Appendix C

SPECIALIST STUDIES

Appendix C1

AVIFAUNA IMPACT ASSESMENT

ADDENDUM TO THE AVIFAUNAL IMPACT ASSESSMENT CONDUCTED FOR THE PROPOSED HARTEBEEST LEEGTE WIND ENERGY FACILTY (WEF) NEAR LOERIESFONTEIN, NORTHERN CAPE PROVINCE

APPLICATION FOR AMENDMENT OF ENVIRONMENTAL AUTHORISATION

Addendum report compiled by:

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July 2019

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EXECUTIVE SUMMARY

The purpose of this addendum report is to revisit the avifaunal impact assessments for the proposed Hartebeest Leegte Wind Energy Facility (WEF) near Loeriesfontein in the Northern Cape (Van Rooyen *et al*. 2016, Van Rooyen & Froneman 2017a, Van Rooyen & Froneman 2017b), based on the proposed amendment to the environmental authorisation in June 2019.

The proposed changes are as follows:

Aspect	Authorised	Proposed amendment
Hub height	**Up to 160m**	**Up to 200m**
Rotor diameter	**Up to 160m**	**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 findings of the previous pre-mitigation assessments are still valid, and if the original proposed mitigation measures need to be revised.

It is concluded that the proposed increase in the turbine dimensions require the pre-mitigation impact significance rating of **"low -medium"** for the risk of mortality due to turbine collisions, to be changed to **"medium",** based on the current lay-out of 47 turbines. However, should the number of turbines be reduced, it will result in the collision rating of "**low-medium**" remaining unchanged, or even reducing, depending on the extent of the reduction in the number of turbines.

No new nests of priority species were recorded during the nest searches performed in June 2019.

It is concluded that the original mitigation measures listed in the Bird Specialist Study (Van Rooyen *et al.* 2016) remains valid and need not be revised in view of the proposed changes to the turbine dimensions.

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1 Background

The purpose of this addendum report is to revisit the avifaunal impact assessments for the proposed Hartebeest Leegte Wind Energy Facility (WEF) near Loeriesfontein in the Northern Cape (Van Rooyen *et al*. 2016, Van Rooyen & Froneman 2017a, Van Rooyen & Froneman 2017b), based on the proposed amendment to the environmental authorisation in June 2019. The proposed changes are provided in **Table 1** below.

Table 1: Proposed turbine dimensions amendments

Aspect	Authorised	Proposed amendment
Hub height	Up to 160m	Up to 200m
Rotor diameter	Up to 160m	Up to 200m

2 Terms of reference

Due to the proposed changes in **Error! Reference source not found.**, 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 (Van Rooyen *et al*. 2016) and subsequent addendum report (Van Rooyen & Froneman 2017a) identified risks (Table 2) of bird collisions with the wind turbines based on a proposed layout of 70 turbines.

The key species which were identified in the original Bird Specialist Study and addendum report as being most at risk were Booted Eagle *Aquila pennatus*, Martial Eagle *Polemaetus bellicosus*, Verreaux's Eagle *Aquila verreauxii*, Black-chested Snake-eagle *Circaetus pectoralis* and Ludwig's Bustard *Neotis ludwigii*.

Table 2: Original Bird Collision Risk

Environmental parameter	Impact	Rating prior to mitigation	Rating post mitigation
Avifauna	Priority species mortality due to collision with the turbines	-45 (medium negative)	-30 (medium negative)

In October 2017, a new layout of 47 turbines, which represents a 32.8% reduction in the number of turbines, were assessed and eventually authorised. The specialists concluded the following (Van Rooyen & Froneman 2017b):

"*The new turbine layout represents a 32.8% reduction in the number of turbines. This is a positive development from a bird impact assessment perspective, as it reduces the risk of priority species collisions and reduces the potential displacement impact of habitat fragmentation. We are furthermore satisfied that the proposed changed layout avoids all avifaunal sensitive areas delineated in the original bird specialist study. No additional mitigation measures are required over and above those already recommended in the bird specialist study, all of which are still valid for the new layout*."

The new lay-out of 47 turbines reduced the post-mitigation collision risk from the original "**medium"** to **"low – medium"**.

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 authorised rotor diameter of 160m for the Hartebeest Leegte WEF translates into a rotor swept area of approximately 20 106m² per turbine. 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 56.2% 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 56.2% 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 collision risk for priority species. It is therefore concluded that the proposed changes in turbine dimensions will increase the post-mitigation risk from "**low- medium"** to "**medium"**. However, should the number of turbines be reduced, it will result in the collision rating of "**low-medium**" remaining unchanged, or even reducing, depending on the extent of the reduction in the number of turbines (see **Table 3** below for an unchanged layout of 47 turbines).

