on one for Black Harriers. Guidelines for a range of other sensitive species are also planned, including Martial Eagles, as they have proven to be highly vulnerable to wind turbine collisions.

The original Bird Specialist Study (Jenkins 2011) identified one suspected Verreaux's Eagle nest and recommended a 1.5km turbine free buffer area around the nest. This study further recommended a 500m turbine free buffer along the edge of the escarpment and also that one blade of each turbine be painted black in an experimental approach on a sample of high risk turbines to test the efficiency of this mitigation measure. The subsequent pre-construction bird monitoring (Van Rooyen *et al.* 2016) confirmed the presence of two active Verreaux's Eagle nests and recommended 3km turbine free buffer areas around these in accordance with the BLSA guidelines specific to Verreaux's Eagles (Ralston-Paton 2017). A 2km turbine free buffer area was recommended around an inactive Verreaux's Eagle nest. The 500m no-turbine buffer area along the escarpment was also recommended.

Searches for new raptor nests were repeated by Chris van Rooyen Consulting during June and July 2019. A new active Verreaux's Eagle nest was located at 32°39'50.76"S, 20°51'16.02"E and an inactive alternate nest of the same pair located at 32°39'43.41"S, 20°51'49.07"E.

In order to retain a residual impact significance rating of "medium", the following additional mitigation measures need to be implemented, should the proposed amendment application be approved:

- The number of turbines needs to be reduced from the authorised 56 to a maximum of 39 turbines to reduce the collision risk for raptors.
- The 500m turbine-free buffer zone along the edge of the escarpment should be increased to a minimum of 660m.
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7 Cumulative impacts

The cumulative impacts of the proposed WEF was re-assessed, taking into account the proposed amended turbine dimensions. In doing so, the following projects within a 20km radius around the WEF were considered:

- Sutherland 2 Wind Project (Applicant - Mainstream)
- Rietrug Wind Project (Applicant - Mainstream)
- Suurplaat WEF (Applicant – Moyeng Energy)
- Maralla East WEF (Applicant – Mainstream)
- Maralla West WEF (Applicant – Mainstream)
- Hidden Valley WEF (Applicant – Great Karoo Wind Farm)
- Roggeveld Wind Project (Applicant - Building Energy/G7)
- Roggeveld II Wind Project (Applicant - Building Energy/G7)
- Komsberg East Wind Project (Applicant -Komsberg Wind Farms)
- Komsberg West Wind Project (Applicant -Komsberg Wind Farms)
- Great Karoo Wind Project (Applicant - ACED/EGP)
- Arusa Wind Project (Applicant - ACED/EGP)
- Soetwater Wind Project (Applicant - ACED/EGP)
- Gunstfontein Wind Project (Applicant – Gunstfontein Wind Farm)

After careful consideration, it was concluded that the original findings on the cumulative impact of the Sutherland WEF remains unaltered, taking into account the proposed amendment. The greatest potential concern is for the large raptor species, particularly Verreaux's Eagle and Martial Eagle, due to

their low numbers and vulnerability to turbine collisions. The combined cumulative impact of renewable developments on priority species, and particularly wind energy developments on Red Data Verreaux's Eagle and Martial Eagle within the 20km radius, is potentially significant at a local or even regional scale, even with the application of mitigation measures such as buffer zones around nests, should all of these projects eventually get to be constructed. The impact should be less severe at a national level, due to the large distribution ranges of the species, but should nonetheless be carefully monitored.

8 Conclusions

Given the potential changes to the turbine specifications, a re-assessment of the potential turbine collision impact was carried out in light of the proposed amendment, in order to establish if the original pre-mitigation assessments (Jenkins 2011, Van Rooyen *et al*. 2016) should be revised and if the original mitigation measures need to be revised.

A re-assessment of the potential collision impact was carried out for the proposed amendment. The increase of 77.8% in rotor swept area per turbine is significant, and unless the number of turbines is reduced, it will inevitably result in an increase in the overall residual collision risk for priority species from "medium" to "high". However, should the number of turbines be reduced, it will result in the residual collision rating of "medium" remaining unchanged, depending on the extent of the reduction in the number of turbines.

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The revised mitigation measures are subject to a walk-through by the avifaunal specialist prior to the construction commencing, to confirm the location and status of all priority species nests within the area of influence of the wind farm.

