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Impact Assessments - Environmental Management Programs - Compliance Monitoring - Process Review

THE PROPOSED WIND ENERGY FACILITY SITUATED ON THE EASTERN PLATEAU (SOUTH) NEAR DE AAR, NORTHERN CAPE PROVINCE

APPLICATION FOR AMENDMENT OF THE ENVIRONMENTAL AUTHORISATION: ENVIRONMENTAL ASSESSMENT REPORT

(DEA Reference number: 12/12/20/2463/AM3)

JULY 2015

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PROJECT DETAILS

DEA Ref No: 12/12/20/2463/AM3

TITLE: Proposed Wind Energy Facility situated on the Eastern Plateau (south) near De Aar in the Northern Cape Province: Application for Amendment of Environmental Authorisation

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APPLICANT: Longyuan Mulilo De Aar 2 South (Pty) Ltd

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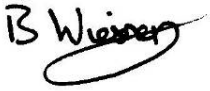

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ABBREVIATIONS

DEA	Department of Environmental Affairs
DENC	Department of Environment and Nature Conservation
DWS	Department of Water and Sanitation
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
EIA	Environmental Impact Assessment
EIA Report	Environmental Impact Assessment Report
EMPr	Environmental Management Programme
EIR	Environmental Impact Report
GN	Government Notice
ha	Hectare
HIA	Heritage Impact Assessment
HNC	Heritage Northern Cape
I&APs	Interested and Affected Parties
NEMA	National Environmental Management Act, 1998 (Act 107 of 1998)
NHRA	National Heritage Resources Act, 1999 (Act 25 of 1999)
PPP	Public Participation Process
SIPs	Strategic Integrated Projects
WEF	Wind Energy Facility
WTG	Wind Turbine Generators

1 INTRODUCTION

1.1 INTRODUCTION AND BACKGROUND

Longyuan Mulilo De Aar 2 South (Pty) Ltd (hereafter referred to as the Applicant) is applying for an amendment of the Environmental Authorisation (EA) in terms of the National Environmental Management Act (No. 107 of 1998) (NEMA) and Environmental Impact Assessment (EIA) Regulations (2014) for the proposed wind energy facility (WEF) situated on the Eastern Plateau (South) (referred to herein as the "De Aar 2 South WEF") near De Aar in the Northern Cape Province.

The WEF site and associated infrastructure is located on Slingers Hoek (Farm No. 2 Remainder of Portion 2 and Remainder); Slingers Hoek (Farm No. 2 Portion 4); Knapdaar (Farm No. 8 Portion 1); Maatjes Fontain Farm (Farm No. 1 Portion 5); Vendussie Kuil (Farm No. 165 Remainder of Portion 2); Vendussie Kuil (Farm No. 165 Portion 11 and Remainder) within the Emthanjeni Local Municipality and Renosterberg Local Municipality in the Northern Cape Province.

The EIA process for the proposed project was completed by Aurecon South Africa (Pty) Ltd in 2012. On 1 March 2013, the Department of Environmental Affairs (DEA) granted environmental authorisation in connection with the proposed project for Items 10, 11 & 18 of GN R.544; Item 1 of GN R. 545; and Item 14 of GN R.546 in the 2010 EIA Regulations. On 24 July 2014, a further environmental authorisation for the proposed project was granted in respect of Items 13 & 16 of GN 546 by the Northern Cape Department of Environment and Nature Conservation (DENC)[1].

The WEF authorised in terms of the abovementioned environmental authorisations comprises approximately 103 turbines, each with a generation capacity of 1.5 - 2.5MW. (Note that the potential generation capacity of the WEF has subsequently been limited to 140MW in accordance with the Department of Energy's Renewable Energy Independent Power Producer Procurement (REIPPP) Programme cap on maximum megawatts, although 258MW was authorised). Construction of the WEF has not commenced as yet.

An Application for Amendment of the EA was submitted by the Applicant to DEA in May 2013 to change the Special Purpose Vehicle (SPV) name from "Mulilo Renewable Energy (Pty) Ltd" to "Longyuan Mulilo De Aar 2 South (Pty) Ltd". This amendment of the EA was granted by DEA on 21 May 2013. On the 10 July 2014, the Applicant submitted a second Application for Amendment of the Environmental Authorisation to DEA for the following amendments:

- Amendment to extend the validity period of the EA;
- Amendment to the property descriptions of the EA; and
- Amendments to Conditions 43, 44 and 45.

The amendment of the EA was granted by DEA on 14 August 2014.

[1] for activities that had been missed (i.e. not applied for), albeit assessed, in the original EIA for the project

The Applicant now proposes to amend the project description of the proposed WEF, as well as to refine the preliminary layout of the WEF, as outlined in Section 2 below. The proposed amendments will require re-assessment of the potential impacts associated with the proposed project, as required in terms of the National Environmental Management Act (No. 107 of 1998) Environmental Impact Assessment (EIA) Regulations (2014).

Holland & Associates Environmental Consultants has been appointed by the Applicant to undertake the requisite Application for Amendment of the Environmental Authorisation for the proposed project, in accordance with the National Environmental Management Act (NEMA) (No. 107 of 1998) EIA Regulations (2014). **This Application for Amendment relates to the EA granted in respect of the proposed project by DEA on 1 March 2013.**

This report has been prepared in accordance with the requirements of the NEMA EIA Regulations (2014), (Part 2 (Regulations 31 and 32) of GN 982)), and should be read in conjunction with the Application for Amendment of the Environmental Authorisation form that was submitted to DEA on 23 June 2015 (refer to Appendix B), as well as the Environmental Impact Report[2] (dated April 2012) for the approved project (refer to Appendix G). The report provides an assessment of all impacts related to the proposed amendments, outlines the advantages and disadvantages associated with the proposed amendments and outlines the measures to ensure avoidance, management and mitigation of impacts associates with the proposed changes.

1.2 ENVIRONMENTAL LEGAL REQUIREMENTS

1.2.1 Application in terms of NEMA 2014 EIA Regulations

In terms of the NEMA EIA Regulations (2014), the proposed amendments to the project description constitutes a "change in scope" (i.e. substantive amendment of the EA). Accordingly, an Application for Amendment of the EA must be undertaken in terms of Part 2 ("Amendments where a change in scope occurs"), Regulations 31 and 32 of GN R. 982, and submitted to DEA for authorisation. In this regard, after submission of the Application for Amendment of the Environmental Authorisation to DEA, the holder of the EA must submit a report reflecting:

"(i) an assessment of all impacts related to the proposed change;
(ii) advantages and disadvantages associated with the proposed change; and
(iii) measures to ensure avoidance, management and mitigation of impacts associated with such proposed change; and
(iv) any changes to the EMPr"; (Note: Changes to the EMPr are not included in this amendment application, given that the EMPr and final layout for this project have not been submitted to DEA for approval as yet. Should the proposed amendment of the project description result in updates to the mitigation measures put forward by the specialists, the EMPr would be amended accordingly in due course, when it is submitted

[2] Aurecon. 2011. Proposed Wind Energy Facilities (North & South) situated on the Eastern Plateau near De Aar, Northern Cape: Final EIAR. Report No. 5933A

to DEA for final approval, as required in terms of Conditions of Authorisation 15 and 16 of the EA[3]).

As indicated previously, an Application for Amendment of the EA was submitted to DEA on 23 June 2015. All of the specialists that undertook specialist studies for the original EIA for the proposed De Aar 2 South WEF were appointed to undertake a re-assessment of the potential environmental impacts (within their area of expertise), to determine the implications of the proposed amendments. A report on the application for the amendment of the EA (i.e. this report) was compiled, including the findings of the updated specialist investigations, which are summarised in Section 3 below. Refer to Appendix C for the specialist Addendum reports.

As required in terms of the NEMA EIA Regulations (2014), a public participation process, including a 30 day comment period on the Environmental Assessment Report, is being undertaken for the proposed amendment application. Refer to Section 4 below for a summary of the public participation process. The Environmental Assessment Report for the Application for Amendment of the EA will be submitted to DEA at the end of the 30 day I&AP comment period[4], for decision making.

1.2.2 Transitional arrangements in terms of the NEMA EIA Regulations (2014)

On 4 December 2014 the Minister of Environmental Affairs promulgated regulations in terms of Chapter 5 of NEMA, *viz* the Environmental Impact Assessment ("EIA") Regulations 2014 (Government Notice ("GN") No. R. 982, R. 983, R. 984 and R. 985 in Government Gazette No. 38282 of 4 December 2014). These regulations came into effect on 8 December 2014, and replace the EIA Regulations that were promulgated in 2010.

The Environmental Authorisation for the De Aar 2 South WEF project was issued by DEA in terms of the 2010 EIA Regulations. Although the Applicant's original application and associated Environmental Authorisation for the De Aar 2 South WEF falls under the 2010 EIA Regulations, the 2014 EIA Regulations, i.e. GN 982 of 2014 and the associated Listing Notices, namely Listing Notice 1 (GN 983), Listing Notice 2 (GN 984) and Listing Notice 3 (GN 985) have been reviewed, to ensure that no new listed activities are triggered by the proposed project or proposed amendments.

The EIA listed activities for which environmental authorisation has been granted by DEA in terms of the 2010 EIA Regulations include Items 10, 11 and 18 of GN R.544, Item 1 of GN R. 545 and Item 14 of GN R546. As described above, further environmental authorisation was granted in respect of Items 13 & 16 of GN 546 by the Northern Cape Department of Environment and Nature Conservation (DENC), for activities that were assessed in the original EIA but not applied for.

[3] This approach was confirmed and accepted telephonically and via email with DEA (Mr Muhammad Essop) on 20 January 2015.
[4] A copy of the report will also be submitted to DEA at the commencement of the public comment period

Table 1.1: 2010 EIA listed activities and the similarly listed 2014 activities applicable to the project (and proposed amendments) (Note: The light grey shaded blocks indicate the listed activities that were authorised by DENC, whilst the remainder of the activities (no shading) were authorised by DEA)

2010 EIA Regulations (Authorised)		**2014 EIA Regulations**		
Activity No(s):	Describe the relevant Basic Assessment Activity(ies) in writing as per **Listing Notice 1 (GN R544)**	Activity No (s)	Describe the relevant Basic Assessment Activity(ies) in writing as per **Listing Notice 1 (GN R983)**	Describe the portion of the development as per the project description that relates to the applicable listed activity.
10	The construction of facilities or infrastructure for the transmission and distribution of electricity - (i) outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts; or (ii) inside urban areas or industrial complexes with a capacity of 275 kilovolts or more.	11	The development of facilities or infrastructure for the transmission and distribution of electricity- (i) outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts; or (ii) inside urban areas or industrial complexes with a capacity of 275 kilovolts or more.	The wind turbine generators would be connected to a 22kV transmission line, where the power would be evacuated via an onsite substation into Eskom's existing 400kV, 220kV and 132kV transmission lines.
11	The construction of: (i) canals; (ii) channels; (iii) bridges; (iv) dams; (v) weirs; (vi) bulk storm water outlet structures; (vii) marinas; (viii) jetties exceeding 50 square metres in size; (ix) slipways exceeding 50 square metres in size; (x) buildings exceeding 50 square metres in size; or (xi) infrastructure or structures covering 50 square metres or more	12	The development of- … (xii) infrastructure or structures with a physical footprint of 100 square metres or more; where such development occurs- (a) within a watercourse; (b) in front of a development setback; or (c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse; -	Wetlands and drainage lines are scattered across the proposed sites and one or more watercourses may need to be crossed by powerlines and access roads.

	where such construction occurs within a watercourse or within 32 metres of a watercourse, measured from the edge of a watercourse, excluding where such construction will occur behind the development setback line.			
18	The infilling or depositing of any material of more than 5 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock or more than 5 cubic metres from: **(i) a watercourse;** (ii) the sea; (iii) the seashore; (iv) the littoral active zone, an estuary or a distance of 100 metres inland of the highwater mark of the sea or an estuary, whichever distance is the greater but excluding where such infilling, depositing , dredging, excavation, removal or moving; (a) is for maintenance purposes undertaken in accordance with a management plan agreed to by the relevant environmental authority; or (b) occurs behind the development setback line.	19	The infilling or depositing of any material of more than 5 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 5 cubic metres from- (i) **a watercourse**; (ii) the seashore; or (iii) the littoral active zone, an estuary or a distance of 100 metres inland of the high-water mark of the sea or an estuary, whichever distance is the greater but excluding where such infilling, depositing , dredging, excavation, removal or moving- (a) will occur behind a development setback; (b) is for maintenance purposes undertaken in accordance with a maintenance management plan; or (c) falls within the ambit of activity 21 in this Notice, in which case that activity applies.	A number of roads would need to be constructed across drainage lines and would cumulatively result in the depositing of more than 5m^3.

Activity No(s):	Describe the relevant Scoping & EIA **Activity(ies)** in writing as per **Listing Notice 2** (GN R545)	Activity No (s)	Describe the relevant **Scoping & EIA Activity(ies)** in writing as per **Listing Notice 2** (GN R984)	Describe the portion of the development as per the project description that relates to the applicable listed activity
1	The construction of facilities or infrastructure for the generation of electricity where the electricity output is 20 megawatts or more.	1	The development of facilities or infrastructure for the generation of electricity from a renewable resource where the electricity output is 20 megawatts or more, excluding where such development of facilities or infrastructure is for photovoltaic installations and occurs within an urban area.	The proposed project would generate electricity from wind power. The generation capacity of the WEF would be 140MW.
N/A	N/A. (Refer to Activities 13 & 14 of GN R546 below)	15	The clearance of an area of 20 hectares or more of indigenous vegetation, excluding where such clearance of indigenous vegetation is required for- (i) the undertaking of a linear activity; or (ii) maintenance purposes undertaken in accordance with a maintenance management plan.	The proposed project would require the clearance of an area of more than 20ha of indigenous vegetation to accommodate the proposed structures (e.g. turbines, sub-station) and infrastructure (e.g. access roads, transmission lines).
Activity No(s):	Describe the relevant **Basic Assessment Activity(ies)** in writing as per **Listing Notice 3** (GN R546)	Activity No(s):	Describe the relevant **Basic Assessment Activity(ies)** in writing as per **Listing Notice 3** (GN R985)	Describe the portion of the development as per the project description that relates to the applicable listed activity
13[5]	The clearance of an area of 1 hectare or more of vegetation where 75% or more of the vegetative cover constitutes indigenous vegetation… (a) In Northern Cape ii. Outside urban areas, the following: (bb) National Protected Area Expansion Strategy Focus areas;	N/A	N/A Refer to activity 15 of GN R984 above.	The proposed project would require the clearance of an area of more than 1ha of indigenous vegetation to accommodate the proposed structures (e.g. turbines, sub-station) and infrastructure (e.g. access roads, transmission lines). The site is located outside an urban

[5] Note: Activities 13 and 16 of GN 546 of the EIA Regulations (2010) were authorised by DENC for the proposed project on 31 July 2014. DENC Reference: NC/BA/14/PIX/EMT/DEA5/2014.

				area. Portions of the site are located within a NPAES.
14	The clearance of an area of 5 hectares or more of vegetation where 75% or more of the vegetative cover constitutes indigenous vegetation, … (a) In Northern Cape i. All areas outside urban areas.	N/A	N/A Refer to activity 15 of GN R984 above.	The proposed project would require the clearance of an area of more than 5ha of indigenous vegetation to accommodate the proposed structures (e.g. turbines, sub-station) and infrastructure (e.g. access roads, transmission lines).
16[6]	The construction of: (i) jetties exceeding 10 square metres in size; (ii) slipways exceeding 10 square metres in size; (iii) buildings with a footprint exceeding 10 square metres in size; or (iv) infrastructure covering 10 square metres or more where such construction occurs within a watercourse or within 32 metres of a watercourse, measured from the edge of a watercourse, excluding where such construction will occur behind the development setback line. (a) In Northern Cape: ii. Outside urban areas, in: (bb) **National Protected Area Expansion Strategy Focus areas**;	14	The development of- (xii) infrastructure or structures with a physical footprint of 10 square metres or more; where such development occurs- (a) within a watercourse; (b) in front of a development setback; or (c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse; (a) In Northern Cape: ii. Outside urban areas, in: (bb) **National Protected Area Expansion Strategy Focus areas**;	Wetlands and drainage lines are scattered across the proposed sites and one or more watercourses may need to be crossed by powerlines and access roads. Portions of the proposed site fall within an NPAES focus area.