Table 3: Avifauna impact and ratings table

Environmental Parameter	*Avifauna*
Issue/Impact/Environmental Effect/Nature	*Collisions of priority species with the turbines in the operational phase*
Extent	*The impact will affect the local area or district*
Probability	***Possible -*** *The impact may occur (between 25% - 50% chance of occurrence).*
Reversibility	***Partly reversible -*** *Mitigation measures could reduce the risk of collisions.*

Irreplaceable loss of resources	*Significant loss of resources.*	
Duration	***Long term -****The risk of collision will be present for the lifetime of the development.*	
Cumulative effect	***Moderate cumulative impact -*** *The cumulative impact will depend largely on which species are killed. If Verreaux's Eagles or Martial Eagles are regularly killed, the regional impact could be significant.*	
Intensity/magnitude	***Medium -*** *The wind turbines could cause mortality of some priority species.*	
Significance Rating	***Medium significance.***	
Impact Rating		
Extent	2	2
Probability	2	2
Reversibility	2	2
Irreplaceable loss	3	3
Duration	3	3
Cumulative effect	3	3
Intensity/magnitude	3	2
Significance rating	**-45 (medium negative)**	**-30 (medium negative)**

6 Revised mitigation measures

An assessment was undertaken to determine if the mitigation measures originally proposed for the Hartebeest Leegte WEF by Van Rooyen *et al.* (2016) would need to be revisited in light of two (2) 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, requires 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 2019 to ensure up to date information on the breeding status of priority species at the proposed Hartebeest Leegte WEF.

No new nests of priority species were recorded during the nest searches performed in June 2019.

It is concluded that the original mitigation measures listed in the Bird Specialist Study (Van Rooyen *et al.* 2016) remains valid and need not be revised in view of the proposed changes to the turbine dimensions.

7 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 previous pre-mitigation assessment by Van Rooyen & Froneman (2017b) should be revised, and if the original mitigation measures (Van Rooyen *et al.* 2016) need to be revised.

It is concluded that the proposed increase in the turbine dimensions require the pre-mitigation impact significance rating of **"low -medium"** for the risk of mortality due to turbine collisions, to be changed to **"medium",** based on the authorised lay-out of 47 turbines. However, should the number of turbines be reduced, it will result in the collision rating of "**low-medium**" remaining unchanged, or even reducing, depending on the extent of the reduction in the number of turbines.

No new nests of priority species were recorded during the nest searches performed in June 2019.

It is concluded that the original mitigation measures listed in the Bird Specialist Study (Van Rooyen *et al.* 2016) remains valid and therefore does not need to be revised in view of the proposed changes to the turbine dimensions.

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Appendix C2

BAT IMPACT ASSESMENT

BAT IMPACT ASSESSMENT: AMENDMENT

HARTEBEEST LEEGTE WIND ENERGY FACILITY, NORTHERN CAPE

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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: Hartebeest Leegte 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 19 August 2019

BAT IMPACT ASSESSMENT AMENDMENT: HARTEBEEST LEEGTE 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 Hartebeest Leegte Wind Farm in March 2018, located near Loeriesfontein in the Northern Cape Province. Two subsequent amendments were issued by the DEA for a reduced turbine layout and increased hub height and rotor diameter of turbines by April 2019. Mainstream is currently submitting an amendment application to the DEA to again 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.

Table 1: Aspects of the proposed amendment

Aspect to be amended	Previously assessed	Proposed amendment
Hub height	Up to 160 m	Up to 200 m
Rotor diameter	Up to 160 m	Up to 200 m

Hartebeest Leegte WEF are proposing a total capacity of 235 MW, but the exact turbine specifications that will be deployed are not known yet.

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 47 turbines be installed, with a hub height of 200 m and a rotor diameter of 200 m, there will be a 95,31% 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 4.1.

Table 2: Changes in area of collision

Aspect to be amended	Previously assessed (47 turbines)	Proposed amendment (47 turbines)	Difference between previously assessed specifications and proposed amendment
Total volume of the sweep of the turbine blades, if calculated as a sphere	0.100796075 km^3	0.196867333 km^3	0.096071 km^3 more airspace is occupied (95,31% increase)
Lowest point of the sweep of the turbine blades, from ground level	80 m	100 m	20 higher from ground level

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 original bat impact assessment performed by Animalia Consultants (Pty) Ltd (Animalia, 2017) and the subsequent mitigation recommendations from a revised turbine layout letter compiled by Animalia Consultants (Pty) Ltd dated 19 October 2017. Animalia is no longer undertaking bat assessments and hence a Bat Specialist that did not undertake the preconstruction monitoring had to be 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.