9 References

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MAINSTREAM RENEWABLE POWER

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FINAL AMENDMENT REPORT

APPENDIX C.1.3:

Bats

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BAT IMPACT ASSESSMENT: AMENDMENT

DECLARATION OF INDEPENDENCE

In terms of the National Environmental Management Act of 1998, I, Stephanie C Dippenaar, owner of Stephanie Dippenaar Consulting, operating as a sole proprietor, do hereby declare that I have no conflicts of interest related to the work of this Second Amendment of the Bat Impact Assessment Report: Sutherland Wind Energy Facility, Northern Cape. I have no personal or financial connections to the relevant property owners, developers, planners, financiers or consultants of the development.

Stephanie C Dippenaar

Signed at Stellenbosch on 15 July 2019

BAT IMPACT ASSESSMENT AMENDMENT: SUTHERLAND WEF

1. PROJECT DESCRIPTION

South Africa Mainstream Renewable Power Developments (Pty) Ltd received Environmental Authorisation (EA) from the Department of Environmental Affairs (DEA) for development of the Sutherland Wind Farm, located near the town of Sutherland near the border of the Western and Northern Cape Provinces. An initial bat sensitivity study was conducted in 2010 (Jacobs, 2010) and a 12-month preconstruction monitoring study was carried out over 2015 – 2016 (Animalia, 2017). Mainstream is currently submitting an amendment application to the DEA to modify turbine specifications. Stephanie Dippenaar Consulting has been contracted by Mainstream Renewable Power South Africa to undertake an assessment of the project amendments (Table 1) with regards to the potential impacts to bats No limitations were encountered during the compilation of this Amendment.

Table 1: Aspects of the proposed amendment

Aspect to be amended	Previously assessed	Proposed amendment
Hub height	Up to 150 m	Up to 200 m
Rotor diameter	Up to 150 m	Up to 200 m

Sutherland WEF will have a total capacity of 140MW, but the exact turbine specifications that will be deployed are not known yet. It is recommended that a maximum of 39 turbines are deployed, if turbines with a hub height of 200 m and a rotor diameter of 200 m are deployed. Should smaller turbines be deployed, more turbines might be installed.

The main negative impact of turbines on bats is the encroachment of air space where bats forage or commute. Table 2 and Figure 1 indicate the increase in the volume of the total sweep area, if turbine sweep is calculated as a sphere. For example, would 39 turbines be installed, with a hub height of 200 m and a rotor diameter of 200 m, there will be a 65,08% increase in sweep area. The lowest point of the sweep of the turbine blades is also indicated, as this could have an impact on bat mortality, see Section 1.1.

Table 2: Changes in area of collision

Aspect to be amended	Previously assessed (56 Turbines)	Proposed amendment (39 turbines)	Difference between previously assessed specifications and amendment
Total volume of the sweep of the turbine blades, if calculated as a sphere	0.098957 km^3	0.163358 km^3	0.064401 km^3 more airspace is occupied
Lowest point of the sweep of the turbine blades, from ground level	75 m	100 m	25 m higher from ground level

2. TERMS OF REFERENCE

The purpose and scope of this report is to assess whether the proposed amendments to the EA will alter the impacts identified in the two original bat impact assessments performed by David Jacobs (Specialist Reports on Bats – Proposed Renewable Facility at Sutherland (July 2010)) and Animalia Consultants (Pty) Ltd (Fifth and Final Progress Report of a 12-month Long-Term Bat Monitoring Study (January 2017)). Animalia are no longer undertaking bat assessments, hence a different Specialist (that did not undertake the preconstruction monitoring study) was appointed.

Amendments or additions to the mitigation measures in the existing Environmental Management Programme (EMPr) will be identified in this report in order to prevent, manage and mitigate impacts of the proposed turbine changes (if found to be necessary). The cumulative impacts (of wind energy developments within a 20 km radius of the WEF) identified in the original bat impact assessment will be reviewed considering the current developments and updated if necessary.