[6] Note: Activities 13 and 16 of GN 546 of the EIA Regulations (2010) were authorised by DENC for the proposed project on 31 July 2014. DENC Reference: NC/BA/14/PIX/EMT/DEA5/2014

As mentioned above, this Amendment Application is exclusively concerned with the amendment of the environmental authorisation which was granted in respect of the WEF by DEA on 1 March 2013. For the sake of completeness however, the Table 1.1 above sets out listed activities in respect of which environmental authorisation was granted by both DEA and DENC in terms of the 2010 EIA Regulations for the proposed project. The table furthermore includes the relevant listed activities which are similarly listed in terms of the 2014 EIA Regulations.

As is reflected in Table 1.1, the listed activities in respect of which environmental authorisation has been granted by DEA and DENC for the project are similarly listed to Activities 11, 12, & 19 of GN No. R.983; Activities 1 & 15 of GN No.R.984; and Activity 14 of GN No. R.985 in the 2014 EIA Regulations. In the circumstances, the proposed changes to the project (referred to above) will not, on their own, trigger any listed activities requiring environmental authorisation.

1.3 DETAILS AND EXPERTISE OF THE EAP WHO COMPILED THIS REPORT

Nicole Holland and Barry Wiesner prepared this report on the Application for Amendment of the Environmental Authorisation. The qualifications and expertise of the EAPs are outlined below:

Name	Academic Qualifications	Registration	Expertise
Nicole Holland	• BSc (Hons) Environmental & Geographical Science	Registered as Professional Natural Scientist with SACNASP, field of Environmental Science, Reg. No 400306/06.	Nicole has over 13 years of experience in the environmental management field and has extensive experience in managing environmental impact assessments and the associated public participation processes for projects including, amongst others, renewable energy project, water supply infrastructure, wastewater treatment works, housing and resort developments, cemeteries, road upgrades, pipelines and waste sites, amongst others. Nicole is a registered Professional Natural Scientist (Environmental Scientist) with the South African Council for Natural Scientific Professions, and is an active member of the South African affiliate of the International Association for Impact Assessment (IAIAsa).
Barry Wiesner	• BA, HDE (Sec), BTh, MPHIL Environmental Management)	IAIA SA Member and Accredited Professional with GBCS	Barry completed a MPHIL in Environmental Management at the University of Cape Town. Barry also has read a BA majoring in Archaeology and Environmental and Geographical Science and has a Higher Diploma in Education (HDE) from the University of Cape Town. He also has a Bachelor of Theology from the University of South Africa. Barry is a Green Star SA Accredited Professional and a member of the International Association for Impact Assessment.

			Barry has extensive site experience working as an Environmental Control Officer at major construction sites and in conducting Environmental Audits, EIAs, BARs and the compilation of numerous Environmental Management Programmes (EMPr) over the last twelve years. Barry has recently and is still currently involved as ECO with three 75 MW static Solar farms (two have become operational).

The *Curriculum Vitae* of the Environmental Assessment Practitioner is included in Appendix D.

The requirement for independence of the environmental consultant is aimed at reducing the potential for bias in the environmental process. It should be noted that neither Holland & Associates Environmental Consultants nor any of its sub-consultants have any interests in secondary or downstream developments that may arise out of the amendment of the EA application.

Refer to Appendix D for the details of the EAP and Declaration of Interest.

1.4 DETAILS OF SPECIALISTS

Table 1.2 below outlines the specialist studies that were undertaken as part of the original EIA for the project, and which have been updated by the respective specialists to inform the application for amendment of the EA process. Copies of the original specialist studies, as well as the original EIA report, are included in electronic format, in Appendix G.

Table 1.2: Specialist studies and specialists utilised for the original EIA and subject application for amendment of the EA process

Specialist study	Specialist
Ecology	David Hoare Consulting (David Hoare)
Avian (birds)	Dr Doug M. Harebottle (Note: Chris van Rooyen, who undertook the pre-construction bird monitoring, reviewed and commented on the draft addendum to the specialist avifauna assessment)
Bats	Animalia (Werner Marais & Monika Moir)
Noise	Enviro Acoustic Research (Morne De Jager)
Visual	Karen Hansen Landscape Architects (Karen Hansen)
Agriculture	SiVest (Michael Wright & Nicolaas Hannekom)
Archaeology and Heritage	ACO Associates cc (Lita Webley)
Palaeontology	Natura Viva cc (Dr John Almond)
Fresh water	Blue Science (Antonia Belcher)

Refer to each of the respective specialist studies included in Appendix C for the details of the specialists (including their CVs) and Declarations of Interest.

1.5 ASSUMPTIONS AND LIMITATIONS

1.5.1 Assumptions

In undertaking this investigation and compiling the report on the Application for Amendment of the EA, it has been assumed that-

- The information provided by the Applicant and specialists is accurate, unbiased and valid at the time it was provided.
- The scope of this investigation is limited to assessing the environmental impacts associated with the proposed amendment to the project description and preliminary layout.
- The baseline environmental information and assessment methodology contained in the EIA report (April 2012) and associated specialist reports is accurate and valid, and is not repeated in the current report. Copies of the original specialist studies, as well as the original EIA report, are included in electronic format, in Appendix G.
- Specialists have utilised the same methodology for assessing the significance of potential impacts associated with the proposed changes, in order to comparatively assess the approved versus the proposed amended project.

1.5.2 Limitations and gaps in knowledge

- The layout of the WEF included in the EIA and this amendment application process is preliminary. The final layout for the proposed WEF will be determined and submitted to DEA for approval in due course, as required in terms of Condition of Authorisation 13 of the EA. The final layout will take cognisance of the findings of the 12 month pre-construction monitoring for birds and bats as well as the report on the Application for Amendment of the EA (i.e. this report) and associated updated specialist studies. All available biodiversity information will be used in the finalisation of the layout plan, as required in terms of Condition of Authorisation 13 of the EA.
- Refer to the specialist reports contained in Appendix C for each specialist's assumptions, limitations and gaps in knowledge, where relevant.

2 PROPOSED AMENDMENT OF THE ENVIRONMENTAL AUTHORISATION

2.1 MOTIVATION AND DESCRIPTION OF PROPOSED AMENDMENTS

As onshore wind energy facilities (WEF) receive continued support worldwide from governments and energy regulators, technological improvements are being seen on a constant basis. In order to ensure that a wind energy facility has the smallest possible footprint per total installed capacity, the wind turbine generators (WTG) are evolving in higher yielding and more efficient generating units. As the engineering loads and fatigues are better understood on the units, it allows the designers and engineers to design the most optimal and highest yielding WTGs for the specific terrain and climatic conditions.

2.1.1 Proposed amendments to the project description (including layout)

The Applicant wishes to increase the generating size of the WTG's in order to align to current international WTG models while reducing the number of WTG's on the WEF site. The following changes to the WTG parameters are proposed:

- Increasing hub heights from 100 m to 120m
- Increasing blade lengths from 60 m to 80m
- Increasing WTG generation size to encompass a range of 2.3MW to 4.0MW

Note: The generation capacity of the WEF would be a maximum of 140MW (in accordance with the Department of Energy's REIPPP Programme cap on maximum megawatts).

Component	Approved	Proposed amendment
Number of turbines	103	61 Turbines @ 2.3MW per turbine (to 30 Turbines @ 4MW per turbine). Note: The maximum of 61 is being applied for.
Generation capacity per turbine	1.5 - 2.5MW	2.3MW – 4.0MW
Generation capacity of the WEF	155 - 258MW	140 MW
Rotor / blade diameters	120m	(min) 100m (max) 160m (Note: The maximum of 160m is being applied for)
Hub height	100m	(min) 90m (max) 120m (Note: The maximum of 120m is being applied for)

Permanent construction pad	"20" 40 x 50m (adjacent to each turbine) (Note: it is apparent that the "20" is a typographical error in the EA. Refer to Section 2.2 below in this regard)	40 x 50m (adjacent to each turbine)
Permanent affected area (foundation size)	16 x 16m and 2 m deep	18,4m diameter, that narrows up to 10,6m at the surface (the visible portion) once the foundation is completed. Depth : 3,5m

(Note: The Application for amendment of the EA will assess the "worst case scenario" of 61 turbines @ 2.3MW per turbine with the understanding that should the Applicant use 4MW turbines (which will be the same dimensions as the 2.3MW turbines) then the Applicant would reduce the number of turbines to 30. The maximum turbine dimensions will be assessed and applied for. It is furthermore noted that the generation capacity of the WEF is limited to 140MW. Even though 61 turbines of 2.3MW = 140.3MW, the Applicant will be limited to 140MW).

These changes would result in an increase of the turbine tower base diameter from 15m to 20m however the construction pad would remain 40 x 50m.

The proposed amendments would result in a reduction in the development footprint of the WEF, due to the reduction in the number of turbines proposed as part of this amendment application. As indicated in the Final EIA report (April 2012), the development footprint of the authorised WEF includes approximately 20ha for the proposed access roads, a total footprint of approximately 24ha for the three construction laydown areas, approximately 2ha for the substation, and approximately 20.6ha for the hard-standings adjacent to each turbine. The footprint of the laydown areas, substation and roads would stay the same for the proposed amended project as the authorised WEF (albeit that it is likely that the internal access roads will be marginally less than the authorised WEF, as there will be some sections of road that are no longer necessary to construct due to the reduced number of WTGs). The total footprint associated with the hard standings will however reduce from approximately 20.6ha to approximately 12.2ha.

The Applicant has indicated that the proposed amendments to the WTGs are the upper limits of possible future WTG sizing, and if the De Aar 2 South WEF is to be constructed in the next few years, the actual WTG sizing will be in the middle range. The general benefits of using larger sized turbines, compared to older generation turbines are:

- Improved grid code compliance and voltage regulation, providing a more secured energy supply;
- Improved warranted power and noise curves;
- Decrease in WTG load fatigue, maintenance costs and downtime;
- Decrease in the road area coverage per installed capacity;
- More efficiently yielding the wind energy resource, and reducing the need for further WEF development to increase the total installed capacity (Longyuan Mulilo De Aar 2 South (Pty) Ltd, May 2015).

According to the Applicant, the proposed location for the De Aar 2 South WEF is adequately positioned for a Wind Energy Facility due to the following attributes:

- Excellent consistent wind resource;
- Eskom substation positioned close to the WEF, with minimal distance required for the transmission lines to be built;
- Most accessible positions have been chosen, with the least impact on the environment and construction costs; and
- The Wind Energy Facility is located in a central position in the Northern Cape/ Eskom Grid, thereby being able to offset any electrical loses that occur due to transmitting electricity to the region (Longyuan Mulilo De Aar 2 South (Pty) Ltd, May 2015).

Refinements to the WEF preliminary layout are also proposed. Refer to Figure 1 and Appendix A for the updated layout.

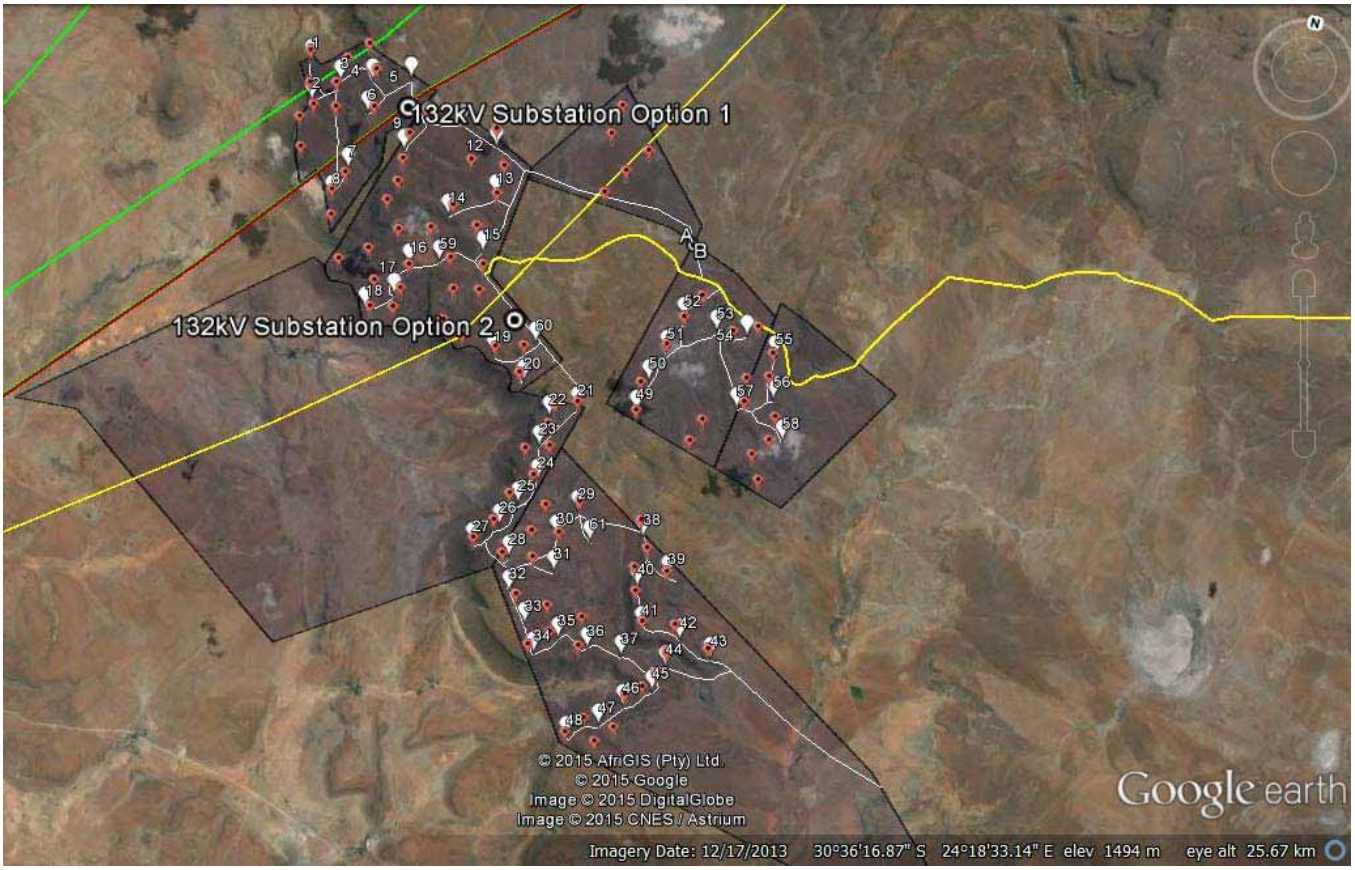


Figure 1: Proposed amended (preliminary) layout. Note: the red markers indicate the EA approved turbine positions and white markers indicate the new revised turbine positions (Google Earth, 2015)

The proposed amended layout will require changes to the location of supporting infrastructure (refer to Appendix A for turbine positions, access roads and distribution network). It should be noted that, as required in terms of Condition 13 of the EA, the Applicant will still submit a final layout plan for the wind energy facility to the DEA for approval (once Environmental Authorisation for the proposed amendment of the EA is issued and preferred bidder status is awarded).