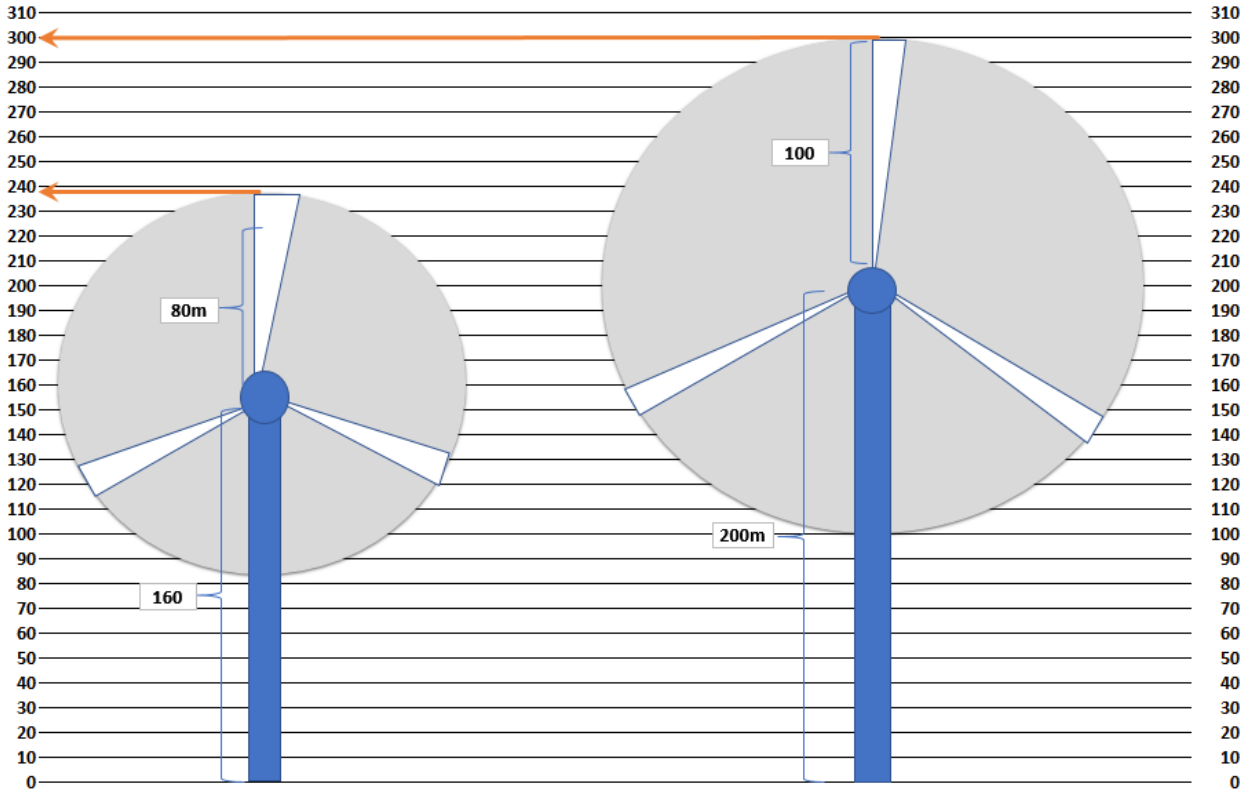

Figure 1: Changes in specifications of turbine dimension

2. 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.

3. RESULTS

3.1 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 47 turbines for Hartebeest Leegte 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 (Willig *et al.,* 2018). Willig 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.

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

3.2.1 Species richness and activity trends

Acoustic monitoring, as indicated in the Bat Monitoring Report (Animalia, 2017) was conducted at 80 m height for a period of 12 months (30 November 2015 – 2 December 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 outside

of the proposed amendment turbine sweep area, which needs to be borne in mind when applying the findings of the previous monitoring study in this amendment. The SM microphones that were used during pre-construction monitoring have quite a wide range, and depending on the bat call parameters and the environmental conditions, it is expected that at least some data was collected within the lower sweep of the turbine blades.

As expected, higher activity levels were detected at the 10 m recording height than at the 80 m height; however, the species richness was the same for both recording heights. *Tadarida aegyptiaca* (Eqyptian free-tail bat) was the most abundant species on site and at the 80 m monitoring height. This is a high-flying species with a high risk of collision with turbine blades (Sowler et al., 2017). Two periods of high activity were identified over January to April 2016 and August to November 2016. Bat activity was typically highest during the first half of the night through all seasons of the year, with secondary peaks before sunrise. Section 8 (Proposed initial mitigation measures and details) of the final bat monitoring report sufficiently mitigates for the higher activity periods and higher risk species (Animalia, 2017). The mitigation schedule was reduced in the turbine amendment letter of October 2017.

3.2.2 Sensitivity map

The layout was already amended by the proponent during the bat monitoring phase to ensure that no turbines are located within high or moderate sensitivity areas or buffers. The sensitivity map identified areas of moderate and high bat sensitivity with designated buffers of **100 m** and **200 m**, respectively (Animalia, 2017). Bat sensitivity areas are 'no-go' areas for turbine placement and according to the guidelines (Sowler, et al., 2017) no part of the turbines are allowed within the sensitive areas or the buffers; thus, also turbine blade tips are excluded from entering the buffer- or sensitivity areas.

Buffer distance, as indicated above**,** stays the same as approved during in the Final Bat Monitoring report (Animalia, 2017), but in order to avoid the larger turbine components, particularly the 100 m blades, encroaching into buffers, the placement of turbines will have to be adapted.

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.

3.2.3 Impact assessment

Of the impacts identified in the EIA and subsequent turbine amendment assessment, only bat mortalities due to direct blade impact or barotrauma during foraging activities (Section 5.2.1, Animalia, 2017), is relevant to this amendment. In the most recent amendment assessment, the impact was identified as high (score of -57) without mitigation, and reduced to low (score of -28) with mitigations of:

- Adhere to the bat sensitivity map (avoid development in the demarcated sensitivity areas and their buffers);
- Adhere to the mitigation recommendations of the Section 1 of the Amendment report, dated October 2017;
- Implement an operational bat monitoring study immediately after construction of turbines.