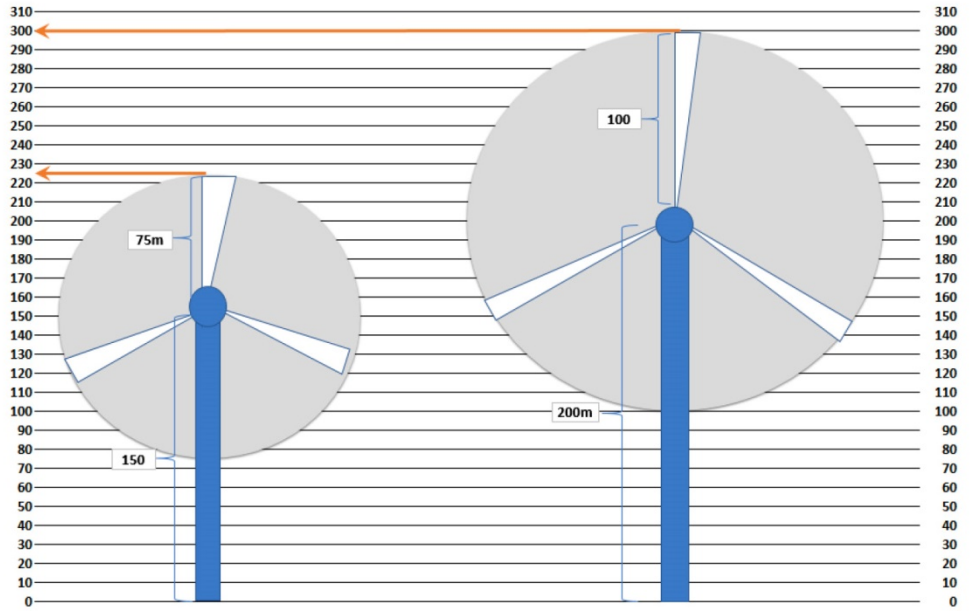

Figure 1: Changes in specifications of turbine dimension

3. METHODS

The current scientific literature was reviewed to gain insight into the relationship of turbine size on bat mortalities to aid in the assessment of the impacts of greater turbine hub height and rotor diameter. The literature was also reviewed for effective mitigation measures for the relevant impacts.

The original bat impact assessment report was reviewed with critical assessment of bat species richness and activity levels on site, the sensitivity map, impact assessment, cumulative impact assessment and recommended mitigation measures considering the proposed project amendments.

4. RESULTS

4.1 Literature review

The proposed increased turbine dimensions result in a larger rotor swept area and greater overall height per turbine. The impact relevant to this amendment is the change in risk of direct collision of bats in flight with moving turbine blades. Two studies by Barclay *et al.* (2007) and Georgiakakis *et al.* (2012) reported a positive exponential relationship of bat mortalities with turbine tower height, with no effect of the size of rotor sweep area (blade diameter). Whereas Rydell *et al.* (2010) found significant positive effects of tower height and rotor swept area with bat mortality. Studies by Johnson *et al.* (2003) and Fiedler *et al.* (2007) corroborated findings of increased mortalities with increased turbine dimensions. However, Thompson *et al.* (2017) performed a synthesis and review of mortality data from 218 North American studies representing 100 wind farms and did not find a significant relationship between increased turbine height and increased bat mortality. It is important to note that turbine specifications in the above-mentioned studies (hub height range of 44 m to 98 m and maximum rotor diameter of 180 m) are smaller than the maximum dimensions applied for in this amendment and, the wind farms consisted of much fewer turbines. Rydell *et al.* (2010) found the bat mortality rate to be independent of the size of the wind farm (number of turbines) however, the survey covered a maximum of 18 turbines which is substantially fewer than the authorised 56 for the Sutherland WEF.

Thaxter and co-workers (2017) undertook the first global quantitative assessment from published literature of the effects of wind farms on bat and bird mortality. They detected a strong positive association between turbine capacity (MW) and collisions per turbine for both bats and birds. Per wind farm energy output, a large number of small turbines resulted in higher predicted mortality rates than fewer larger turbines. The modelled mortality rate was highest when 1000 0.01MW turbines were used, thereafter the mortality rate decreased exponentially up to 1.2 MW turbines. The mortality for bats then increased again from 14 bats with 1.2 MW turbines, to 24 bats with 2.5 MW turbines. Thus, increasing the turbine dimensions with a reduction in total number of turbines would reduce mortality up to a point (1.2 MW turbines), thereafter mortality would increase with an increase in turbine dimensions.

The other consideration is that a greater turbine hub height increases the height of the lower blade tip from the ground, and may shift the species-specific risks towards open air foraging and high-flying species, such as the Molossidae family (Free-tailed bats), while reducing the risk for species flying closer to ground level (Wellig *et al.*, 2018). Wellig and co-workers (2018) investigated the vertical distribution of bat activity within the European Alps. They demonstrated a clear trend of decreased activity with increased height, most activity was recorded below 50 m height. Mathews *et al.* (2016) found greater species richness and activity levels at ground level than at heights between 30 and 80 m. Wind farm fatalities of clutter-edge foraging species, that do not typically occupy open air spaces high above the ground, have been found in South Africa (Aronson *et al.*, 2013; MacEwan, 2016). Additionally, the Bat Specialist/Consultant has observed the trend of higher activity and species richness at lower monitoring systems, usually situated around 10 m, in most preconstruction bat monitoring studies conducted across South Africa. Therefore, it seems that the proportion of bat species at risk may decrease with increased hub height, but open-air high-flying species would have an increased mortality risk.