2.2 PROPOSED AMENDMENT OF ENVIRONMENTAL AUTHORISATION

In light of the above, the Applicant is applying for an amendment to the following in the abovementioned Environmental Authorisation (as amended):

- **Amendment to the project description**

The proposed amendments to the project description outlined in Section 2.1 above will require an amendment to page 5 of the EA, sub-section titled "*The infrastructure associated with this facility includes*", which currently describes the proposed project as:

> *"- the construction of approximately 103 turbines with a potential capacity of 155 - 258 MW".*

The proposed amendment of this sentence on page 5 of the EA is as follows:

> *"- the construction of approximately 61 turbines (with a generation capacity of 2.3MW per turbine) to 30 turbines (with a generation capacity of 4MW per turbine). The generation capacity of the WEF would be 140 MW".*

Note: The Application for Amendment of the EA is therefore applying for a range of approximately 30 to 61 turbines, with a generation capacity ranging from 2.3MW to 4.0MW per turbine. The generation capacity of the WEF would be a maximum of 140MW (in accordance with the Department of Energy's cap on maximum megawatts). The Application for Amendment of the EA has assessed the "worst case scenario" of 61 turbines @ 2.3MW per turbine, with the understanding that, should the Applicant use turbines with a generation capacity up to 4.0MW, then the Applicant would reduce the amount of turbines accordingly (with the minimum being approximately 30 turbines). According to the Applicant, the dimensions of the turbines ranging from 2.3MW to 4.0MW would be similar.

- **Amendment of Typographical error**

There is a typographical error on page 5 of the Environmental Authorisation dated 1 March 2013 relating to one of the "associated infrastructure" descriptions. In particular, the EA refers to:

> *"A permanent hard standing made of compacted gravel and approximately 20 50 m x 40 m would be constructed adjacent to each turbine location for the crane ".*

The Applicant requests that the editorial error be corrected in the EA by removing the number "20", given that there would be a hard standing area adjacent to each turbine (as indicated in the remainder of the description), and therefore more than 20 hard standing areas would be required. It is therefore requested that the sentence be amended as follows:

> *"A permanent hard standing made of compacted gravel and approximately 50 m x 40 m would be constructed adjacent to each turbine location for the crane".*

In this regard, the Final EIA Report[7] for the proposed project, page 35, states that "*A permanent hard standing made of compacted gravel and approximately 50m x 40m would be constructed adjacent to each turbine location for the crane*". Similarly, the conclusion section of the Final EIA Report (page 111) states that the associated infrastructure includes "*hardstandings of 50m x 40m alongside turbines*".

[7] Aurecon. 20102. Proposed Wind Energy Facilities (North and South) situated on the Eastern Plateau near De Aar, Northern Cape. Final Environmental Assessment Report. April 2012.

3 ASSESSMENT OF POTENTIAL ENVIRONMENTAL IMPACTS

The potential environmental impacts[8] associated with the proposed amendments have been assessed and described in the following section of this report. In this regard, all of the specialists that undertook specialist studies for the original EIA for the proposed De Aar 2 South WEF, have undertaken a re-assessment of the potential environmental impacts (within their area of expertise), to determine the implications of the proposed amendments in terms of potential environmental impacts. The following specialist investigations were undertaken:

- Impact on ecology
- Impact on avifauna
- Impact on bats
- Impact of noise
- Visual impact
- Impact on agricultural land
- Impact on heritage resources, including an archaeology and palaeontology
- Impact on freshwater resources

Refer to Table 1.2 for the list of specialists. The results of the updated specialist studies, outlining the implications, if any, in terms of environmental impacts, are summarised below. The specialists' addendum reports are included in Appendix C.

3.1 AMENDMENT OF THE PROJECT DESCRIPTION AND LAYOUT

3.1.1 Impacts on ecology

As indicated in the original EIA for the project, the proposed WEF may potentially impact on the ecology of the study area, including the biodiversity, sensitive habitats and ecosystem functions of the receiving environment. As such Dr David Hoare was appointed as part of the original EIA for the project to undertake a specialist ecological impact assessment (refer to Appendix G for the original specialist ecological impact assessment report). In light of the proposed amendments to the project description and preliminary layout, Dr Hoare has undertaken a re-assessment of potential ecological impacts, to determine the implications of the proposed amendments. Refer to Appendix C1 for the addendum to the specialist ecological impact assessment report.

The vegetation type on site that will be affected by construction of the WEF and associated infrastructure is Northern Upper Karoo and Besemkaree Koppies Shrubland, neither of which is threatened or listed (Hoare, 2015).

[8] Note that the original EIA for the WEF incorporated other potential impacts, notably: impacts on climate change; energy production; local economy (employment) and social conditions; storage of hazardous substances; and dust impacts. The proposed amendments will not increase the level or nature of these impacts, or change the significance of these potential impacts, accordingly they are not described again in this Report.

a) Potential Impacts

Potential ecological impacts identified during the original EIA for the project included the following:

- Loss or fragmentation of indigenous natural vegetation
- Loss of individuals of threatened plants
- Loss of individuals of protected tree species
- Loss of individuals of protected plant species
- Loss of individuals of threatened or protected animals
- Impacts on wetlands and drainage areas
- Establishment and spread of declared weeds and alien invader plants

It was established during the EIA study that no threatened plant species occur in the general area and that there are no threatened or protected animal species that are likely to be negatively affected by the proposed project (due to them being highly mobile). Wetlands and drainage areas have been assessed by another (freshwater) specialist (refer to Section 3.1.3 below) and therefore was not assessed as part of the ecological impact assessment.

It was determined during the EIA study that protected trees were unlikely to occur on site, but the protected tree, *Boscia albitrunca*, has subsequently been found on site, but only on the plateau itself, not within the footprint of the transmission power lines footprint below the plateau to the Hydra Substation. Additionally, there are various plant species protected according to Provincial legislation that may occur at low densities in some parts of the site.

In summary, the following potential impacts were re-assessed in terms of the proposed amendments:

Construction Phase impacts:
- Loss or fragmentation of indigenous natural vegetation
- Loss of individuals of protected tree species
- Loss of individuals of protected plant species

Operation Phase impacts:
- Establishment and spread of declared weeds and alien invader plants

Note: Impacts were assessed for each component of infrastructure for the proposed wind energy facility. There is therefore a separate assessment for the turbines, internal access roads and overhead power lines (refer to Appendix C1). These are grouped according to project phases and are summarised below.

Construction Phase Impacts:

A total of a maximum of 61 turbines have been proposed for the wind energy facility. These would be located in areas of natural vegetation. The impacts of potential concern are therefore on natural vegetation, impacts due to the potential establishment and spread of alien plants.

- **Loss or fragmentation of indigenous natural vegetation:** The vegetation type on site that will be affected by construction of infrastructure is Northern Upper Karoo and Besemkaree Koppies Shrubland, neither of which is threatened or listed. In terms of the proposed amendments, the significance of this potential impact associated with the various project components, i.e. wind turbine generators, overhead transmission lines and internal access roads would remain the same, before and after mitigation, for the authorised and proposed amended option. Specifically, in terms of Wind Turbine Generators (WTGs), the significance of this potential impact will remain Low (-) before and after mitigation for the proposed amended option. In terms of overhead power lines, the significance of this impact for both the authorised and proposed amended options is Low (-) before mitigation and Very Low (-) after mitigation, and in terms of access roads, Medium (-) before and after mitigation for both the authorised and proposed amended option respectively.

- **Loss of individuals of protected tree species:** The protected tree, *Boscia albitrunca*, occurs at low densities in some parts of the site on the plateau. In terms of the proposed amendments, the significance of this potential impact associated with the various project components, i.e. WTGs, overhead transmission lines and internal access roads would remain the same, before and after mitigation, for the authorised and proposed amended option. Specifically, in terms of WTGs and overhead power lines, the significance of this potential impact will remain Very Low (-) before and after mitigation for the proposed amended option. In terms of internal access roads, the significance of the potential impact would remain Low (-) for both the authorised and proposed amended option, before and after mitigation, respectively.

- **Loss of individuals of protected plant species:** There are various plant species protected according to Provincial legislation that may occur at low densities in some parts of the site. In terms of the proposed amendments, the significance of this potential impact associated with the various project components, i.e. WTGs, overhead transmission lines and internal access roads would remain the same, before and after mitigation, for the authorised and proposed amended option. Specifically, in terms of WTGs, overhead power lines and internal access roads, the significance of this potential impact will remain Very Low (-) before and after mitigation for the proposed amended option.

Refer to Appendix C1 for the detailed assessment tables relating to the abovementioned impacts.

Operational Phase Impacts:

- **Establishment and spread of declared weeds and alien invader plants:** There will be little additional disturbance on site following the construction phase, but it is probable that existing disturbance to natural habitats will change conditions in favour of invasive plant species. In terms of the proposed amendments, the significance of this potential impact associated with the various project components, i.e. WTGs, overhead transmission lines and internal access roads would remain the same, before and after mitigation, for the authorised and proposed amended option. Specifically, in terms of WTGs, overhead power lines and internal access

roads, the significance of this potential impact will remain Medium (-) before mitigation and Very Low (-) after mitigation for the proposed amended option.

A summary of the significance of impacts for both the construction and operational phases is given in Tables 3.1 and 3.2 below for the authorised and proposed amended options respectively. This shows that the potential impact on natural vegetation by the internal access roads is the only impact with a significance of "Medium" after mitigation. Other potential impacts are either "Low" or can be reduced to "Low" or "Very Low" with mitigation.

Table 3.1: Summary of significance of ecological impacts for the authorised option (Source: Hoare, 2015)

Impact	Wind turbines		Internal access roads		Overhead power lines	
	Without mitigation	With mitigation	Without mitigation	With mitigation	Without mitigation	With mitigation
1. Loss or fragmentation of vegetation	Low	Low	Medium	Medium	Low	Very low
2. Loss of individuals of protected tree species	Very low	Very low	Very low	Very low	Very low	Very low
3. Loss of individuals of protected plant species	Very low	Very low	Very low	Very low	Very low	Very low
4. Spread of alien plants	Medium	Very low	Medium	Very low	Medium	Very low

Table 3.2: Summary of significance of ecological impacts for the proposed amended option (Source: Hoare, 2015)

Impact	Wind turbines		Internal access roads		Overhead power lines	
	Without mitigation	With mitigation	Without mitigation	With mitigation	Without mitigation	With mitigation
1. Loss or fragmentation of vegetation	Low	Low	Medium	Medium	Low	Very low
2. Loss of individuals of protected tree species	Very low	Very low	Very low	Very low	Very low	Very low
3. Loss of individuals of protected plant species	Very low	Very low	Very low	Very low	Very low	Very low
4. Spread of alien plants	Medium	Very low	Medium	Very low	Medium	Very low

The assessed impacts are not shown to be different between the authorised option and the proposed amended option. This is because the categorical nature of the impact assessment methodology does not have the resolution to distinguish between impacts that are marginally different from one another. For example, whether there are 103 turbines, as in the authorised option, or 61, as in the amended option, the extent, magnitude, probability and duration of an impact remain within the same categories. Slight differences would only be possible to distinguish if the impact assessment methodology was calculated using continuous variables.

It is, however, worth noting that the actual footprint area affected by WTGs is lower for the amended option than the authorised option. Based on the permanent hard stand area, the authorised option will result in the destruction of 20.6 ha, whereas the proposed amended option will result in the destruction of 12.2 ha. These areas must be added to the area that will be lost due to internal access roads (in the order of 0.4 ha per kilometre of road for a 4 m wide road for a total of 50 – 60 km of internal roads = approximately 20-24 ha), the substation (2 ha) and the laydown areas (24 ha). The network of internal access roads will be marginally less for the amended option than for the authorised option, because there will be some sections of road that are no longer necessary to construct due to the smaller number of wind turbine generators. The total area affected by the authorised option is therefore in the order of 66.6 ha whereas for the amended option it is in the order of 58.2 ha. This is an approximately 13% reduction in footprint area, which is significant.

When compared to the total area within which the wind energy facility is located (an area approximately 14 x 6 km = 8 400 ha), it can be seen that the overall area affected by either the authorised option or the amended option, including all infrastructure components, is a small percentage of the total area (< 0.8%).

As demonstrated in the paragraph above, the difference in area affected is significantly different for the authorised option and the amended option, with the amended option being lower. The reduction is of benefit to the ecological receiving environment and includes a marginally lower probability of striking populations of any species of concern as well as a reduced loss of overall habitat. Of equal importance is the effect on ecological processes, which are determined on a landscape scale and are not affected so much by the actual footprint of the infrastructure, but more by the way in which the infrastructure creates ecological fragmentation and deleterious edge effects. The effect on ecological processes is therefore deemed to be the approximately the same for both options (Hoare, 2015).

Cumulative Impact:

Due to the fact that two wind energy facilities are proposed adjacent to one another, the issue of cumulative impacts from both facilities needs to be addressed. There are a total of four impacts that have been assessed in the sections above, as follows:

- Loss or fragmentation of indigenous natural vegetation,
- Establishment and spread of declared weeds and alien invader plants;
- Loss of individuals of protected tree species;
- Loss of individuals of protected plant species.

The impact on natural vegetation is due primarily to internal access roads. For this infrastructure component the impact was evaluated as being of medium magnitude at a site specific scale and of long-term duration, and the impact was scored as having a significance of medium. If two facilities are taken together then the scale would be elevated to “local”, but the remaining measures would stay the same. The significance of the impact for the combined project would therefore remain medium.

Loss of individuals of protected plants and tree species could result from any infrastructure component. For all infrastructure components the impact was evaluated as being of low magnitude at a site specific scale and of long term duration, and the impact was scored as having a significance of low. If the two proposed facilities are taken together then the scale would be elevated to “local”, but the remaining measures would stay the same. The significance of the impact for the combined project would therefore remain low.

Establishment and spread of declared weeds and alien invader plants could result from any infrastructure component. For all infrastructure components the impact was evaluated as being of medium magnitude at a local scale and of long term duration, and the impact was scored as having a significance of medium. If the two proposed facilities are taken together then the scale would be elevated to “local”, but the remaining measures would stay the same. The significance of the impact for the combined project would therefore remain medium.

It is therefore concluded that cumulative impacts will not result in impacts having a significance that is greater than for each of the individual proposed wind energy facilities.

b) Mitigation Measures

The proposed amendments will not result in any changes to the mitigation measures put forward in the original ecological assessment and EIA report. In this regard, the mitigation measures relating to potential ecological impacts include the following (as outlined in the Addendum to the ecological assessment report):

Construction Phase:

- Unnecessary impacts on surrounding natural vegetation must be avoided. The construction impacts must be contained to the footprint of the turbines, tower structures, lay down area, servitude of the power line and footprint/ servitude of the internal access roads.
- Disturbed areas must be rehabilitated as soon as possible after construction, using site-appropriate indigenous species.
- Existing access roads must be used, where possible as the location for new roads. Disturbances will then be placed where there is an existing, albeit small, disturbance.
- Service roads in the servitude must be properly maintained to avoid erosion impacts.
- Steep slopes must be avoided, if possible.
- Rehabilitate disturbed areas adjacent to construction as quickly as possible.
- Rescue any species of value from the footprint of construction.
- Control alien plants adjacent to infrastructure.
- Undertake a walk-through survey within the footprint of the proposed infrastructure prior to construction in order to identify any individual protected trees/ plants that may be affected.
- Obtain a permit for the removal of any affected listed /protected trees/ plants.
- Consider slight local adjustments to tower positions to avoid any affected individuals or concentrations of any affected individuals of protected plants.