Considering the greater turbine dimensions proposed in the amendment application, and the increased affected airspace, the impact would remain high (score of -57) without mitigation and reduced to low (score of -28) with implementation of the existing mitigation as well as added mitigation measures; therefore, recommended mitigation measures for the amended Hartebeeste Leegte turbine specifications are as follow:

- **Adhere to the original bat sensitivity map (Animalia, 2017) to avoid development in the demarcated sensitivity areas and their buffers as described in Section 4.2.2 of this Amendment;**
- **The final layout should be approved by a bat specialist upon finalisation of turbine specifications;**

- **All turbines must be feathered below cut in speed and not allow for freewheeling during construction and from the start of operation. Bat activity is markedly higher over low wind speed periods. Preventing freewheeling should not affect energy production significantly, but will be a substantial bat conservation mitigation measure.**
- **The total output of the windfarm be reduced to 200MW;**
- **A maximum amount of 47 turbines, with a hub height of 200 m and a rotor diameter of 200 m, is proposed within the total output of 200 MW. If the total output of the wind farm would exceed 200 MW, the curtailment programme as indicated in Table 3, is recommended at the onset of the wind development facility. Would smaller turbines be deployed, more turbines may be installed, but with agreement of a bat specialist.**
- **An operational bat monitoring study should already be in place at the start of the wind farm operation and should be implemented immediately at the onset of the wind turbines. Mitigation measures outlined by the Bat Specialist during the operational monitoring study should be applied with due diligence;**
- **To refine mitigation measures and to account for the lack of data within the sweep of the amended turbine specifications, the appropriate turbines, as indicated by the post-construction bat specialist, should be installed with bat monitoring equipment at height and bat monitoring should start at the onset of turbines.**

Table 3: Wind turbine mitigation schedule taken from the Bat Monitoring Report (Animalia, 2017).

Terms of mitigation implementation	
Peak activity (times to implement curtailment/ mitigation)	Met Mast (10m): 15 – 25 January from the time of sunset to 04:00
Environmental conditions in which to implement curtailment/ mitigation	Met Mast (10m): Wind speed below 8.5m/s *and* Temperature above 20°C
Peak activity (times to implement curtailment/ mitigation)	Met Mast (80m): 15 – 25 January over the time of sunset – 01:00
Environmental conditions in which to implement curtailment/ mitigation	Met Mast (80m): Wind speed below 7m/s *and* Temperature above 18°C

Peak activity (times to implement curtailment/ mitigation)	Met Mast (10m): 15 February – 31 March over the time of sunset – 04:00
Environmental conditions in which to implement curtailment/ mitigation -	Met Mast (10m): Wind speed below 8.0m/s *and* Temperature above 16.0°C
Peak activity (times to implement curtailment/ mitigation)	Met Mast (10m): 10 April – 10 June over the time of sunset – 04:00
Environmental conditions in which to implement curtailment/ mitigation	Met Mast (10m): Wind speed below 6m/s *and* Temperature above 17°C
Peak activity (times to implement curtailment/ mitigation)	Met Mast (10m): 25 August – 30 November over the time of sunset – 03:00
Environmental conditions in which to implement curtailment/ mitigation	Met Mast (10m): Wind speed below 8m/s *and* Temperature above 14°C
Peak activity (times to implement curtailment/ mitigation)	Met Mast (80m): 25 August – 30 November over the time of sunset – 00:00
Environmental conditions in which to implement curtailment/ mitigation	Met Mast (80m): Wind speed below 8m/s *and* Temperature above 13°C

3.2.4 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. There is potential for significant loss of locally active bats and migratory bats that will essentially reduce the effective population size and may cause population crashes. The impact in the amendment report (October 2017) was rated as high (score of -57) without mitigation; and reduced to a rating of medium (score of -30) with mitigations.

Currently, there are 9 authorised wind farms within a 20 km radius of the Hartebeest Leegte WEF, namely:

- Dwarsrug WEF (Mainstream)
- Khobab WEF (Mainstream)
- Loeriesfontein WEF (Mainstream)

- !Xha Boom WEF (Mainstream)
- Graskoppies WEF (Mainstream)
- Ithemba WEF (Mainstream)
- Kokerboom 1 WEF (Business Venture Investments No. 1788 (Pty) Ltd)
- Kokerboom 2 WEF (Business Venture Investments No. 1788 (Pty) Ltd)
- Kokerboom 3 WEF (Business Venture Investments No. 1788 (Pty) Ltd)

Additionally, The Orlight SA Solar Photovoltaic Power Plant (Orlight SA (Pty) Ltd), Photovoltaic Solar facility (Orlight SA (Pty) Ltd) and Cpv/Pv Solar Power Plant (Mainstream) are proposed to be developed in the immediate vicinity. Although solar power installations do not typically contribute directly to bat mortalities, they do result in habitat destruction that may interrupt foraging behaviours.

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.