4.2 Review of the Final Progress Report of 12-month Long-Term Bat Monitoring Study

4.2.1 Species richness and activity trends

Acoustic monitoring was conducted at 80 m height for a period of 12 months (10 November 2015 – 17 November 2016) on the meteorological mast on site without system failures. The height at which monitoring took place is an important consideration for the proposed amendment to assess the relevance of the trends in species richness and activity levels detected at 80 m height, relative to the proposed amended turbine specifications. The height at which monitoring took place is below the lowest reach of the proposed amendment

turbine sweep area, but if the specifications of the monitoring systems, namely SM3BAT, used at Sutherland are taken into account, at least some data might have been recorded within the sweep of the turbines

As expected, higher activity levels and species richness were detected at the 10 m recording height than 80 m height. *Tadarida aegyptiaca* (Eqyptian free-tail bat) and *Neoromicia capensis* (Cape serotine bat) were the most abundant species on site, while *T. aegyptiaca* was the most abundant species at the 80 m monitoring height. It is a high-flying species with a high risk of collision with turbine blades (Sowler *et al.*, 2017).

Bat activity levels varied substantially over the months of the year between the six monitoring systems deployed in the preconstruction EIA study; however, activity was reliably lower over the winter months (May – July). The peak activity periods identified in the EIA report are November 2015 – February 2016 and September – October 2016 (Animalia, 2017). Activity levels were typically higher over the first half of the night immediately following sunset, with a smaller secondary peak two to three hours before sunrise. Section 7 (Proposed initial mitigation measures and details) of the final EIA report sufficiently mitigates for the higher activity periods and higher risk species. The overall original impact was identified as very high negative without mitigation, and reduced to low negative with mitigations (Animalia, 2017). Mitigation conditions of the final EIA report must be implemented to all turbines situated within the moderate bat sensitivity areas as per the EIA report upon construction of the wind farm (Table 3). These mitigation measures should be refined as deemed necessary by the post construction bat specialist during post construction monitoring.

Table 3: Wind turbine mitigation schedule taken from the final EIA report

	Terms of mitigation implementation
Peak activity (times to implement curtailment/ mitigation)	Met Mast (10m): 12 November 2015 – 01 May 2016; sunset – 01:00
Environmental conditions in which to implement curtailment/ mitigation	Met Mast (10m): Wind speed below 7.5m/s *and* Temperature above 14.0°C
Peak activity (times to implement curtailment/ mitigation)	Met Mast (80m): 12 November 2015 – 10 January 2016; sunset – 01:00
Environmental conditions in which to implement curtailment/ mitigation	Met Mast (80m): Wind speed below 7.5m/s *and* Temperature above 12°C
Peak activity (times to implement curtailment/ mitigation)	Met Mast (80m): 18 January – 29 February 2016; sunset – 01:00
Environmental conditions in which to implement curtailment/ mitigation -	Met Mast (80m): Wind speed below 7m/s *and* Temperature above 14°C
Peak activity (times to implement curtailment/ mitigation)	Met Mast (80m): 5 September – 30 October 2016; sunset – 02:00
Environmental conditions in which to implement curtailment/ mitigation	Met Mast (80m): Wind speed below 6.5m/s *and* Temperature above 9.0°C

4.2.2 Sensitivity map

The sensitivity map of the bat monitoring report (Animalia, 2017) identified areas of moderate and high bat sensitivity and designated buffers of 150 m and 200 m, respectively. This Amendment concurs with the mitigation measures in the bat monitoring report:

- **Moderate sensitivity areas and buffers (150 m)**: Any turbines located within moderate buffer zones, or turbines with components within moderate buffer zones, are to receive priority during the operational monitoring study and mitigation measures must be applied from the start of operation, see Table 3 of this report.
- **High sensitivity areas and buffers (200 m):** These are 'no-go' areas for turbine placement. For this amendment, turbine blade tips must also be excluded from entering the buffer areas.

The Applicant must ensure that turbines are placed at an appropriate distance away from bat sensitivity areas, based on the finalized turbine dimensions. The turbine layout should be approved by a bat specialist upon finalisation of turbine specifications.