Operational Phase:

- Disturbance of indigenous vegetation outside of the footprint of construction must be kept to a minimum.
- Where disturbance is unavoidable, disturbed areas should be rehabilitated as quickly as possible.
- Any alien plants within the control zone of the company must be immediately controlled to avoid establishment of a soil seed bank. Control measures must follow established norms and legal limitations in terms of the method to be used and the chemical substances used.
- An on-going monitoring programme should be implemented to detect and quantify any aliens that may become established and provide information for the management of aliens.
- An alien management plan should be compiled for the project.

c) Conclusion

A summary of the significance of potential ecological impacts is given in Tables 3.1 and 3.2 above for the authorised and proposed amended options respectively. The aforementioned tables show that the potential impact on natural vegetation by the internal access roads is the only impact with a significance of "Medium" after mitigation. Other potential impacts are either "Low" or can be reduced to "Low" or "Very Low" with mitigation (Hoare, 2015).

The significance of impacts associated with the proposed amended option is the same as those for the authorised option, according to the impact assessment methodology. However, there is a significant reduction in the actual footprint area associated with the amended option in comparison to the authorised option, which is to the benefit of the ecological receiving environment. The proposed amendments are therefore supported from an ecological point of view (Hoare, 2015).

Refer to **Appendix C1** for the Ecology Addendum Report.

3.1.2 Impacts on avifauna

A re-assessment of potential avifaunal impacts was carried out by avifauna specialist, Mr Doug Harebottle, in light of the proposed amendments to the De Aar 2 South WEF. The findings of the re-assessment are summarised below and are included in Appendix C2.

It should be noted that the pre-construction bird monitoring for the project, undertaken by Mr Chris van Rooyen (of Chris van Rooyen Consulting), is complete, and a summary of the pertinent findings from the pre-construction monitoring is included in the addendum to the avifauna specialist report. Data from the completed pre-construction monitoring programme was used extensively in the re-assessment undertaken by Mr Harebottle. Furthermore, Chris van Rooyen was invited to review and provide comment on the addendum to the draft avifauna assessment report. (Refer to Appendix C2 for Mr van Rooyen's comments on the report). Cognisance was given to Mr van Rooyen's comments in the finalisation of Mr Harebottle's addendum report.

The development area falls within the Nama-Karoo biome and forms part of the Platberg-Karoo Conservancy Important Bird Area (IBA). The impact zone of the proposed WEF constitutes a kareekoppie shrubland plateau with rocky outcrops and cliff faces. The surrounding landscape is used primarily for cattle and sheep grazing and comprises karroid scrub vegetation. Overall, the avifauna comprises a rich Nama-Karoo assemblage which reflects the major habitat types within the De Aar region. The initial avifaunal assessment listed 125 species that were recorded on the plateau and in the surrounding landscape (a radius of ± 20 km); the assessment covered both the northern and southern WEF developments. Twenty-three priority species were identified as critical to the impact assessment for both developments. The pre-construction monitoring programme recorded 101 species on the WEF site and identified 24 priority species which included five species not recorded during the initial site visit for the first impact assessment (Grey-winged Francolin, Karoo Korhaan, Rufous-chested Sparrow-hawk, Peregrine Falcon, African Harrier-hawk, Sclater's Lark). A composite list of 33 priority species was drawn up for the impact re-assessment which included the five additional species above.

Based on the results from the pre-construction monitoring, a revised list of avifaunal sensitive zones was adopted for the proposed amended option. These include:

- Buffer zones of 800 m around the Verreaux's Eagle nest sites
- Buffer zones of 800 m around the Booted Eagle nest sites
- Within a 100 m of the plateau edge (cliff face) – this to prevent raptors, using the cliffs for uplifts, from colliding with turbines that would have been located closer to the edge of the plateau.
- The Vendussiekuil farm dam has been withdrawn as an exclusion zone.

a) Potential Impacts

The birds which are likely to have the greatest potential relevance relative to the WEF impacts are (a) resident and breeding raptors, foraging on, or moving across the turbine sites, notably, Booted Eagle *Aquila pennatus*, Verreaux's Eagle *Aquila verreauxii*, Black-chested Snake-Eagle *Circaetus pectoralis*, and Jackal Buzzard *Buteo rufofuscus*; (b) large terrestrial birds foraging on, or moving over, the lowland/plateau interface, including, Karoo Korhaan *Eupodotis vigorsii*, Ludwig's Bustard *Neotis ludwigii*, Kori Bustard *Ardeotis kori*, and Blue Crane *Anthropoides paradiseus* and (c) endemic passerines that utilise the ridge lines (most likely Sclater's Lark *Spizocorys sclateri* and possibly African Rock Pipit *Anthus crenatus*).

Given the proposed changes to the WEF layout, turbine specifications and the results from the pre-construction monitoring, a re-assessment of the impacts was carried out for the proposed amended option. The impacts assessed are summarised below:

- Disturbance and displacement of resident or breeding Karoo species from foraging/breeding areas by construction and/or operation of the facility.
- Disturbance and displacement of large terrestrial birds from nesting or foraging areas by construction and/or operation of the facility and/or mortality of these species in collisions with new power lines.

- Disturbance and displacement of resident/migrant raptor species from foraging/breeding areas by construction and/or operation of the facility, and/or mortality of these species in collisions with new power lines, or electrocution when perched on powerlines.
- Disturbance and displacement of resident and breeding waterbirds from nesting and/or foraging areas by construction and/or operation of the facility, and/or mortality of these species in collisions with turbine blades or powerline infrastructure while commuting between resource areas.
- Mortality of aerial foraging species (notably swallows, swifts and martins) with turbine blades or powerlines.

The impact characteristics for the proposed amended option for the De Aar 2 South WEF remain largely unchanged from the original avifaunal assessment given in Harebottle (2012). The only changes that have been made relate to the key receptor species: three species (Greater Flamingo, Blue Crane and Ludwig's Bustard) listed by Harebottle (2012a) which have been replaced by five new priority species (Jackal Buzzard, Peregrine Falcon, Grey-winged Francolin, Karoo Korhaan, Sclater's Lark) that were identified from the pre-construction monitoring (van Rooyen et al. 2014).

A detailed comparison of the overall significance of avifauna impacts between the original avifauna impact assessment (authorised WEF) and the re-assessment for the proposed amendments are presented in Table 3.3, and are discussed briefly below. Refer to Appendix C2 for the detailed re-assessment of avifauna impacts.

Table 3.3: Comparison of the overall significance of impacts between the original avifaunal impact assessment (authorised option, Harebottle 2012a) and the re-assessment for De Aar 2 South (proposed amended option). Where significance has changed this is indicated in italics. (Source: Harebottle, 2015)

Phase/Impact	Pre-mitigation Significance		Post-mitigation Significance	
	Harebottle (2012) (Authorised Option)	This report (Proposed amended Option)	Harebottle (2012) (Authorised Option)	This report (Proposed amended Option)
Construction				
Habitat loss	Low-Medium	*Low*	Low	Low
Disturbance/ Displacement	High	*Medium-High*	Medium	Medium
Operational				
Disturbance/ Displacement	High	*Medium*	Medium	*Low-Medium*
Mortality	Medium-High	*Medium*	Medium	*Medium*

Post-mitigation significance has remained unchanged (*medium*) from the original avifauna assessment (Harebottle 2002a). The reasons for this are largely that although the reduction of WGTs should further reduce the frequency of birds colliding with turbine blades and/or any overhead

powerlines the risks associated with priority and/or collision-risk species remains uncertain and therefore a more cautionary approach should be followed. Quantitative post-construction monitoring will reveal the real extent of the operational impacts and so these significances, although they provide an optimistic outlook, should be viewed with some caution (Harebottle, 2015).

Construction Phase Impacts:

Construction activities would result in a negative direct impact on the avifauna of the WEF site, specifically with regards to habitat loss and disturbance and displacement of avifauna.

- **Habitat Loss:** In terms of habitat loss, the footprint of the development has been reduced from the authorised option but still covers a wide area. Due to its placement on a ridge-top, there will be some loss of habitat for specialised, montane grassland species. Harebottle (2015) indicated that habitat loss impacts before mitigation has changed (reduced) from Medium - Low (-) (Authorised Option) to Low (-) (proposed Amendment Option). This is due to the reduction in the number of WTGs which will reduce the area (habitats) that will be impacted during the construction phase. The result from this is the likely increase in the amount of available habitat for the general karoo avifaunal community, given that the avifauna habituate to the turbines once the WEF is established.

- **Disturbance/ Displacement:** In terms of disturbance and displacement of avifauna, the general avian community will be impacted to some degree although some species may habituate over time. Sensitive and/or threatened species (e.g. Grey-winged Francolin, Sclater's Lark and Karoo Korhaan) could be displaced temporarily from favoured sites, especially if explosives are used for the turbine foundations. The impact significance for disturbance and displacement prior to construction changed from High to Medium - High. With the proposed number of turbines being reduced there will be considerably less construction activities which may reduce the overall impact on the general avifauna. However, the post-mitigation remains unchanged (Medium (-)) especially in light of the priority species and the raptor community; the latter have nest sites that are situated in fairly close proximity to some of the turbine sites on the edge of the western section of the plateau.

Operational Phase Impacts:

Operational activities would result in a negative direct impact on the avifauna of the WEF through displacement and/or disturbance from foraging/ nesting by noise and/ or movement of turbine blades, as well as through bird deaths from collision with turbine blades and/or overhead powerlines or electrocution on new power infrastructure associated with the WEF.

- **Displacement and/or disturbance:** Some priority species may be displaced for the duration of the project. The extent of this impact would be regional if Verreaux's Eagles, Booted Eagles, Martial Eagles or Jackal Buzzards are displaced, or local should only other priority species be affected. Pre- and post-mitigation significance for disturbance and displacement impacts during operation of the WEF changed from high to medium and medium to low-medium respectively. This drop in significance for both impacts is based on the fewer

operational activities (e.g. turbine maintenance) that will be associated with an overall smaller footprint, and should mitigation measures proposed above be adhered to then post-construction impacts are likely to be further reduced (Harebottle, 2015).

- **Mortality from collisions:** Numbers of individuals of threatened or sensitive species may be killed in collision or electrocution incidents. The extent of this impact would be regional if Verreaux's Eagles, Booted Eagles, Martial Eagles or Jackal Buzzards are killed, or local should other priority species be affected, or non-priority aerial foragers (i.e. swifts and swallows) that occupy the area. In terms of mortality (collision risks) pre-mitigation significance has been changed from medium-high to medium. The reduction in the overall footprint of the WEF and number of WGTs are the primary reasons for this. However, it should be noted that this is still a relatively high significance as priority and collision-prone species (e.g. Booted Eagle, Verreaux's Eagle, Jackal Buzzard, Martial Eagle, Karoo Korhaan, Grey-winged Francolin) would still remain largely at risk, given the uncertainty of how these species will react to operational turbines in the landscape.

Cumulative Impacts:

For cumulative impacts, the proposed amended option cannot be assessed in isolation as they may pose limited threats to avifaunal populations. It needs to be reviewed in combination with the development of other renewable energy facilities in the region. Cumulatively, these are likely to form significant barriers to birds either in the form of displacement from foraging areas or reducing energy-efficient travel between resource areas. No definite cumulative impacts can be provided at this stage of project development (Harebottle, 2015). Masden et al. (2010) and Jenkins (2011) concur that a more strategic approach to assessing wind energy development in South Africa is required than is currently being applied. It would be necessary for the Department of Environmental Affairs (DEA), or a similar body, to undertake this strategic assessment as it cannot be assessed in a project specific application (Harebottle, 2015).

b) Mitigation

Proposed mitigation measures have been refined since the original EIA to take cognisance of the findings of the pre-construction monitoring. Recommended mitigation includes the following (and would be the same for the authorised and amended options):

Construction Phase

- Avoiding construction in areas classified as a sensitive vegetation type particularly where remnant patches are present (reference will need to be made to the botanical impact assessment for details of sensitivity).
- Rehabilitation of areas that have been altered/cleared could assist in managing habitat loss.
- Reducing and maintaining noise disturbance to a minimum particularly with regards to blasting. Blasting should be avoided (where possible) during the breeding seasons of the general avifaunal community and in particular for the priority species and notably the cliff-breeding raptor species (refer to Table 1 in Harebottle 2012). Blasting should be kept to a minimum and, where possible, synchronized with neighbouring blasts.

- Limiting (or avoiding where possible) construction of turbines closest to the cliff-edges from July – November; this will minimize impacts on the breeding productivity of Booted Eagle and Verreaux's Eagle. It is important that all turbines located along the cliff line be included and not only those that are situated closest to the nest sites as the birds use the cliff line for foraging and finding thermals on a daily basis.
- Excluding development or disturbance from sensitive areas.

Operational Phase:

- Minimizing the disturbance associated with the operation of the facility, by scheduling, as far as possible , maintenance activities to avoid and/or reduce disturbance in sensitive areas at sensitive times (e.g. breeding season for cliff-nesting raptors , June – November). Where unscheduled maintenance needs to take place, disturbance by maintenance staff will need to be kept to a minimum. The 800-m 'no-go' buffer zones around key nesting areas should largely eliminate the risk of disturbance (C. van Rooyen in litt.). However, should staff be concerned that maintenance to turbines located in sensitive areas may impact on any of the avifauna (notably the cliff –nesting raptors) they should consult with the Environmental Site Officer (ESO) and/or a relevant avifaunal specialist prior to carrying out any maintenance activities.
- Minimising the length of any new internal power lines installed, and ensuring that all priority lines are marked with bird flight diverters (Jenkins *et al.* 2011) along their entire length. It is recommended that prioritisation of lines take place prior to construction and then refined during the operational phase (C. van Rooyen in litt.); hence (a) prior to the electrification of the wind farm, an on-site "walk-through" should be conducted by an avifaunal specialist to identify the sections of power line between the turbines which require marking with Bird Flight Diverters as an anti-collision measure, and (b) during the operational phase, regular surveys of the intra-turbine power lines should be conducted as part of the post-construction monitoring programme to assess if there are collision mortalities, and any additional spans identified as high risk should be marked with Bird Flight Diverters. It is imperative that all new power line infrastructure is adequately insulated and bird friendly when configured (Lehman *et al.* 2007).
- In addition, the 132kV grid connection should also be inspected at least once a quarter to establish if there is any significant collision mortality.
- The project should consider marking the turbine blades as way to reduce collisions, especially in light of longer blades being considered for the WGTs. Although there is no conclusive evidence, some studies have proposed that painting one blade of each turbine black may enhance conspicuousness to oncoming birds (McIsaac 2001, Hodod 2002). It is recommended that this should be considered as part of an adaptive management approach once a specific turbine has been identified as a mortality risk in the operational phase (C. van Rooyen in litt.). Other blade-marking options should also be considered, where applicable.
- Ensuring that lighting on the turbines is kept to a minimum, and is coloured (red or green) and intermittent, rather than permanent and white, to reduce confusion effects for birds flying at night.
- Using low-risk turbine designs and configurations, which discourage birds from perching on turbine towers or blades (Jenkins 2011).
- Monitoring collision incidence and where appropriate being prepared to shut-down problem turbines at particular times or under particular conditions (Jenkins 2011).
- A future recommendation is the need for a post-construction monitoring programme to be implemented as soon as the WEF becomes operational.