4. CONCLUSION

After review of relevant scientific literature and the long-term preconstruction Bat Monitoring Report (Animalia, 2017), the requested amendments to the turbine dimensions proposed for the Hartebeest Leegte Wind Energy Facility may decrease the risk for lower flying species detected on site, as the lower blade tip height increases with larger turbine dimensions; However, there is a higher risk for high flying species that are also the most abundant on site, as well as a larger total amount of airspace occupied by turbine sweep. To account for this and to avoid curtailment at the onset of operation of the windfarm, mitigation measures outlined in Section 4.2.3 of this report must be implemented upon construction and the turbine layout must adhere to the sensitivity areas and buffers. If these mitigations are adhered to, the impact assessment ratings for the Hartebeest Leegte WEF will remain the same as previously assessed, namely high negative without mitigation (score of -57) and reduced to low negative with mitigation (score of -28).

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 in place before the onset of the Hartebeest Leegte Wind Energy Facility and must be implemented when the turbines start to operate. A bat specialist must approve the final layout and mitigation measures before the construction phase commences. 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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Appendix C3

NOISE IMPACT ASSESMENT

EAR
Enviro Acoustic Research

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Date: 7 June 2019
Ref: Hartebeest Leegte WEF

SiVEST Environmental Division
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Attention: Ms. Andrea Gibb

Dear Madam

SPECIALIST STUDY: NOISE IMPACT ASSESSMENT: PROPOSED HARTEBEEST LEEGTE WIND ENERGY FACILITY NORTH OF LOERIESFONTEIN: CHANGE OF WIND TURBINE SPECIFICATIONS

The above-mentioned issue as well as report MRPDSA-LBHWF/ENIA/201708-Rev 1 is of relevance.

I conducted an Environmental Noise Impact Assessment (ENIA) during 2017 for the proposed Hartebeest Leegte Wind Energy Facility (WEF), with two layouts evaluated. With the input data as used, this assessment indicated that the proposed project will have a noise impact of a ***medium significance*** on all Noise Sensitive Developments (NSDs) in the area during both the construction and operational phases using the Acciona AW125 wind turbine for all wind speeds. This wind turbine has a maximum sound power generation level of 108.4 dBA and the projected maximum noise levels would be around 47 dBA at the closest NSD. The report recommended mitigation measures to reduce the significance of the projected noise impact to low for both the construction and operational phase impacts.

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 Hartebeest Leegte WEF is considering changing the wind turbine specifications and optimizing the layout. As the specifications of the final selection are not yet defined, this review will evaluate a potential worst-case scenario, considering a wind turbine with a sound power emission level of 108.5 dBA. Other changes include:

- Rotor Diameter increase up to **200m**
- Hub height up 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. By changing the wind turbine model and make to a wind turbine with a lower sound power emission levels however will have a significant advantage on acoustics.

This is subject to the condition that the developer does not use a wind turbine with a sound power emission level exceeding 108.5 dBA, and, 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 MRPDSA-LBHWF/ENIA/201708-Rev 1) will still be valid.

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

Appendix C4

VISUAL IMPACT ASSESMENT

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South Africa Mainstream Renewable Power Developments (Pty) Ltd
P O Box 45063
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CAPE TOWN
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Your reference: N/A
Our reference: 15660 - HL
Date: 19 June 2019

ATTENTION: REBECCA THOMAS

Dear Ms Thomas

VISUAL SPECIALIST COMMENT IN RESPECT OF PROPOSED AMENDMENTS TO THE AUTHORISED TURBINE SPECIFICATIONS FOR THE HARTEBEEST LEEGTE WIND FARM NEAR LOERIESFONTEIN, NORTHERN CAPE PROVINCE

- **DEA Reference: 14/12/16/3/3/2/1015 (As amended)**

1. BACKGROUND

South Africa Mainstream Renewable Power Developments (Pty) Ltd (hereafter referred to as Mainstream) was issued with an Environmental Authorisation (EA) for the proposed 235MW Hartebeest Leegte Wind Farm, near Loeriesfontein in the Northern Cape Province on 15 March 2018 (DEA Reference 14/12/16/3/3/2/1015). This authorisation made provision for the construction of a total number of 47 wind turbines, each with a hub height of up to 160m and a rotor diameter of 160m.

Mainstream is now proposing to submit a Part 2 Amendment application to change the approved turbine specifications for the Hartebeest Leegte Wind Farm to allow for turbines with a hub height of up to 200m and a rotor diameter of up to 200m.

Following on from the EIA level Visual Impact Assessment (VIA) conducted for the Hartebeest Leegte Wind Farm, SiVEST has been requested to provide visual specialist comment in respect of the proposed amendments.

2. SPECIALIST COMMENT

The EIA phase VIA, conducted by SiVEST in August 2017, assessed the potential visual impacts in relation to a wind farm layout comprising 70 turbines, each with a hub height and rotor diameter up to 160m (i.e. a maximum tip height of 240m). Thereafter, Mainstream proposed that the turbine layout be amended and the number of turbines be reduced from 70 to 47. This was assessed and the results were provided in the

visual specialist comment letter dated 19 October 2017. The VIA concluded that the visual impacts identified would not be significant enough to prevent the project from proceeding and that an EA should be granted. It was further stated that the impacts associated with the construction and operation phases of the proposed wind farm could be mitigated to acceptable levels provided that the recommended mitigation measures were implemented.