4.2.3 Impact assessment

Of the impacts identified in the EIA, only bat mortalities due to direct blade impact or barotrauma during foraging activities (Section 5.2 of the EIA report), is relevant to this amendment. The impact was identified as very high negative (score of -76) without mitigation, and reduced to low negative (score of -26) with mitigations. In order to maintain the impact as low negative, the following mitigations are proposed:

- Adhere to the bat sensitivity map as indicated in Section 4.2.2 and avoid development in the demarcated high sensitivity areas and buffers. Medium sensitivity areas and buffers should preferably be avoided, but would there be turbine components in these areas, mitigation will have to be applied and curtailment need to be put into place from the onset of the wind farm, as described in Section 7 of the final EIA report, also see Section 4.2.1 and Table 3 above;
- All turbines must be curtailed below cut in speed and not allow for freewheeling from the start of operation. Bat activity is markedly higher over low wind speed periods. Preventing freewheeling should not affect energy production significantly and will be a significant bat conservation mitigation measure.
- A maximum amount of 39 turbines, with a hub height of 200 m and a rotor diameter of 200 m, is proposed within the provided total output of 140 MW. If more than 39 turbines with these specifications are installed, then mitigations as described in Table 3 will be applicable. Would smaller turbines be deployed, more turbines may be installed, but with agreement of a bat specialist.
- An operational bat monitoring study should be in place at the start of the wind farm operation and should be implemented immediately after construction of turbines. Mitigation measures outlined by the Bat Specialist during the operational monitoring study should be applied with due diligence;
- Install bat detectors at height as advised by the post construction bat specialist, preferably at hub height at the appropriate turbines, with the deployment of the turbines;
- Mitigation measures are subject to a bat specialist walk through, as deemed necessary by the specialist, prior to construction, to confirm avoidance of priority species roost sites and appropriate buffer areas;

Considering the greater turbine dimensions proposed in the amendment application, the impact would remain as assessed in the final EIA report, on condition of implementation of the above listed mitigation measures, the mitigation recommendations from the final EIA report (described in section 4.2.1 of this report), and sensitivity buffer calculation recommended in section 4.2.2 of this report.

4.2.4 Cumulative impact assessment

The pertinent threat to bats, from the cumulative impact of several wind energy facilities operating within a single general area, is mortality from turbine blade collision and barotrauma. In an area such as the Komsberg REDZ there is potential for significant loss of locally active bats and migratory bats that could essentially reduce the effective population size and may cause population crashes. The Amendment conclude with the Bat Monitoring Report (Animalia, 2017), which states the cumulative impact as very high negative without mitigation and medium negative with mitigation.

According to the DEA's Renewable Energy EIA Application Database for SA (First quarter 2019), there are currently several authorised wind farms within a 20 km radius of the Sutherland WEF, namely:

- Sutherland II Wind Project (Applicant - Mainstream)
- Rietrug Wind Project (Applicant - Mainstream)
- Suurplaat WEF (Applicant – Moyeng Energy)
- Maralla East WEF (Applicant – Mainstream)
- Maralla West WEF (Applicant – Mainstream)
- Hidden Valley WEF (Applicant – Great Karoo Wind Farm)
- Roggeveld Wind Project (Applicant - Building Energy/G7)

- Roggeveld II Wind Project (Applicant - Building Energy/G7)
- Komsberg East Wind Project (Applicant -Komsberg Wind Farms)
- Komsberg West Wind Project (Applicant -Komsberg Wind Farms)
- Great Karoo Wind Project (Applicant - ACED/EGP)
- Arusa Wind Project (Applicant - ACED/EGP)
- Soetwater Wind Project (Applicant - ACED/EGP)
- Gunstfontein Wind Project (Applicant – Gunstfontein Wind Farm)

Currently, there are no guidelines or recommendations of how to mitigate for the cumulative impact of wind farms within a greater area. This amendment assessment assumes all neighbouring facilities will implement appropriate mitigation measures informed by their preconstruction EIA studies, and that the mitigation measures proposed in this report are adhered to.

5. CONCLUSION

After review of relevant scientific literature and the long-term preconstruction monitoring report, the requested amendments to the turbine dimensions proposed for the Sutherland wind energy facility would continue to have an overall negative impact to bats as identified during the bat monitoring study conducted in 2017 (Animalia, 2017). The mortality risk may be decreased for the lower flying species detected on site as the lower blade tip height increases with larger turbine dimensions; However, there is a higher risk of mortality for high flying species (which are the most abundant on site) as the rotor swept area and higher blade tip height are increased with larger turbine dimensions. The impact would remain as assessed in the final EIA report though, on condition of implementation of the mitigation recommendations from the final EIA report (described in section 4.2.1 of this report), and sensitivity buffer calculation recommended in section 4.2.2 of this report, and mitigations outlined in section 4.2.3 of this report.