The final EMPr for the project must include the abovementioned recommended mitigation measures.

c) Conclusion

Based on the initial avifaunal assessment (Harebottle 2012), and extensive data collected from the pre-construction monitoring (van Rooyen 2014), the avifauna specialist has concluded that the residual impacts associated with the proposed amendments remain at least of medium significance with the proposed amendments. This is based mainly on construction and operational impacts on cliff-nesting raptors in the area (primarily Verreaux's Eagle and Booted Eagle), and other priority species including Grey-winged Francolin, Ludwig's Bustard and Scalter's Lark.

Overall, construction and operation of the WEF is predicted to have an impact on the avifauna present on site. The predicted disturbances will vary between the two phases. How detrimental the impacts will be on bird populations in the short or long-term is variable and difficult to predict. However, the proposed reduction in the number of turbines and the subsequent reduction in the overall footprint of the WEF (proposed amended option), should assist the avifaunal community by reducing the overall significance of the impacts. This is reflected in the impact significance assessment (refer to Table 3.3 above and Appendix C2) for the avifauna re-assessment.

Refer to **Appendix C2** for the Avifauna Addendum Report.

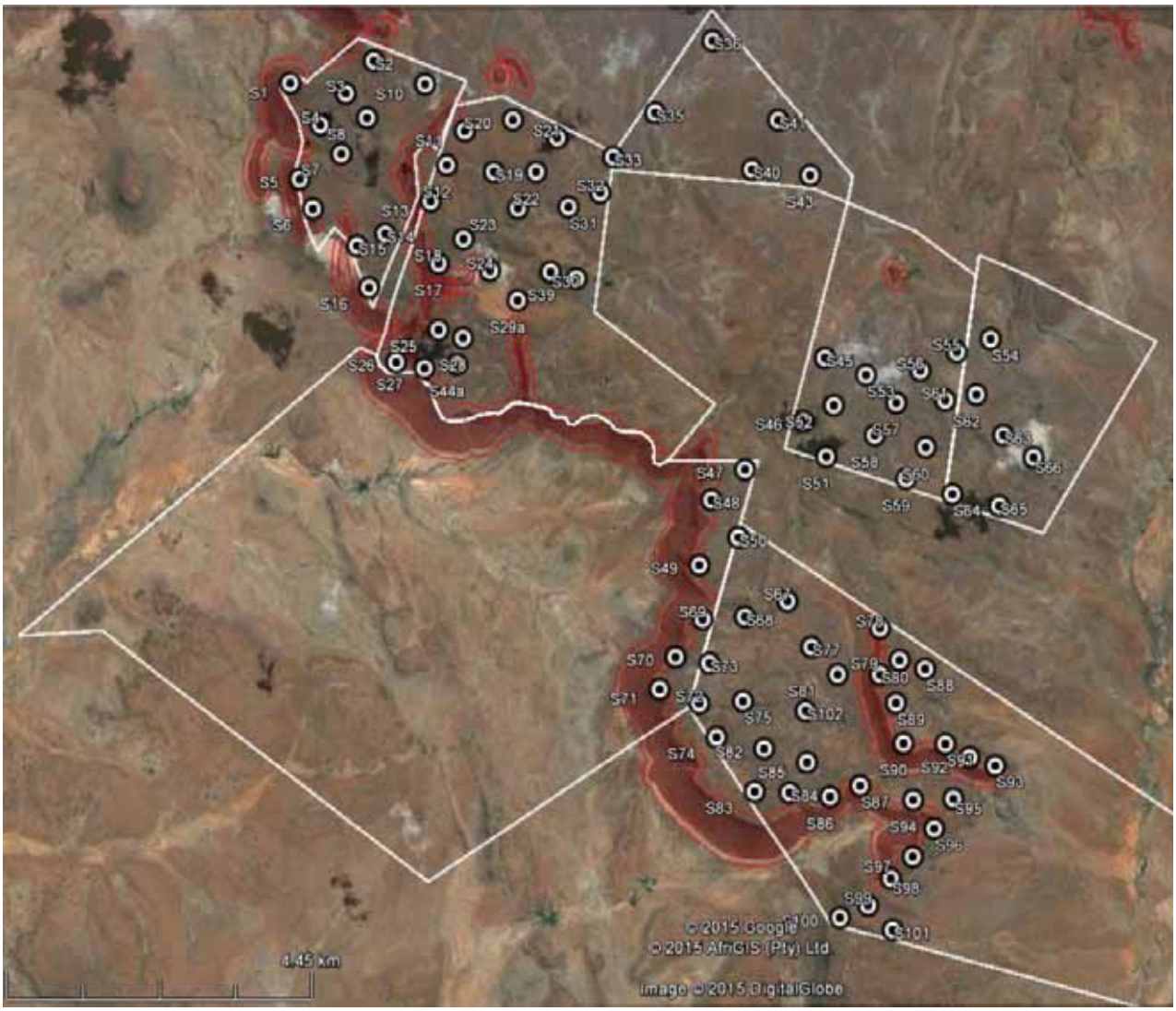
3.1.3 Impacts on bats

Wind energy facilities are known to have potential impacts on bats and as such the proposed amendments to the project could have an impact on any bats found on site. The original bat impact assessment for the De Aar 2 South Wind Energy Facility (WEF), as well as the subsequent 12 month pre-construction bat monitoring, was undertaken by Mr Werner Marais of Animalia Zoological & Ecological Consultation cc. The 12 month pre-construction bat monitoring study was carried out over April 2013 to April 2014. Therefore, the results and findings of the pre-construction bat monitoring, as well as additional experience gained on the topic, have improved insight into the project site, as the original bat impact assessment was conducted in early 2012 at the advent of wind energy related bat assessments in South Africa. This resulted in some limited differences between the impact assessment ratings of the authorised option in the original bat EIA impact assessment and the addendum to the bat impact assessment (Animalia, 2015).

a) Potential Impacts

The bat sensitivity map highlights the sensitive areas of the site, based on features identified to be important for foraging and roosting of the bat species that are confirmed and most probable to occur on site. The sensitivity map is based on species ecology, habitat preferences and results of the passive monitoring conducted during the pre-construction study. The bat sensitivity map is the first line of impact mitigation by means of improving turbine placement with regards to bat preferred

habitats on site. Figures 2 and 3 displays the sensitivity map with the authorised and proposed amended layouts.



Bat sensitivity area Bat sensitivity buffer

Figure 2: Sensitivity map of the proposed De Aar 2 South wind energy facility with the authorised 103 turbine layout. (Source: Animalia, 2015)

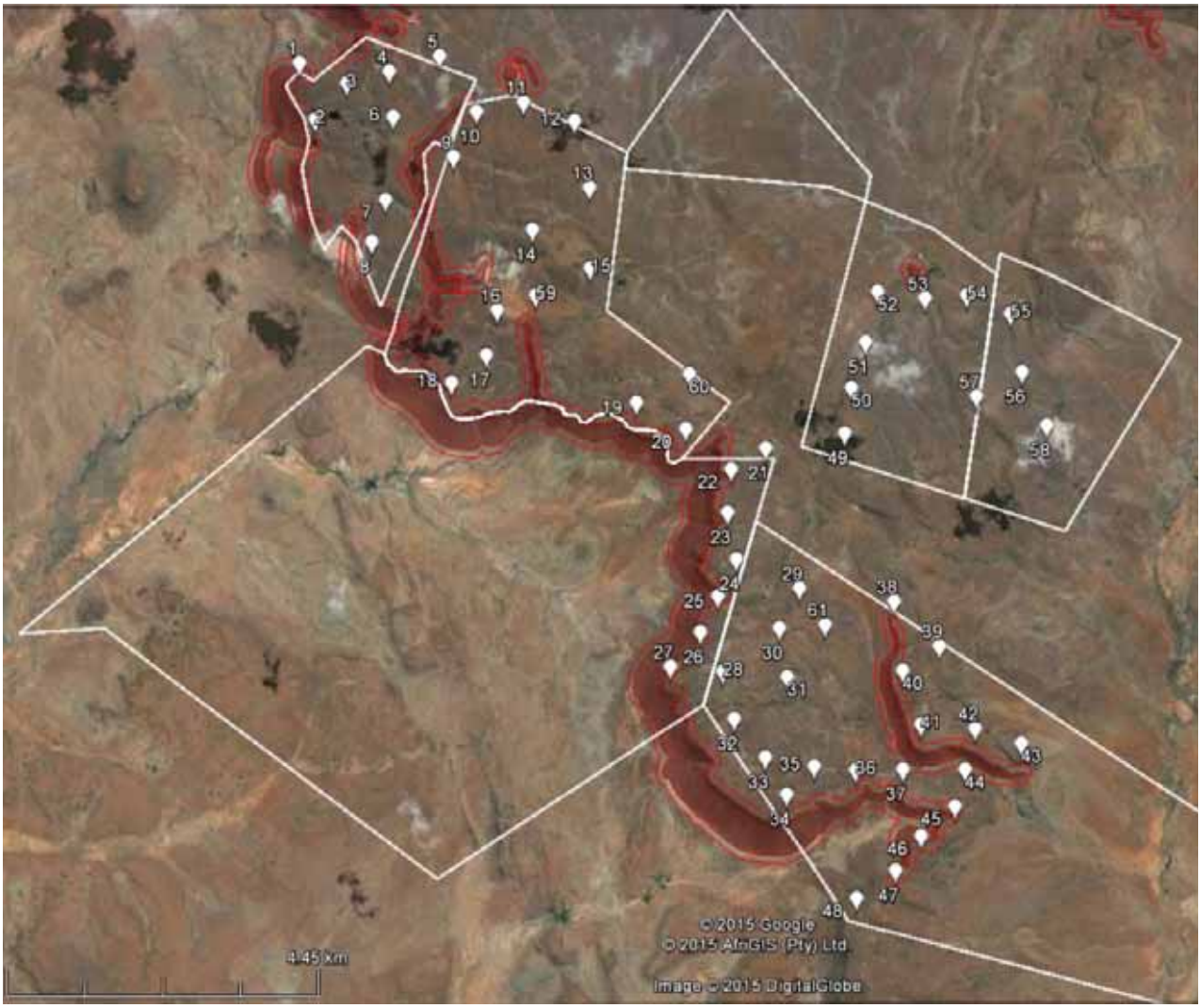


Figure 3: Sensitivity map of the proposed De Aar 2 South wind energy facility with the proposed amended 61 turbine layout. (Source: Animalia, 2015)

Table 3.4 below outlines the turbines of the authorised and proposed amended project that would occur within the high sensitivity areas and buffers.

Table 3.4: Turbines located within bat sensitive areas (Source: Animalia, 2015)

Turbine Layout	Turbines within high sensitivity areas and buffers
Authorized 103 turbine layout	5, 27, 70, 78 and 91
Proposed amended 61 turbine layout	2, 26, 27, 38, 41 and 42

Construction Phase Impacts:

Potential construction phase impacts on bats include: destruction of bat roosts due to earthworks and blasting; foraging habitat loss; and impacts on bats associated with artificial lighting.

- **Destruction of bat roosts due to earthworks and blasting:** During construction, the earthworks and especially blasting can damage bat roosts in rock crevices. Blasting close to a rock crevice roost can cause mortality to the inhabitants of the roost. The significance of this potential impact would remain Low (-) (before mitigation) and Very Low (-) (after mitigation) with the proposed amendments, as outlined in Table 3.5 below.

Table 3.5: Destruction of bat roosts due to earthworks and blasting: Comparative assessment of the authorised Option and proposed amended Option (Source: Animalia, 2015)

	Authorized Option		**Proposed amended Option**	
	Without mitigation	**With mitigation**	**Without mitigation**	**With mitigation**
Type	Negative	Negative	Negative	Negative
Extent	Site specific	Site specific	Site specific	Site specific
Magnitude	Medium - High	Low	Medium	Low
Duration	Long term	Long term	Long term	Long term
Probability	Probable	Unlikely	Probable	Unlikely
Confidence	Sure	Sure	Sure	Sure
Reversibility	Irreversible	Irreversible	Irreversible	Irreversible
Significance	Low (-)	Very Low (-)	Low (-)	Very Low (-)
Mitigation: Adhere to the sensitivity map during turbine placement. No blasting is allowed to occur within bat sensitive areas outlined in the sensitivity map. Blasting should be minimized and used only when absolutely necessary.				

- **Artificial lighting:** During construction strong artificial lights used in the work environment during night time will attract insects and thereby also bats. However only certain species of bats will readily forage around strong lights, whereas others avoid such lights even if there is insect prey available. This can draw insect prey away from other natural areas and thereby artificially favour certain species, affecting bat diversity in the area. As outlined in Table 3.6, the proposed amended option would reduce the significance of this potential impact before mitigation from Low (-) to Very Low (-). The impact significance, after mitigation, would remain the same for the proposed amended option, i.e. Very Low (-).

- **Foraging habitat loss:** Some foraging habitat will be permanently lost by construction of turbines and access roads. Temporary foraging habitat loss will occur during construction due to storage areas and movement of heavy vehicles. The significance of this potential impact would remain Low (-) before mitigation, and Very Low (-) after mitigation, with the proposed amendments, as outlined in Table 3.7.

Table 3.6: Artificial lighting: Comparative assessment of the authorised Option and proposed amended Option (Source: Animalia, 2015)

	Authorized Option		**Proposed amended Option**	
	Without mitigation	**With mitigation**	**Without mitigation**	**With mitigation**
Type	Negative	Negative	Negative	Negative
Extent	Site specific	Site specific	Site specific	Site specific
Magnitude	Medium - Low	Very low	Low	Very low
Duration	Construction period	Construction period	Construction period	Construction period
Probability	Probable	Probable	Probable	Probable
Confidence	Certain	Certain	Certain	Certain
Reversibility	Reversible	Reversible	Reversible	Reversible
Significance	Low (-)	Very low (-)	Very low (-)	Very low (-)
Mitigation: Consciously switch off all lights at a construction area when not required anymore, do not let it burn throughout the night. If suitable for the purpose, utilize lighting temperatures (colours/wavelengths) that attract less insects.				

Table 3.7: Foraging habitat loss: Comparative assessment of the authorised Option and proposed amended Option (Source: Animalia, 2015)

	Authorized Option		**Proposed amended Option**	
	Without mitigation	**With mitigation**	**Without mitigation**	**With mitigation**
Type	Negative	Negative	Negative	Negative
Extent	Site specific	Site specific	Site specific	Site specific
Magnitude	Medium	Low	Low	Very low
Duration	Long term	Long term	Long term	Long term
Probability	Definite	Definite	Definite	Definite
Confidence	Certain	Sure	Certain	Sure
Reversibility	Irreversible	Irreversible	Irreversible	Irreversible
Significance	Low (-)	Very low (-)	Low (-)	Very low (-)
Mitigation: Adhere to the bat sensitivity map. Keep to designated areas when storing building materials, resources, turbine components and/or construction vehicles and keep to designated roads with all construction vehicles. Damaged areas should be rehabilitated by an experienced vegetation succession specialist after construction.				

Operational Phase Impacts:

- **Bat mortalities**: During the operational phase, bat mortalities may occur due to direct blade impact or barotrauma during foraging activities (not migration). In terms of the proposed amendments, the significance of this potential impact would remain High (-) before mitigation, however the significance of the impact after mitigation would reduce from Medium (-) for the authorised WEF to Low (-) for the proposed amended project description. Refer to Table 3.8 below.