The proposed new turbine specifications would allow for a maximum tip height of 300m, some 60m higher than the height currently authorised. The significance of this change from a visual perspective is assessed below.

The increased height as proposed will increase the visibility of the turbines and extend the area from which the turbines will be visible (viewshed). This will be exacerbated by the lack of natural screening elements in the broader study area resulting from the relatively flat terrain and the prevalence of low shrubland vegetation cover. It is however important to note that visual impacts are only experienced when there are receptors present to experience this impact. The original VIA for this development found that the broader study area is not typically valued for its tourism significance and there is limited human habitation resulting in relatively few potentially sensitive receptors in the area. In light of this and given the relatively remote location of the proposed Hartebeest Leegte Wind Farm, the extended viewshed does not incorporate any additional receptors within the 8km assessment zone.

Visual impacts resulting from the larger turbines would be greatest within a 1km to 2km radius, from where the increased height of the structure would be most noticeable. The VIA identified three (3) potentially sensitive receptors within the visual assessment zone, all of which are farmsteads. Two (2) of the identified receptors are located less than 2km from the buildable area and are thus in a zone of high potential visual impact. One of these receptors is however inside the Hartebeest Leegte Wind Farm application site and as such, it was assumed that the owner of this property would have a vested interest in the wind farm development and would not perceive the proposed development in a negative light. Hence the larger turbines as proposed would not increase the impacts experienced by this receptor.

The farmstead on Portion 2 of Zuur Fontein No 224 is approximately 1km from the buildable area, just south of the Hartebeest Leegte application site and as such this receptor will experience increased visual impacts as a result of the larger turbines. It was however noted in the VIA that it was not possible to determine the occupancy or level of use of this receptor and as such the likely degree of visual impact is uncertain. In addition, no concerns were raised by the owner of this property during the Public Participation Process conducted for the Hartebeest Leegte Wind Farm EIA and it is therefore possible that the proposed development is not perceived in a negative light.

The remaining receptor is more than 4km from the buildable area and, while the increased turbine height would make the turbines more visible from this receptor, the overall impact is expected to remain largely unchanged from this distance. It should be noted that although the larger turbines may be visible from some farmhouses outside the 8km assessment zone, at this distance it is likely that the turbines will merge to some degree with the surrounding landscape and as such impacts resulting from the increased turbine height will be minimal.

It should also be noted that two wind farms, namely Khobab and Loeriesfontein 2 have recently been developed in the broader area. Each of these developments includes some 61 wind turbines with associated infrastructure as well as 132kV grid connections to Helios Substation. All of this development in combination is resulting in a significant level of transformation of the natural environment in this area which will reduce the significance of visual impacts resulting from the proposed amendments.

The overall impact rating conducted for the Hartebeest Leegte Wind Farm VIA revealed that the proposed wind farm is expected to have a low negative visual impact rating during construction and a medium negative visual impact rating during operation, with relatively few mitigation measures available. In light of the above comments, the increase in the proposed turbine height will not change this impact rating. Furthermore, no additional recommendations or mitigation measures will be required and all of the mitigation measures set out in the VIA remain valid.

3. IMPACT STATEMENT

It is SiVEST's opinion that the proposed changes to the authorised turbine specifications for Hartebeest Leegte Wind Farm do not give rise to additional visual impacts or exacerbate the impacts previously identified in the VIA for this development. Given the low level of human habitation and the relative absence of sensitive receptors in the area, the increased turbine height is deemed acceptable from a visual perspective and the Environmental Authorisation (EA) should be amended. SiVEST is of the opinion that the impacts associated with the construction, operation and decommissioning phases can be mitigated to acceptable levels provided the recommended mitigation measures are implemented.

Yours sincerely

Andrea Gibb
Divisional Manager
SiVEST Environmental

Appendix C5

OTHER SPECIALIST COMMENTS

Johann Lanz

Soil Scientist (Pri.Sci.Nat)

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Part 2 (substantive) amendment for the Leeuweberg wind energy projects (namely Graskoppies, Hartebeest Leegte, Ithemba and !Xha Boom)

The following 2 amendments are proposed to the above projects:

- Increase in the hub height up to 200m
- Increase in the rotor diameter up to 200m

This letter confirms that these amendments will not increase or change the nature of the impact which was assessed in my original agricultural specialist report.

Johann Lanz (Pri. Sci. Nat.)
20 September 2019

3Foxes Biodiversity Solutions
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Att: Andrea Gibb

20 September 2019

RE: Amendment Application for the Leeuwberg Wind Energy Facilities, near Loeriesfontein

This statement letter is in reference to the authorised Leeuwberg Wind Energy Facilities, which comprises four applications, namely Graskoppies, Hartebeest Leegte, Ithemba and !Xha Boom. SiVEST has requested comment on the ecological implications of the proposed changes to the turbine specifications that would be included in the amendment application to the Department of Environmental Affairs.

The changes to the layout and technical specifications of the turbines include the following:

- Increase in the hub height up to 200m
- Increase in the rotor diameter up to 200m

SiVEST have requested confirmation regarding the amendment in terms of the previously assessed impacts and whether these changes would affect any of these assessed impacts for any of the four wind farms as follows:

a) The amendment will not increase or change the nature of the impact which was initially assessed; or
b) The amendment will increase or change the nature of the impact which was initially assessed.