The turbine layout must adhere to the sensitivity areas and buffers; and the layout should be approved by a bat specialist upon finalisation of turbine specifications.

To reduce bat mortality risk, a three-pronged consideration must be used when selecting the appropriate turbine technology for the wind farm:

- Turbine dimensions with a greater hub height (to increase lower blade tip height and reduce collision risk with lower flying species)
- Turbine dimensions with the smallest rotor diameter (to decreased total tip height and reduce collision risk with high flying species)
- Least number of turbines required to generate the total megawatt output of the facility

An operational monitoring study must be implemented immediately upon construction of the wind farm and be already in place when turbines are starting to operate. All applicable mitigation measures should be incorporated in the EMPr and mitigation measures recommended by the Bat Specialist during the operational monitoring study must be implemented immediately and in real time.

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MAINSTREAM RENEWABLE POWER

Amendment Report for the Application of a Substantive Amendment to the Environmental Authorisation issued for the development of the 140 MW Sutherland Wind Energy Facility, Sutherland, Northern and Western Cape Provinces

Sutherland

FINAL AMENDMENT REPORT

APPENDIX C.1.4:

Noise

CSIR

our future through science

EAR
Enviro Acoustic Research

Name: Morné de Jager
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Date: 13 November 2019
Ref: Sutherland WEF

CSIR – Environmental Management Services
11 Jan Celliers Street
Stellenbosch
7599

Attention: Ms Minnelise Levendal

Dear Madam

SPECIALIST STUDY: NOISE IMPACT ASSESSMENT: PROPOSED SUTHERLAND WIND ENERGY FACILITY SOUTH-EAST OF SUTHERLAND: CHANGE OF SPECIFICATIONS

The above-mentioned issue as well as report SAMRP-SWEF/ENIA/201701-Rev 2 is of relevance.

I conducted an Environmental Noise Impact Assessment (ENIA) during 2017 for the proposed Sutherland Wind Energy Facility (WEF). With the input data as used, the above-mentioned assessment indicated that the proposed project will have a noise impact of a ***low significance*** on all Noise Sensitive Developments (NSDs) in the area during both the construction and operational phases using the Siemens SWT 3.6 130 wind turbine for all wind speeds. This wind turbine has a maximum sound power generation level of 106.0 dBA. The projected maximum noise levels would be less than 36 dBA at the closest NSD.

The wind energy market is fast changing and adapting to new technologies as well as site specific constraints. Optimizing the technical specifications can add value through, for example, minimizing environmental impact and maximizing energy yield. As such the developer has been evaluating several turbine models, however the selection will only be finalized at a later stage once the most optimal wind turbine are identified (factors such as meteorological data, price and financing options, guarantees and maintenance costs, etc. must be considered).

Because of the availability of more optimal or efficient wind turbines, the developer of the Sutherland WEF is considering changing the wind turbine specifications. Based on the feedback from the developer, the potential selected wind turbine will have the following specifications:

- A maximum sound power emission level of **105 dBA**
- Rotor Diameter increase from up to **150** to **200m**
- Hub height from up to **150** to **200m**

It should be noted that the change in wind turbine specifications such as the wind turbine hub height and rotor diameter does not relate to sound power emission levels, which depends on the model and make of a wind turbine. For the same model and make, a change in specifications such as hub-height and rotor diameter has an insignificant impact on sound power emission levels. Therefore, there is no advantage or disadvantage in terms of acoustics by changing the wind turbine specifications such as turbine hub height as well as rotor diameter. By changing the wind turbine model and make to a wind

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turbine with a lower sound power emission levels however will have a significant advantage on acoustics.

Making use of a wind turbine with a sound power emission level of 105 dBA will result in a noise level less than 35 dBA at the closest NSD. Therefore, subject to the condition that the sound power emission level of the selected wind turbine remains below 109 dBA, considering the location of the wind turbines and the potential noise impact, it is my opinion that the change will not increase the significance of the noise impact. A full noise impact assessment with new modeling will not be required and the findings and recommendations as contained in the previous document (report SAMRP-SWEF/ENIA/201701-Rev 2) will still be valid. In terms of noise, this change will be acceptable.

Should you require any further details, or have any additional questions, please do not hesitate to call me on the above numbers.