Table 3.8: Bat mortalities: Comparative assessment of the authorised Option and proposed amended Option (Source: Animalia, 2015)

	Authorized Option		**Proposed amended Option**	
	Without mitigation	**With mitigation**	**Without mitigation**	**With mitigation**
Type	Negative	Negative	Negative	Negative
Extent	Local	Local	Local	Local
Magnitude	High	Low	High	Low
Duration	Long term	Long term	Long term	Long term
Probability	Probable	Probable	Probable	Unlikely
Confidence	Certain	Unsure	Certain	Unsure
Reversibility	Irreversible	Irreversible	Irreversible	Irreversible
Significance	High (-)	Medium (-)	High (-)	Low (-)
Mitigation: Adhere to the sensitivity maps, avoid turbine placement in areas of High bat sensitivity and their buffers. Also adhere to mitigation recommendations outlined in this addendum.				

Cumulative Impacts:

Animalia noted bat mortalities due to direct blade impact or barotrauma during foraging as a potential cumulative impact (for resident and migrating bats affected). Mortalities of bats due to wind turbines during foraging and migration can have significant ecological consequences as the bat species at risk are insectivorous and thereby contribute significantly to the control of flying insects at night. On a project specific level insect numbers in a certain habitat can increase if significant numbers of bats are killed off. But if such an impact is present on multiple projects in close vicinity of each other, insect numbers can increase regionally and possibly cause outbreaks of colonies of certain insect species.

Additionally if migrating bats are killed off it can have detrimental effects on the cave ecology of the caves that a specific colony utilizes. This is due to the fact that bat guano is the primary form of energy input into a cave ecology system given that no sunshine that allows photosynthesis exists in cave ecosystems.

An assessment of the potential cumulative impact in terms of bat mortalities is provided in Table 3.9 below.

Table 3.9: Bat mortalities due to direct blade impact or barotrauma during foraging – cumulative impact (resident and migrating bats affected): Comparative assessment of the authorised Option and proposed amended Option (Source: Animalia, 2015)

	Authorized layout		**Proposed amended layout**	
	Without mitigation	**With mitigation**	**Without mitigation**	**With mitigation**
Type	Negative	Negative	Negative	Negative
Extent	Regional	Regional	Regional	Regional
Magnitude	High	Low	High	Low
Duration	Long term	Long term	Long term	Long term
Probability	Probable	Unlikely	Probable	Unlikely
Confidence	Certain	Sure	Certain	Sure
Reversibility	Irreversible	Irreversible	Irreversible	Irreversible

Significance	High (-)	Very low (-)	Medium (-)	Very low (-)
Mitigation: Adhere to the bat sensitivity map for turbine placement. Also adhere to recommended mitigation measures for this project. It is essential that project specific mitigations be applied and adhered to.				

It light of the findings of the assessment, it is evident that the significance of the potential cumulative impact relating to bat mortalities before mitigation would reduce with the proposed amendments, i.e. from High (-) to Medium (-), and would remain the same, i.e. Very Low (-), after mitigation.

b) Mitigation

Refer to Section 3 of Appendix C3 for the detailed recommended mitigation measures relating to potential impacts on bats. It is apparent that such mitigation measures have been updated since the EIA for the project to take cognisance of the findings of the preconstruction bat monitoring, and not due to the proposed amendments, *per se.* The mitigation measures are outlined briefly below.

The correct placement of wind farms and of individual turbines according to the bat sensitivity map can significantly lessen the impacts on bat fauna in an area, and should be considered as the preferred option for mitigation. The turbine layout for the De Aar 2 South Wind Farm was assessed in the addendum of the bat assessment report. Where mitigation by location is not possible, other options that may be utilized if required, including curtailment, blade feathering, blade lock, acoustic deterrents or light lures.

Currently the most effective method of mitigation, after correct turbine placement, is alteration of blade speeds and cut-in speeds under environmental conditions favourable to bats. A basic "5 levels of mitigation" (by blade manipulation or curtailment), from light to aggressive mitigation is presented below:

1. No curtailment (free-wheeling is unhindered below manufacturers cut in speed so all momentum is retained, thus normal operation).
2. 90 Degree feathering of blades below manufacturers cut-in speed so it is exactly parallel to the wind direction as to minimize free-wheeling blade rotation as much as possible without locking the blades.
3. 90 Degree feathering of blades below manufacturers cut in speed, with reduced power mode settings between manufacturer’s cut-in speed and mitigation cut-in conditions.
4. 90 Degree feathering of blades below mitigation cut in conditions.
5. 90 Degree feathering throughout the entire night.

The preliminary recommendation is that curtailment mitigation initiates at Level 2 for the periods, times and weather conditions outlined in Table 3.10 below. These mitigations must be applied to the turbines identified within bat sensitive areas (refer to Table 4 of Appendix C3). If such mitigation is undertaken, then depending on the results of the post construction mortality monitoring the mitigation can be either relaxed or intensified (moving down or up in the levels) up to a maximum intensity of Level 4. This is an adaptive mitigation management approach that will require changes in the mitigation plan to be implemented immediately and in real time during the post construction monitoring.

The table below is based on the passive data collected during the pre-construction monitoring and provides baseline data to be utilized during the operational monitoring assessment. Both the temperature and wind speed parameters indicated in the table must be experienced simultaneously to create favourable conditions for bat activity. This is due to the fact that they have synergistic or otherwise contradictory influences on bat activity and are never considered in isolation. In general bat activity is negatively correlated to wind speed and positively correlated to temperature. Due to climatic data lacking during critical mitigation periods, no weather bat activity parameters could be calculated for selected periods and areas in Table 3.10. In this instance, turbines must be mitigated during the period listed as high the bat activity time frame. The times and weather conditions at which 80% of bat activity were recorded are as follows:

Table 3.10: Times and weather conditions at which 80% of bat activity were recorded at De Aar 2 South WEF (Source: Animalia, 2015)

	Applied to turbines identified in Table 3.4 above
Peak activity time frame 1	1 October – 31 December
	Time of sunset to 03:00
Environmental conditions of peak activity	Wind speed 0 – 5.0m/s (measured at 10m) Temperatures above 15˚C (measured at 10m)
Peak activity time frame 2	Whole month of January
	Time of sunset to 03:00
Environmental conditions of peak activity	Wind speed 0 – 5.0m/s (measured at 50m) Temperatures above 17˚C (measured at 10m)
Peak activity time frame 3	Whole month of February
	Time of sunset to 03:00
Environmental conditions of peak activity	Could not be determined

Impact specialist mitigation measures outlined in the addendum report include the following:

- Adhere to the sensitivity maps, avoid turbine placement in areas of High bat sensitivity and their buffers. Also adhere to mitigation recommendations outlined in the addendum to the bat impact assessment (refer to Appendix C3).
- No blasting is allowed to occur within bat sensitive areas outlined in the sensitivity map. Blasting should be minimized and used only when absolutely necessary.
- Adhere to the bat sensitivity map. Keep to designated areas when storing building materials, resources, turbine components and/or construction vehicles and keep to designated roads with all construction vehicles. Damaged areas should be rehabilitated by an experienced vegetation succession specialist after construction.
- Consciously switch off all lights at a construction area when not required anymore, do not let it burn throughout the night. If suitable for the purpose, utilize lighting temperatures (colours/wavelengths) that attract less insects.
- It is essential that project specific mitigations be applied and adhered to.

The final EMPr for the project must include the recommended mitigation measures included in the addendum to the bat impact assessment for the project.

c) Conclusion

With regards to the amended turbine specifications, a change to rotor diameter and hub height can increase the risk of impact on bats due to the fact that an increased turbine size increases the airspace in which bat mortality may occur. With regards to utilizing turbines with a higher blade-ground clearance, a negative correlation was found between bat activity and height from the ground (higher microphones detected less bat activity than lower microphones). Thus the risk of impacts on species of concern will decrease with a higher blade ground clearance. However, for the De Aar 2 South Wind Energy Facility, the lowest height of the blades above the ground has remained approximately the same with the authorised and proposed amended turbine specifications. Thus the ground clearance impact remains the same.

The increased airspace due to larger rotor diameter would increase the negative impacts on high flying bat species. However, the heavily reduced turbine layout from 103 turbines to 61 turbines is a positive amendment and simultaneously decreases the negative impacts on bats. Ultimately, the reduced 61 turbine layout is favoured over the authorised layout.

Refer to **Appendix C3** for the Bat Addendum Report.

3.1.4 Freshwater impacts

A specialist freshwater assessment was undertaken by Ms Antonia Belcher (of BlueScience) as part of the original EIA for the project, given the presence of a number of wetlands and seeps, as well as numerous drainage lines found in the vicinity of the site. In this regard, the EIA Report noted that "*The potential impacts on the freshwater systems on the sites include increased runoff, erosion (in particular on surfaces with a steeper gradient) and sedimentation of downslope areas due to hard surfaces created during development. None of the locations proposed for the wind turbines would be within an identified drainage line/stream or wetland/pan as they are placed on higher areas. Some of the proposed wind turbines are however near to pans. Overhead transmission lines would cross drainage lines in a number of places. The proposed access routes (some of which are existing roads only requiring widening and upgrade) would also cross a number of the identified freshwater features and go past a number of pans*." (Aurecon, 2012). In terms of the authorised project, the potential impact on freshwater resources was considered to be of Low (-) significance, without mitigation, and Very Low (-) with mitigation (Aurecon, 2012) for both the construction and operational phases.

The implications of the proposed amendments in terms of potential impacts on freshwater resources have been assessed by Ms Belcher, and are summarised below. (Refer to Appendix C4 for the specialist freshwater addendum report).

a) Potential Impacts

With the proposed amended layout, the freshwater constraints mapping has been taken into account (BlueScience, 2015). No WTGs are located in close proximity to any of the delineated freshwater features. There are approximately 12 road crossings over minor watercourses within the site. Three of these crossings are for existing roads that will be upgraded.

Construction Phase Impacts

Potential construction phase impacts on freshwater resources associated with the WEF and associated infrastructure include the following:

- Limited disturbance of freshwater related habitats at the construction sites; and
- Disturbance of habitat and possibly impedance/diversion of flow at stream/ drainage line crossings or adjacent to freshwater features.

Below is a summary of the assessment of potential construction phase impacts of the individual proposed activities for the proposed amended project description:

Table 3.11 Limited disturbance of freshwater related habitats at the construction sites (Source: BlueScience, 2015)

Potential impact on freshwater features	**Proposed wind energy facilities and buildings associated with the WEF**
Nature of impact:	Limited disturbance of freshwater related habitats at the construction sites
Extent and duration of impact:	Localised short term impacts
Intensity of Impact	Moderate to high – depends on proximity to freshwater features
Probability of occurrence:	Probable if construction activities occur in close proximity to the freshwater features
Degree to which impact can be reversed:	Medium to high
Irreplaceability of resources:	Medium to low
Cumulative impact prior to mitigation:	Low to Very low – depends on proximity to freshwater features
Significance of impact pre-mitigation	Low
Degree of mitigation possible:	Very low
Proposed mitigation:	Construction activities should as far as possible be limited to the identified sites for the proposed wind energy facilities and the structures. A buffer of at least 30m (from centre of stream for smaller drainage lines and from top of bank for larger tributaries) should be maintained adjacent to the identified freshwater features, and 75m for the pans and wetland areas. It is important that any of the cleared areas that are not hardened surfaces are rehabilitated after construction is completed by revegetating the areas disturbed by the construction activities with suitable indigenous plants. Invasive alien plants that currently exist within the immediate area of the construction activities should also be removed and the sites monitored for re-growth on a regular basis. To reduce the risk of erosion, the locality of the turbines and structures should preferably not be on any steep slopes or within the wide wash areas on the plains. Run-off over the exposed areas should be mitigated to

	reduce the rate and volume of run-off and prevent erosion occurring on the site and within the freshwater features and drainage lines. Contaminated runoff from the construction site(s) should be prevented from entering the rivers/streams. All materials on the construction sites should be properly stored and contained. Disposal of waste from the sites should also be properly managed. Construction workers should be given ablution facilities at the construction sites that are located at least 100m away from the river system and regularly serviced. These measures should be addressed, implemented and monitored in terms of the EMPr for the construction phase.
Cumulative impact post mitigation:	Very Low
Significance after mitigation	Very Low

Table 3.12 Disturbance of habitat and possibly impedance/diversion of flow at stream / drainage line crossings or adjacent to freshwater features (Source: BlueScience, 2015)

Potential impact on freshwater features	**Proposed access routes and other linear infrastructure associated with the WEF**
Nature of impact:	Disturbance of habitat and possibly impedance/diversion of flow at stream / drainage line crossings or adjacent to freshwater features
Extent and duration of impact:	Localised short term impacts
Intensity of Impact	Moderate to Low
Probability of occurrence:	Probable – depends on proximity to freshwater features
Degree to which impact can be reversed:	High
Irreplaceability of resources:	Medium to Low
Cumulative impact prior to mitigation:	Low to very low – depends on proximity to freshwater features
Significance of impact pre-mitigation	Low
Degree of mitigation possible:	Very low
Proposed mitigation:	The existing road infrastructure should be utilized as far as possible to minimize the overall disturbance created by the proposed project. Where new roads need to be constructed the existing road infrastructure should be rationalised and any unnecessary roads decommissioned and rehabilitated to reduce the disturbance of the area and within the stream beds. For new access roads to the turbines, these should rather be along the ridges of the hills than in the drainage/stream beds. Where access routes need to be constructed through streams/drainage lines, the disturbance of the channel should be limited. Wetland and pan areas should be avoided and any road adjacent to a wetland feature should also remain outside of the 75m buffer zone as far as possible. All crossings over drainage channels or stream beds should be such that the flow within the drainage channel is not impeded. Road infrastructure, transmission lines and cable alignments should coincide as much as possible to minimize the impact.
Cumulative impact post mitigation:	Very Low
Significance after mitigation	Very Low

Operational Phase Impacts

Potential operational phase impacts on freshwater resources associated with the WEF and associated infrastructure, include the following:

- Limited disturbance of freshwater related habitats at the stream/ drainage line crossings or adjacent to the freshwater features for cables, transmission line and access roads.