I have reviewed the proposed changes, and these would not result in any changes to the proposed layouts or to the terrestrial ecological impact of any of the facilities, there are no reasons to indicate that the amendment would increase the impacts of the developments as assessed. As such, the original assessed impacts are considered to hold for the amendment and there are no additional impacts or mitigation measures that would need to be applied for any of the four wind farms.

Based on the above conclusion, the amendment to the Graskoppies, Hartebeest Leegte, Ithemba and !Xha Boom Wind Energy Facilities can be supported from an ecological point of view and there are no reasons to oppose the changes as applied for.

Prepared by Simon Todd
Director
3Foxes Biodiversity Solutions
20 September 2019

Pr.Sci.Nat
SACNASP 400425/11.

23 September 2019

SiVEST Environmental Division

Attention: Mr Stephan Jacobs

PROPOSED CONSTRUCTION OF THE 235MW GRASKOPPIES, 235MW HARTEBEEST LEEGTE, 235MW ITHEMBA AND THE 235MW !XHA BOOM WIND FARMS NEAR LOERIESFONTEIN, NORTHERN CAPE PROVINCE: HERITAGE STATEMENT

SiVEST has been appointed by South Africa Mainstream Renewable Power Developments to undertake the part 2 (substantive) amendments for the Leeuweberg projects (namely Graskoppies, Hartebeest Leegte, Ithemba and !Xha Boom).

The DEA has responded to the application forms submitted by SiVEST and requesting for comment from all the specialists previously involved in the project.

1. SCOPE OF AMENDMENT

The proposed amendments are as follows:

- Increase in the hub height up to 200m
- Increase in the rotor diameter up to 200m.

2. HERITAGE OPINION

PGS Heritage has previously completed the Heritage Impact Assessments (HIA) for these projects and me as principal heritage specialist.

I have evaluated the proposed amendments to the approved project and find that the change in hub height and rotor diameter will not change the findings of the HIAs for these projects.

It should be noted that the implementation of the management measures for chance finds have been included in the previously submitted EMPr and will be carried through to the proposed amendments.

3. CONSLUSION

It is therefore my considered opinion that based on the above, it is not expected that any further specialist input would be required to inform this amendment application.

Any further questions can be forwarded to Wouter Fourie of PGS Heritage (Pty) Ltd, on +27 (12) 332 5305.

Regards,

Wouter Fourie
Director /Accredited Heritage Specialist (APHP) Accredited Archaeologist (ASAPA)
PGS Heritage (Pty) Ltd

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20 September 2019

To whom it may concern

RE: IMPLICATIONS OF THE CHANGES OF THE HUB HEIGHT AND ROTOR DIAMETER OF WIND TURBINES IN THE PROPOSED GRASKOPPIES, HARTEBEEST LEEGTE, ITHEMBA AND !XHA BOOM WIND ENERGY FACILITIES, THE NORTHERN CAPE PROVINCE ON THE ASSESSED SOCIO-ECONOMIC IMPACTS

This letter is written in response to the proposed changes made by the project proponent, Mainstream Renewable Power (Pty) Ltd, South Africa with respect to the above-mentioned projects. The following amendments to Graskoppies, Hartebeest Leegte, Ithemba and !Xha Boom wind farms planned to be developed in the Northern Cape are proposed:

- Increase in the hub height of turbine towers of up to 200m
- Increase in the rotor diameter of wind turbines of up to 200m

The proposed amendments will not affect the total output capacity authorised for the above mentioned projects, which is 235 MW each.

1. Socio-economic impacts and their ratings assessed during the original studies

The socio-economic impact assessment undertaken of the above projects during 2016 and subsequent revision of impacts for Graskopies in 2017 identified the following potential impacts to be exerted by these projects during construction and operation phases:

Table 1: Socio-economic impacts during construction and operation assessed before mitigations

Impact	Status	Hartebeest Leegte	Graskopies (as revised)	Ithemba	!Xha Boom
Construction phase					
Temporary employment creation	Positive	Medium (36)	Medium (36)	Medium (36)	Medium (36)

Impact	Status	Hartebeest Leegte	Graskopies (as revised)	Ithemba	!Xha Boom
Skills development and training	Positive	High (51)	Medium (48)	High (51)	High (51)
Impact on health	Negative	Medium (42)	Medium (42)	Medium (42)	Medium (42)
Change in demographics due to migration	Negative	Medium (32)	Medium (32)	Medium (32)	Medium (32)
Increase in social pathologies	Negative	Medium (48)	Medium (48)	Medium (48)	Medium (48)
Investment in local community	Positive	High (45)	High (45)	High (45)	High (45)
Impact on personal safety and stock theft	Negative	Low (26)	Low (26)	Low (26)	Low (26)
Change in sense of place	Negative	Low (26)	Low (24)	Low (26)	Low (26)
Temporary increase in production and temporary stimulation of GDP	Positive	High (54)	High (54)	High (54)	High (54)
Demand for social facilities	Negative	Low (28)	Low (28)	Low (28)	Low (28)
Added pressure on basic services	Negative	Low (28)	Low (28)	Low (28)	Low (28)
Temporary increase in household income	Positive	Low (26)	Low (26)	Low (26)	Low (26)
Establishment of informal hospitality industry	Positive	Medium (45)	Medium (45)	Medium (45)	Medium (45)
Temporary increase in government revenue	Positive	Medium (30)	Medium (30)	Medium (30)	Medium (30)
Operation phase					
Sustainable employment creation	Positive	Low (28)	Low (13)	Low (28)	Low (28)
Skills development and training	Positive	Low (18)	Low (16)	Low (18)	Low (18)
Sustainable increase in production and GDP	Positive	Medium (40)	Medium (40)	Medium (40)	Medium (40)
Sustainable increase in household income	Positive	Low (13)	Low (13)	Low (13)	Low (13)
Increase in government revenue	Positive	Medium (32)	Medium (32)	Medium (32)	Medium (32)