Yours Faithfully,

Morné de Jager
Enviro-Acoustic Research cc

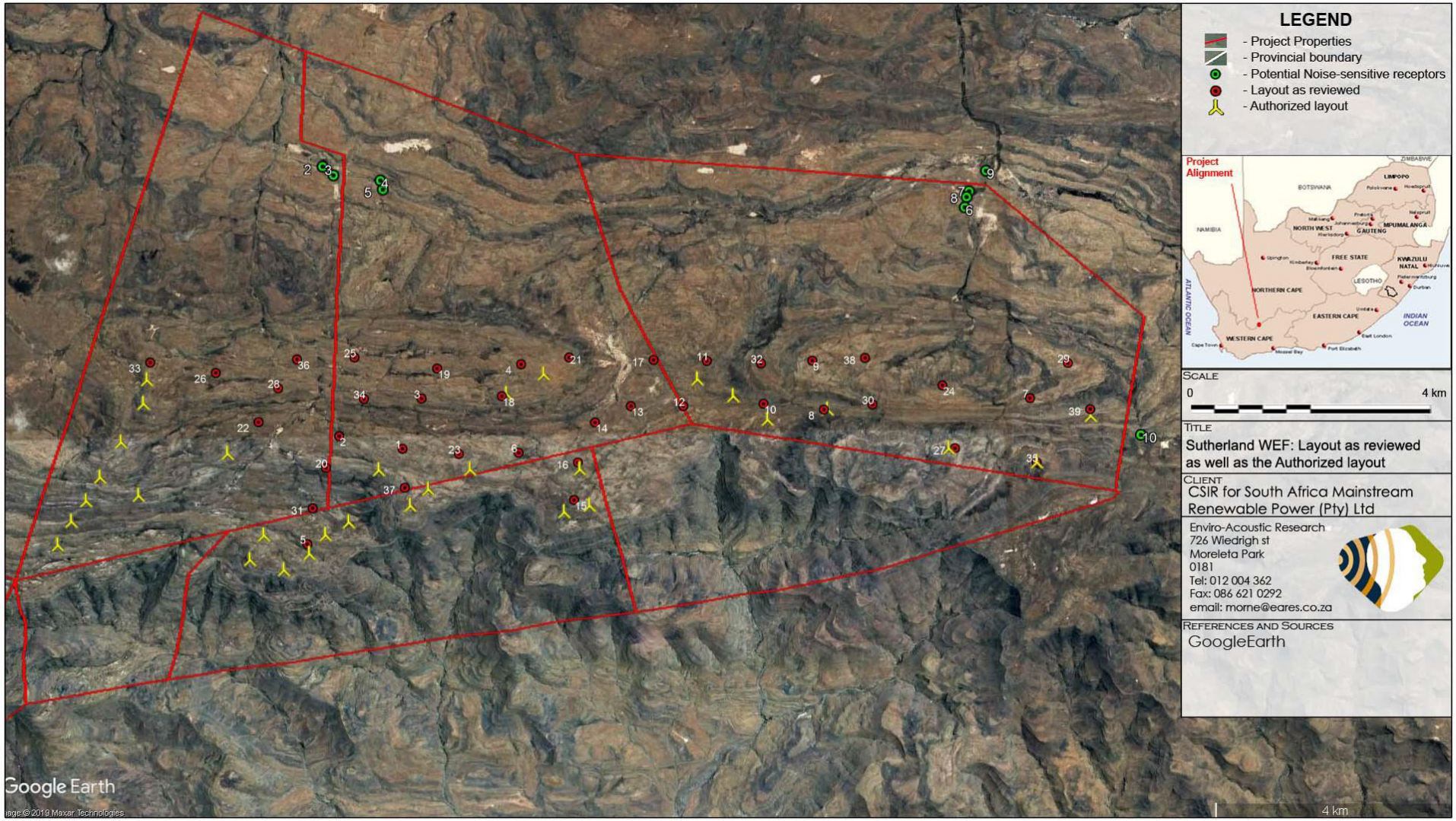

Figure 1: Locations of wind turbines as considered in this review

MAINSTREAM RENEWABLE POWER

Amendment Report for the Application of a Substantive Amendment to the Environmental Authorisation issued for the development of the 140 MW Sutherland Wind Energy Facility, Sutherland, Northern and Western Cape Provinces

Sutherland

FINAL AMENDMENT REPORT

APPENDIX C.1.5:

Visual

CSIR

our future through science

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Amendment 3 for Proposed Sutherland Wind Energy Facility: Visual Assessment

Terms of Reference

As the Visual Specialists for the visual assessment of the original Sutherland Wind Energy Facility (WEF) in 2011, we have been requested by CSIR to comment on the current revised **Amendment 3** layout of the **Sutherland WEF**, which is one of 3 separate wind farms near Sutherland in the Western Cape.