Table 3.13 below provides a summary of the assessment of potential operational phase impacts of the individual proposed activities for the proposed amended project description in terms of freshwater impacts:

Table 3.13 Operational Phase impacts: Limited disturbance of freshwater related habitats at the stream / drainage line crossings or adjacent to the freshwater features for cables, transmission line and access roads (Source: BlueScience, 2015)

Potential impact on freshwater features	Maintenance of wind energy facilities
Nature of impact:	Limited disturbance of freshwater related habitats at the stream / drainage line crossings or adjacent to the freshwater features for cables, transmission line and access roads
Extent and duration of impact:	Localised longer term impacts
Intensity of Impact	Low
Probability of occurrence:	Probable as a result of construction activities within stream beds and riparian zones
Degree to which impact can be reversed:	Medium to high
Irreplaceability of resources:	Medium to Low
Cumulative impact prior to mitigation:	Very low due to the existing disturbances within these streams
Significance of impact pre-mitigation	Very low
Degree of mitigation possible:	Very low
Proposed mitigation:	Operational activities should as far as possible be limited to the delineated site for the proposed development and the identified infrastructure routes. Invasive alien plant growth should be monitored on an ongoing basis to ensure that these disturbed areas do not become infested with invasive alien plants. Storm water run-off infrastructure must be maintained to mitigate both the flow and water quality impacts of any storm water leaving the wind energy facilities site. Should any erosion features develop, they should be stabilised as soon as possible. Water supply, sanitation services as well as solid waste management should preferably be provided by an off-site service provider. Any disturbed areas should be rehabilitated and monitored to ensure that these areas do not become subject to erosion or invasive alien plant growth.
Cumulative impact post mitigation:	Very Low
Significance after mitigation	Very Low

Cumulative Impacts

A number of renewable energy projects have been proposed in the area surrounding De Aar, particularly towards the east and south east where they can link up with the existing Hydra substation and transmission lines. Within the immediate surrounding area of the proposed De Aar 2 WEF, the other proposed projects are also for WEF. The nature of these projects allows them to have minimal impact on the surface water features as the turbines can be placed far enough away from the freshwater features so as to not impact on them. The largest potential impact of these projects is as a result of the associated infrastructure which can be mitigated such that its impact on the aquatic ecosystems is of a **low** significance.

b) Mitigation

The proposed amendments to the project description will not result in any changes to the mitigation measures put forward in the original freshwater assessment.

c) Conclusion

The overall impact of the proposed layout for the project as assessed in the freshwater report was deemed to be limited and of a Low significance (Belcher, 2015). The freshwater specialist concluded that one can therefore expect that the proposed amended project description and revised layout would potentially impact even less on the freshwater features in the area (Belcher, 2015).

3.1.5 Noise Impacts

The study area has a rural character in terms of the background sound levels. The potential exists for noise from the proposed wind turbines to affect surrounding landowners and the ambient noise environment (Aurecon, 2012). Given that the proposed amendments include, amongst others, increased size of turbines as well as refinements to the WEF layout, Mr Morné de Jager of Enviro-Acoustic Research cc (EARES) was appointed to undertake an update to the specialist noise study for the project, to determine the implications of the proposed amendments in terms of potential noise impacts. The findings of the updated report are summarised below and are included in Appendix C5.

a) Potential Impacts

Increased noise levels are directly linked to various activities associated with the construction of the WEF and related infrastructure as well as the operational phase of the activity. The noise emissions into the environment from the various sources as defined by the project developer were calculated for the construction and operational phases in detail, using the sound propagation models described by SANS 10357 (Construction phase) as well as ISO 9613-2 (Operational phase).

In terms of the proposed amended layout, a number of different activities might take place close to potentially sensitive receptors, each with a specific potential impact.

Construction Phase Impacts:

Construction equipment and activities associated with the establishment of the WEF, such as blasting, all have a potential noise impact. The following construction activities could take place simultaneously and were considered in the specialist investigation:

- General work at a temporary workshop area. This would be activities such as equipment maintenance, off-loading and material handling. All vehicles will travel to this site where most equipment and material will be off-loaded (general noise, crane). Material, such as aggregate and building sand, will be taken directly to the construction area (foundation establishment). It was assumed that activities will be taking place for 16 hours during the 16 hour daytime period.
- Surface preparation prior to civil work. This could be the removal of topsoil and levelling with compaction, or the preparation of an access road (bulldozer/grader). Activities will be taking place for 8 hours during the 16 hour daytime period.
- Preparation of foundation area (sub-surface removal until secure base is reached – excavator, compaction, and general noise). Activities will be taking place for 10 hours during the 16 hour daytime period.
- Pouring and compaction of foundation concrete (general noise, electric generator/compressor, concrete vibration, mobile concrete plant, TLB). As foundations must be poured in one go, the activity is projected to take place over the full 16 hour day time period.
- Erecting of the wind turbine generator (general noise, electric generator/compressor and a crane). Activities will be taking place for 16 hours during the 16 hour daytime period.
- Traffic on the site (trucks transporting material, aggregate/concrete, work crews) moving from the workshop/store area to the various activity sites. All vehicles to travel at less than 60 km/h, with a maximum of five (5) trucks and vehicles per hour to be modelled travelling to the areas where work is taking place (red line).

There will be a number of smaller equipment, but the addition of the general noise source (at each point) covers most of these noise sources. It is assumed that all equipment would be operating under full load (generate the most noise) at a number of locations and that atmospheric conditions would be ideal for sound propagation. This is likely the worst case scenario that can occur during the construction of the facility.

The impact assessment for the various construction activities associated with the proposed amendments that may impact on the surrounding environment is presented in Table 3.14.

Table 3.14 defines the significance of noise impacts during construction as low for the identified potential noise-sensitive receptors.

The proposed amendments would result in a reduction in the significance of construction phase noise impacts, from “Low” (authorised option) to “Very Low”[9] (proposed amended option) (De Jager, 2015). No additional mitigation measures are required or recommended.

[9] Morne De Jager indicated that the EIA criteria used for his impact assessment does not include “very low” as one of the possible significance rating, only “low”. He indicated that if there was other criteria (specifically, “very low”) he would have used that in the assessment table in terms of the significance of impacts associated with the proposed amendments. The text of the report therefore states that the proposed changes will have a reduced impact significance (pers comm. De Jager, 2015).

Table 3.14: Noise Impact Assessment: Construction phase – overview (Source: De Jager, 2015)

Nature:	Numerous simultaneous construction activities that could impact on receptors.
Acceptable Rating Level	Rural district (excluding construction traffic): 45 dBA outside during. Use of $L_{Req,D}$ of 45 dBA for rural areas. Ambient sound level = 35 - 50 dBA
Extent ($\Delta L_{Aeq,D}$>7dBA)	**Local** – Change in ambient sound levels would not extend further than 1,000 meters from activities **(2)**
Duration	**Short term** – Noisy activities in the vicinity of the receptors would last a portion of, or the duration of the construction period **(2)**
Magnitude	Noise Rating Levels < Potential disturbing noise level – **Low (2)**
Probability	While it is likely that receptors would hear construction noises during quiet periods, it is considered unlikely that the noise levels will change the ambient sound levels sufficiently to result in complaints at the receptors. **Improbable (1**)
Significance	**12 (Low - (2 + 2 + 2) x 2)**
Status	Negative.
Reversibility	High.
Irreplaceable loss of resources?	Not relevant.
Comments	*Modelling considered a worst-case scenario with significant activities taking place for 16 hours each day at all possible locations*
Can impacts be mitigated?	*Mitigation not required.*
Mitigation:	*Not required.*
Effectiveness of mitigation:	*Not applicable, mitigation not required*
Cumulative impacts:	This impact is cumulative with existing ambient sound as well as other noisy activities conducted in the same area.
Residual Impacts:	This impact will only disappear once construction activities cease.

Operational Phase Impacts

Noise emitted by wind turbines can be associated with two types of noise sources. These are aerodynamic sources due to the passage of air over the wind turbine blades and mechanical sources that are associated with components of the power train within the turbine, such as the gearbox and generator and control equipment for yaw, blade pitch, etc. These sources generally have different characteristics and can be considered separately. In addition there are other lesser noise sources, such as the substations themselves, traffic (maintenance) as well as transmission line noise.

Table 3.15: Noise Impact Assessment: Operational phase (Source: De Jager, 2015)

Nature:	*Numerous wind turbines operating simultaneously during a period when a quiet environment is desirable.*
Acceptable Rating Level	Rural district, (refer to Table 5.6 of Appendix C5) for the acceptable Night Rating Level – 42 dBA. Night-time ambient sound levels are expected to be range between 40 and 45 dBA (wind speeds exceeding 8 m/s).
Magnitude	The noise level is higher than the SANS 10103:2008 rating level of 35 dBA. The noise level will not be more than 7 dB than the expected ambient sound level and it is not expected that it will be higher than 3 dBA during quiet times. The magnitude of the noise impact is set at **low-Medium (see Table 5.2 of Appendix C5)**. **(4)**
Duration	Facility will operate for a number of years **Long term** – **(4 –** see **Table 5.3 of Appendix C5).**
Extent ($\Delta L_{Req,N}$>7dBA)	**Regional (refer to Table 5.4 of Appendix C5)** – Impact would not extend further than 1,000 meters from the closest wind turbines. **(2).**
Probability	Ambient sound levels were measured in similar areas ranging between 20 – 65 dBA at night (with an 8 m/s wind) with a mathematical average of **37.94 dBA**. Noise rating levels were predicted to be a maximum of 41 dBA at NSD01. It is therefore likely that the wind turbines may be audible at NSD01 during quiet periods. It should be noted that audibility should not be confused with a Noise Impact.

	International studies indicate that approximately 5 - 15% of receptors staying close to wind farms may complain. Considering Table 5.2 of Appendix C5 (potential ambient sound levels), the findings of international studies and the criteria defined in Table 5.5. (of Appendix C5) the probability of a noise impact occurring is estimated at Possible (2), raised by 1 to **Likely** (**3** – precautionary principle)
Significance	**30 (Low) for all NSD**
Status	Negative.
Reversibility	High.
Irreplaceable loss of resources?	*Not relevant.*
Comments	-
Can impacts be mitigated?	Yes, but not required
Mitigation:	-
Cumulative impacts:	This impact is cumulative with existing ambient background noises.
Residual Impacts:	This impact will only disappear once the operation of the facility stops, or the sensitive receptor no longer exists.

The noise impact is considered to be of a **Low significance** for all the identified receptors. Projected noise levels will not be higher than 42 dBA and these noise levels will not be disturbing (in terms of the National Noise Control Regulations). As with the construction phase, the proposed amendments would result in a reduction in the significance of construction phase noise impacts, from "Low" (authorised option) to "Very Low" (proposed amended option) (De Jager, 2015).

Cumulative Impact:

Cumulative impacts were addressed as part of the assessment of construction and operational phase impacts (refer to Table 3.14 and 3.15 above). In this regard, the noise specialist noted that the construction and operational phase impacts are cumulative with existing ambient sound, as well as other noisy activities conducted in the same area (De Jager, 2015).

b) Mitigation

Further mitigation (to that recommended as part of the original noise specialist study) is not required or recommended.

However if a valid and reasonable noise complaint is registered relating to the construction or operation of the facility, additional noise measurements should be conducted by an acoustic consultant. Noise measurements must be continued as long as noise complaints are registered.

The developer should re-evaluate the addendum to the noise study if the layout is changed (where any wind turbines are moved closer, or turbines are added within 800 meters from any potential noise-sensitive receptor) or if the developer makes use of a different wind turbine that generates more than 108 dBA (De Jager, 2015).

c) Conclusion

With the input data as used, the assessment indicated that the change in layout as well as the reduction in wind turbines did reduce the projected noise levels at the surrounding receptors during both the construction and operational phase.

The proposed amendments would result in a reduction in the significance of both the construction and operational phase noise impacts, from “Low” (authorised option) to “Very Low” (proposed amended option). Further mitigation is not required or recommended.

Refer to **Appendix C5** for the Noise Addendum Report.

3.1.6 Visual Impacts

In determining the significance of visual impacts associated with the proposed amendments to the De Aar 2 South WEF description, the visual specialist (Ms Karen Hansen) considered the following facts:

- 40% fewer turbines
- Correspondingly reduced visual clutter from transmission lines through the site
- The turbines have increased in total height by a factor of 20%
- The lower mast ø has increased by a factor of 25%
- Permanently affected local ground area at each turbine has only increased by a factor of 8%

The site area, the disposition of the proposed turbines in the landscape, and the access road network is similar to the original scheme (Hansen, 2015).

Of the two main population centres, De Aar is at 1250m a.s.l., and Philipstown at 1360m a.s.l. and receptors would look up at the turbine locations; the turbines would be on hill land on average 120-300m higher (Hansen, 2015).

Local farmsteads potentially affected by the project are unchanged from those impacted upon by the Authorised Option, viz., Slingershoek, Meyersfontein, Witput, Kranskop, and Vendusiekuil; but they would be visually aware of fewer turbines, at no greater proximity.

In terms of transport corridors - for travellers in either direction, the visual impact from the R48 would be continuous for a period of time similar to, but no greater than, the Authorised Option. For travellers in either direction, the visual impact from the R389 would be brief and distant. Rail line, passenger and freight services are affected to the same degree as for the authorised WEF.

a) Potential Impact:

Construction Phase Impacts:

Potential construction phase impacts include:

- Impact of initial site works, construction camps, site set up, laying services, ground works.
- Impact of construction of access roads, hauling and delivery of construction materials.

The assessment of the above impacts in terms of the proposed amendments is presented in Tables 3.16 and 3.17 below.

Table 3.16 Visual Impacts: Construction Phase: Proposed Amended Option (Source: Hansen, 2015)

Nature: Impact of initial site works, construction camps, site set up, laying services, ground works		
	Without mitigation	***With mitigation***
Extent	Local	Local
Duration	Short -term	short-term
Magnitude	Moderate	Medium-Low
Probability	Probable	Probable
Significance	Medium	Medium-Low
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be avoided, managed or mitigated?	Yes	
Mitigation: Establish screening structures to shield construction works from sensitive receptors; good traffic and site management. Keeping construction period as short as reasonable		
Cumulative impacts: None		
Residual Impacts: There could some limited ground contamination		

Table 3.17 Visual Impacts: Construction Phase: Proposed Amended Option (Hansen, 2015)

Nature: Impact of construction of access roads, hauling and delivery of construction materials		
	Without mitigation	***With mitigation***
Extent	Local	Local
Duration	Short -term	Short-term
Magnitude	Moderate	Medium-Low
Probability	Probable	Probable
Significance	Medium	Low
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be avoided, managed or mitigated?	Yes	
Mitigation: Good traffic management		
Cumulative impacts: None		
Residual Impacts: None		

Operational Phase Impacts:

Operational phase impacts include the following:

- Impact on receptors living and working locally of the change in site character from rural upland to industry; impact on road users.
- Impact of the colours, finishes, heights of the infrastructure

Table 3.18 Visual Impacts: Operational Phase: Proposed Amended Option (Source: Hansen, 2015)

Nature: Impact on receptors living and working locally of the change in site character from rural upland to industry; impact on road users		
	Without mitigation	***With mitigation***
Extent	Local, regional	Local, regional
Duration	Long -term	Long-term
Magnitude	High	High
Probability	Probable	Probable
Significance	High	High
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No

Can impacts be avoided, managed or mitigated?	To a limited degree
Mitigation: good maintenance ensuring the WEF is always in use	
Cumulative impacts: Some possibility that the development could be extended in the future if additional substation capacity is developed	
Residual Impacts: From the concrete foundations	

Table 3.19 Visual Impacts: Operational Phase: Proposed Amended Option (Source: Hansen, 2015)

Nature: Impact of the colours, finishes, heights of the infrastructure		
	Without mitigation	***With mitigation***
Extent	Local, regional	Local, regional
Duration	Long -term	Long-term
Magnitude	High	High
Probability	Probable	Probable
Significance	High	High
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be avoided, managed or mitigated?	To a limited degree	
Mitigation: reduce visual clutter, establish buildings in locations not visible to majority of receptors; consider probability of habituation to the visual impact from sensitive receptors.		
Cumulative impacts: None		
Residual Impacts: From the concrete foundations		

The visual specialist concluded that the WEF would have a high significance rating, (which is a combination of intensity, extent and duration ratings), but the degree of that high rating would be less than for the Authorised WEF, due to less clutter.

Cumulative Impact:

The visual specialist noted that, as for the authorised project, the potential cumulative visual impact associated with the proposed amended option is limited by the capacity of the Hydra substation.

b) Mitigation

No change to the mitigation measures put forward in the original visual impact assessment are required in light of the proposed amendments.

c) Conclusion

Change of Land Use and Landscape Character
The award of Environmental Authorisation in 2013 to the scheme referred to as Authorised Option, accepts the principle that a WEF of 103 WTG, 160m high, (mast height and rotor radius), may be established on this site. The change of land use and landscape character has been accepted. The landform setting is of a scale to absorb this development.