2. Implications on socio-economic impacts during the construction period

Considering the propose amendments, there is a possibility that the costs of developing the wind farms will increase due to the need to use more materials to construct a higher turbine tower. Such materials – steel and cement predominantly - are likely to be procured from within South Africa and will increase the impact on GDP, employment, and household income during construction. A bigger rotor diameter is also likely to lead to a greater cost than originally planned; however, rotors are to be imported.

As indicated in the table above, the impact on employment during construction was of medium significance before mitigations for all four projects under review. The impact on production and GDP was of high significance during construction, while the impact on household income was low for other four projects.

Since the exact increase in the five projects costs associated with the increase in hub height is not known and given that the total output capacity will not change, it would be prudent to assume that the changes in socio-economic effects will not be so significant that will affect the magnitude of the impacts and will lead to the changes in the overall rating of the impacts. As a result, the following significance ratings will remain for the three impacts that could be affected by the proposed amendment:

Table 2: Impact rating of the impacts that are likely to be affected due to proposed amendments

Impact	Status	Hartebeest Leegte	Graskopies (as revised)	Ithemba	!Xha Boom
Construction phase					
Temporary employment creation	Positive	Medium (36)	Medium (36)	Medium (36)	Medium (36)
Temporary increase in production and temporary stimulation of GDP	Positive	High (54)	High (54)	High (54)	High (54)
Temporary increase in household income	Positive	Low (26)	Low (26)	Low (26)	Low (26)

Despite the impact ratings for the above-mentioned three socio-economic impact remaining unchanged, the benefit of the proposed amendment lies in the possibility of creating a greater number of Full-Time-Equivalent employment opportunities due to the need to construct a higher turbine tower, and possibly a greater foundation. The possible increase in demand for construction materials will also stimulate the business of suppliers. All of the above could also lead to some increase in the total household income earned by the directly and indirectly affected parties.

No additional measures aside from those recommended in the original studies are required for the impacts.

3. Implications on socio-economic impacts during the operational period

Greater rotor diameter and hub could increase the efficiencies of the wind farms and lead to greater electricity generation, which in turn could increase the revenues of the project. Since the amount allocated towards Socio-Economic Development (SED) and Enterprise Development (ED) is directly linked to the revenue generated by the wind farms, the possible increase in revenue could lead to higher allocations of wind projects towards SED and ED initiatives.

Socio-economic impact associated with the investment in local communities was initially rated as high for the project. Therefore, whether the project will indeed lead to higher SED and ED allocations or not, the impact rating will remain the same. Local communities could, though, benefit from that increase.

4. Concluding statement

Considering the above assessment, it can be stated that the proposed amendments will not change the nature of the socio-economic impacts identified during the original studies and will not lead to the change in their ratings. This is relevant to all four projects under consideration.

Yours sincerely,

Elena Broughton
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Your reference: Leeuwburg
Our reference: Leeuwburg SWA
Date: 20th September 2019

ATTENTION: ANDREA GIBB

Dear Madam

PROPOSED CONSTRUCTION OF THE 235MW GRASKOPPIES, 235MW HARTEBEEST LEEGTE, 235MW ITHEMBA AND THE 235MW !XHA BOOM WIND FARMS NEAR LOERIESFONTEIN, NORTHERN CAPE PROVINCE: SURFACE WATER ASSESSMENT ADDENDUM

Since receiving Environmental Authorisation (EA) for the proposed 235MW Graskoppies, 235MW Hartebeest Leegte, 235MW Ithemba and the 235MW !xha Boom Wind Farms near Loeriesfontein, the project proponent has been required to alter certain technical parameters of the wind turbines to meet the power production requirements of the sites, and the prevailing wind conditions.

As such, the following parameters have been changed:

- The hub height of the turbine has been increased to 200m above ground; and
- The rotor diameter has been increased to 200m.

The proposed changes, and subsequent amendment of the authorisation will have no impact on the surface water resources on the sites, and thus the amendment will not increase or change the nature of the impact which was initially assessed in the Surface Water Impact Assessment Reports, all four of which are dated October 2017.

Should you wish to discuss any facet of the above, or attached, please feel free to contact me on 083 795 2804, or alternatively on 033 347 1600.

Yours faithfully

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