Methodology

In order to measure the potential difference in possible visual impacts between the previously authorised wind farm and the current proposal, viewsheds of the previous and current layouts are compared to determine the effect on visual exposure (zone of visual influence) of each, as well as potential visual impacts on scenic resources and sensitive receptors. This will in turn determine if there is any change to the overall visual impact significance for the current Amendment 3 layout.

Original Visual Impact Assessment (2011)

The original 2011 layout, which was approved by DEA, involved a total of 325 turbines with a hub height of 120m and rotor diameter of 120m. The original Visual Impact Assessment (VIA) of 2011 indicated a visual impact significance rating of 'high' before mitigation, and a residual impact rating of 'medium-high' after mitigation, assuming (amongst others) a visual buffer of 500m along the escarpment, and 500m from district roads.

Sutherland Amendment 1 Layout (2016):

Amendment 1 split the layout into 3 separate wind farms. The proposed layout provided for 39 turbines in each of the Sutherland WEF, Sutherland 2 WEF and Rietrug WEF, for a total of 117 turbines, being considerably fewer turbines than the original proposal. Authorisation for this layout was granted by DEA.

Sutherland Amendment 2 Layout (2017):

The layout for Amendment 2 involved an increase in the hub height of the turbines from 120m to 150m and an increase in the rotor diameter from 120m to 150m as well as a change in layout to cater for the higher turbines. The change in layout remained within the 'buildable areas' of the proposed wind farm, which avoid all environmental features identified for the site.

A viewshed based on the new layouts was prepared, (see Map 1a), which showed that 'visual exposure' of the turbines could increase along the escarpment. Some of the turbines were located slightly further south, closer to the escarpment edge, than in the earlier layouts.

The visual Specialists were concerned about the potential additional visual exposure of the higher turbines on the Komsberg escarpment. The skyline of the escarpment edge would be particularly visually sensitive. They indicated that he 500m visual buffer, used in the original VIA, should ideally be extended to mitigate the additional height of the proposed 150m turbines.

As part of a 2014 study on the National Wind and Solar PV Strategic Environmental Assessment (SEA) by the CSIR, a Landscape Assessment identified the escarpment within the Komsberg Focus Area as an area of high visual sensitivity.

Current Sutherland Amendment 3 Layout (2019):

The current proposal involves an increase in the hub height of the wind turbines from 150m (approved as part of Amendment 2), to 200m hub height and 200m rotor diameter. It was indicated that the authorised layout would remain the same despite the larger turbines. This represents a significant 25% increase in turbine height.

A revised viewshed for the larger turbines has been prepared to determine the visual exposure on the surrounding landscape and receptors, and whether there would be any increase in visual impact significance, (see Map 1b).

The current viewshed provides a useful comparison with the viewshed of the previous Amendment 2 layout, there being fairly minimal difference in visual exposure, the visual effect of which would decrease with distance.

Although the difference in visual exposure is fairly minimal, the visual impact of the larger wind turbines on the escarpment scenic feature would be greater, especially when seen on the skyline. It is recommended therefore that the original escarpment visual buffer of 500m for the turbines should be proportionally increased to 660m, (based on comparisons made in Figures 1-2). This could affect a number of proposed turbines closest to the escarpment, which should either be micro-sited or removed from the layout (given the increased size of the turbines, and therefore the increase in MW output).

Receptors in the form of surrounding farmsteads that were previously in a view shadow, such as Kookfontein, would now fall within the viewshed of the proposed wind farm. However, distance is a mitigating factor.

Cumulative Visual Impact

A comparison of the combined viewsheds of the 3 proposed wind farms for the Amendment 2 layout and the current layout is illustrated in Maps 2a and 2b. The difference in visual exposure between these two is shown in Map 2c. Again, the cumulative difference in visual exposure is fairly minimal, but the visual effect on the Komsberg escarpment scenic resource would increase. The cumulative visual effect could be partly offset by increasing the visual buffer from the edge of the escarpment to 660m.

Conclusion

The implementation of the recommended visual buffer would result in the visual impact significance ratings being similar to those of the previously authorised layout, i.e. 'high' significance before mitigation and 'medium-high' significance after mitigation. This being the case, the Amendment 3 layout could be authorised from a visual perspective.

Bernard Oberholzer, Landscape Architect
Quinton Lawson, Architect
19 July 2019