Proposed Amended Option offers 40% fewer turbines, 20% greater in scale, established in similar locations, along with similar infrastructure elements as before.

Comparison of Visual Components

- Proposed Amended Option provides turbines that would be 20% more dominant in the landscape, because they have greater mass and would therefore be easier to see.
- Proposed Amended Option offers a scheme where visual clutter has been reduced and the visual scale increased.
- Proposed Amended Option provides a WEF with simpler forms, and could appear more high tech in appearance due to scale. The WEF would have a high significance rating, (which is a combination of intensity, extent and duration ratings), but the degree of that high rating would be lesser than for the previous scheme, (Authorised Option), due to less clutter.

Proposed Amended Option is acceptable from a visual standpoint (Hansen, 2015).

The proposed amendments will result in a moderate change to the significance of the impact, i.e. the proposed development would be visible over the same area and for the same predicted timespan; but the development would offer both greater clarity and less clutter. Therefore its visual significance would reduce.

Proposed Amended Option could proceed if mitigation measures (as per the original visual impact assessment) would be implemented and an environmental management plan instituted.

Refer to **Appendix C6** for the Visual Addendum Report.

3.1.7 Agricultural Impacts

From an agricultural perspective the loss of high-value farmland and/ or food security production, as a result of the proposed activities, is the primary concern of the agricultural assessment. The original agricultural assessment, undertaken by SiVest, reported that the site is not classified as high potential nor is it a unique dry land agricultural resource. Most of the study area has been classified as having an extremely low potential for crop production due to an arid climate and highly restrictive soil characteristics. The Southern Site is considered to have a moderately low value as grazing land, its current use. The desktop assessment, field verification and agricultural potential assessment have therefore already shown that the study area is unsuitable for crop production and is dominated by unimproved grazing land.

The proposed development's primary impact on agricultural activities will involve the construction of the wind turbines and associated infrastructure. Whilst the construction of these turbines will only influence a small area of the total farm portion, the potential implications of the proposed amendments in terms of potential agricultural impacts has been re-assessed by SiVest. Refer to Appendix C7 for the Addendum to the specialist agricultural assessment report.

a) Potential Impacts

Construction Phase Impacts:

The construction entails the clearing of vegetation around the footprint of the turbine and the crane hardstand, as well as creating service roads.

Operational Phase Impacts:

The proposed amended De Aar 2 South WEF project activities will have a very low impact on current agricultural production, soil resources, agricultural potential and overall farm viability.

An agricultural impact summary was provided by the specialist – refer to Table 3.20 below, relating to both the construction and operational phase. If the recommended mitigation measures are implemented (as per the original agricultural assessment report, the predicted impacts, as a result of the proposed activities, will be low.

Table 3.20: Agricultural Impact Summary Table (Source: SiVest, 2015)

Environmental parameter	Issues	Rating prior to mitigation	Average	Rating post mitigation	Average
Soil and agricultural potential	*Loss of agricultural land and / or production as a result of the proposed construction of the 132kV transmission lines*	13		13	
			- 13		**-13**
			Low Negative Impact		Low Negative Impact

The impact severity falls within the same category (Low) as the original proposed project, however, the scale of its impact due to the reduced overall footprint, will in reality be even less than previously proposed. Hence, the amended project scope leads to a preferable degree of impact.

Cumulative Impact:

The proposed development is not expected to have any cumulative impact due to the minor loss of agricultural land (SiVest, 2015). In this regard, the significance of potential cumulative impacts was rated as Negligible.

b) Mitigation

No changes to the mitigation measures put forward in the original agricultural impact assessment are required in light of the proposed amendments.

c) Conclusion

The direct impact of the wind turbines on soil resources will be negligible. Normal grazing (the dominant agricultural activity) will be permitted around the turbines. The total loss of grazing land will be less than 1 % of the total study area. SiVest (2015) re-iterated that this loss is considered inconsequential within the context of this assessment. The proposed development is not expected to have any cumulative impacts and will cause minimal disruptions to general farm management. There are no centre pivots, irrigation schemes or active agricultural fields, which will be influenced by the proposed development. Therefore, from an agricultural perspective, there are no problematic or fatal flaw areas for the site.

The impact severity falls within the same category (Low) as the original proposed project, however, the scale of its impact due to the reduced overall footprint, will in reality be even less than previously proposed. Hence, the amended project scope leads to a preferable degree of impact.

3.1.8 Heritage and archaeology impacts

The original heritage impact assessment for the project, undertaken by ACO Associates cc in 2011, provided a detailed description of the heritage resources within the study area. The significance of the heritage resources was again outlined in the Addendum to the Heritage Impact Assessment, including the following:

- No heritage resources of Grade 1 (national) or Grade II (Provincial) significance were identified on the site.
- The archaeological resources on the plateau have been graded as low to medium local significance (i.e. Grade IIIC and Grade IIIB). MSA material is widespread but ephemeral and not in primary context. This reduces the information that it provides the archaeologist and therefore its significance (Ungraded and Grade IIIC). However, some of the MSA sites on Knapdaar are considered “factory sites” for the production of material and they are considered of Grade IIIB significance. It is likely that some scatters of MSA artefacts will be destroyed because of their widespread distribution.
- The concentration of small amounts of LSA material, which appear to represent a variant on the interior Wilton and/or Smithfield, along some of the river valleys on Knapdaar are sufficiently scarce to be graded as Grade IIIA. They are archaeological interest. For this reason, river valleys should be avoided during construction if this is at all possible.
- In terms of buried archaeological material (including graves), one can never be sure of what lies below the ground surface, however indications are that this is extremely sparse and that impacts caused by the construction of footings and other ground disturbance is likely to be low if the appropriate mitigation measures are employed.
- The abandoned and ruined stone kraal complexes on the top of the plateau represent a seasonal utilisation of the “winterveld” on top of the plateau during the late 19th and early 20th century. They are of Grade IIIB significance as this pattern of land use has not been previously recorded on the plateau.

- While most of the permanent farmsteads are located below the plateau, there are a few farm buildings, including sheds, kraals, etc. on top of the plateau. They are generally older than 60 years and protected in terms of the NHRA and have a field rating of Grade IIIC. It is unlikely that the Built Environment (such as farmhouses, sheds, etc) will be destroyed if the Proposed Amended Option is followed.
- The possibility exists that the construction of the WEF may result in the destruction of colonial, but particularly pre-colonial stone kraals. Colonial kraals are generally highly visible and construction workers will be able to identify them. However, pre-colonial stone kraals will likely only be identified by a trained archaeologist.

- The Webley & Orton (ACO Associates) (2011) survey did not identify any cemeteries or graves on the plateau. However, it is possible that graves associated with farm owners and workers may occur, generally in proximity to farmhouse complexes. They are considered of high local significance.
- The 2011 heritage survey also noted the cultural landscape comprising a typical Karoo landscape which has been modified by its use for agricultural purposes. It is recommended that the landscape on and around the wind farm be provisionally graded as Grade IIIB.

a) Potential Impacts

Construction Phase Impacts:

During the construction phase the following physical impacts to the landscape and any heritage that lies on it can be expected:

- Bulldozing of roads to turbines sites with a possibility of cut and fill operations in places;
- Upgrading of existing farm tracks;
- Creation of working and lay-down areas close to each turbine site;
- Excavation of foundations for each tower;
- Excavation of many kilometers of linear trenches for cables;
- Erection of a 132 kV power line (pole design not finalized);
- Construction of electrical infra-structure in the form of one or more sub-stations

The abovementioned activities may impact on archaeological material, built environment and cemeteries and graves, as outlined in Tables 3.21 to 3.24.

Table 3.21: Summary of impacts to archaeological material (Source: ACO Associates, 2015)

NATURE OF IMPACT: Impacts to archaeological material (including stone artefacts, rock engravings and paintings and pre-colonial kraals) could involve localised displacement of material at turbine footings, access roads, etc.		
	Without mitigation	**With Mitigation**
Extent	Local	Site specific
Duration	Permanent (archaeological sites are non-renewable)	No impact
Magnitude	Medium	Zero

Probability	Probable	Unlikely
Significance	Medium	Low
Status (positive or negative)	Negative	Neutral
Reversibility	No, once archaeological sites are destroyed, they cannot be replaced.	
Irreplaceable loss of resources?	Yes, once archaeological sites are destroyed, they cannot be replaced.	
Can impacts be mitigated?	Yes, impacts can be mitigated.	
Mitigation: The Proposed Amended Option avoids the most significant archaeological sites identified in the 2011 survey. No further mitigation is required.		
Cumulative Impacts: The cumulative impact of a number of wind energy facilities on the plateau may result in the loss of MSA archaeological scatters of low significance.		
Residual Impacts: Once the turbines are removed and the access roads are re-vegetated, there will be no further impacts on the archaeological landscape		

The proposed amendments will not result in a change to the significance of potential impacts on archaeological materials.

Table 3.22: Summary of impacts to Built Environment (Source: ACO Associates, 2015)

NATURE OF IMPACT: The construction of access roads in close proximity to aspects of the Built Environment, such as sheds, workers' cottages, etc. could result in accidental damage and/or vandalism.		
	Without mitigation	**With Mitigation**
Extent	Site specific	Site specific
Duration	Permanent (heritage sites are non renewable)	No impact
Magnitude	Moderate	Very Low
Probability	Probable	Unlikely
Significance	Medium (buildings of Grade IIIC significance)	Low
Status (positive or negative)	Negative	Neutral
Reversibility	No, once buildings are destroyed, they cannot be replaced.	
Irreplaceable loss of resources?	Yes, once buildings are destroyed, they cannot be replaced.	
Can impacts be mitigated?	Yes, impacts can be mitigated	
Mitigation: Turbines should be placed at least 500m from heritage sites, i.e. buildings older than 60 years. Old buildings should be fenced off during construction to avoid vandalism. If buildings are re-used during the construction of the WEF, they should be assessed and a permit from SAHRA may be necessary if they are renovated.		
Cumulative Impacts: The cumulative impact of a number of wind energy facilities on the plateau may result in a loss of the built environment.		
Residual Impacts: Once the turbines are removed and the access roads are re-vegetated, there will be no further impacts on the built environment.		

The proposed amendments will not result in a change to the significance of potential impacts on the built environment.

Table 3.23: Summary of impacts to Cemeteries and Graves (Source: ACO Associates, 2015)

NATURE OF IMPACT: The excavation of turbine footings, access roads, etc may result in the destruction of cemeteries and graves which are not clearly marked.		
	Without mitigation	**With Mitigation**
Extent	Regional	Local (severity can be mitigated)
Duration	Permanent	Permanent (even with mitigation, graves uncovered accidentally are still likely to be destroyed).
Magnitude	High	Very Low
Probability	Probable	Unlikely
Significance	High	Moderate
Status (positive or negative)	Negative	Neutral
Reversibility	No, no graves have been destroyed, they cannot be replaced.	
Irreplaceable loss of resources?	Yes, once graves are destroyed, they cannot be replaced.	
Can impacts be mitigated?	No, difficult to mitigate in advance, as locations of graves cannot be predicted in advance. Only mitigation is to ensure proper procedures are followed when graves uncovered.	
Mitigation: If graves are uncovered, work must stop in that area immediately and the SAHRA Burials Unit notified. An archaeologist will be asked to investigate, and various procedures may be proposed, including covering up the human remains and moving the turbines, etc. elsewhere. If exhumation is approved, this may be a lengthy process and costs will be for the developer.		
Cumulative Impacts: The cumulative impact of several wind farms in the area enhances the likelihood of uncovering human remains.		

The proposed amendments will not result in a change to the significance of potential impacts associated with cemeteries and graves.

Operational Phase Impacts:

During the operational life of the wind farm, it is expected that physical impacts to heritage will diminish or cease. Impacts to intangible heritage are expected to occur. Such impacts relate to changes to the feel, atmosphere and identity of a place or landscape. Such changes are evoked by visual intrusion, noise, changes in land use and population density. In the case of this project, impacts to remote and rural landscape and wilderness qualities are possibly of greatest concern. Cultural landscapes are highly sensitive to cumulative impacts and large scale development activities that change the character and public memory of a place. The construction of a large facility can result in profound changes to the overall sense of place of a locality, if not a region.

Table 3.24: Summary of impacts to the Cultural Landscape (Source: ACO Associates, 2015)

NATURE OF IMPACT: The construction of turbines, substations and overhead transmission lines may have a negative visual impact on the cultural landscape.		
	Without mitigation	**With Mitigation**
Extent	Local	Site specific
Duration	Long-term	Construction period
Magnitude	Medium	Low
Probability	Probable	Unlikely
Significance	Medium	Low
Status (positive or negative)	Negative	Neutral
Reversibility	Yes, once the turbines are removed after 25 years, the landscape will return to its approximate earlier state.	
Irreplaceable loss of resources?	No, once the turbines are removed, the landscape qualities will return to their earlier condition.	
Can impacts be mitigated?	Yes.	
Mitigation: The Proposed Amended Option includes 61 WTG, which is a substantial reduction from the 103 WTG in the Authorised Option. This reduction will have a positive impact on the visual impacts of the WEF on the Cultural Landscape.		
Cumulative Impacts: The cumulative impact of several wind farms in the area will increase the visual impact on the cultural landscape of the Karoo.		
Residual Impacts: None.		

The specialist heritage investigation stated that the reduction of the number of WTGs from 103 to 61, will result in a positive impact on the Cultural Landscape of the area.

Cumulative Impacts

There are numerous proposals for the establishment of renewable energy facilities around De Aar (both solar and wind) which will have a significant impact in terms of industrialisation of the landscape (ACO Associates cc, 2015). According to the DEA webpage on Renewable Energy Applications (dea.maps.arcgis.com), there at least two proposed wind energy facilities to the north-east of De Aar, including the Longyuan Mulilo De Aar 2 North WEF (which has received approval) and the Castle WEF (to the east of the plateau) as well as at least one wind energy facility which has received EA to the south-west. There are also at least 8 solar energy facilities located to the north-east of De Aar.

These projects have received Environmental Authorisation and have either proceeded into the construction phase, or are expected to be constructed in the future. If all these projects proceed, then the De Aar 2 South WEF will be built in a landscape where wind turbines and solar facilities will be common features on the landscape.

Given that the visual impacts of the turbines and associated infrastructure cannot be effectively mitigated, the cumulative impact on a regional level will be considerable (ACO Associates cc, 2015). While normal stock farming may be able to continue, the increased industrialisation of the landscape may stifle development that derives value from the wilderness experience i.e. hunting-related tourism, and may impede the development of the hospitality industry and sterilise any prospects of developing

new wilderness areas/conservation areas or parks on any land with a radius of 10 km from any of the WEFs.

However, the positive outcome of this amendment has been the reduction in the number of turbines initially authorised for the project (ACO Associates cc, 2015).

b) Mitigation

Specific recommendations associated with the proposed amendments:

There are at least four locations where the amended layout may impact negatively on heritage resources. They are:

- At the proposed 132 kV substation. The construction of the access road from WTG 10 to WTG 5 will cross the dry river bed in a rocky area with a possible cliff face. There is a possibility that there may be small rock shelters/caves with archaeological deposit and/or rock paintings in this rocky outcrop, making this river crossing sensitive. In addition, the access road will run in close proximity to a series of stone kraals identified in the 2011 survey.

It is recommended that a walk down is undertaken as part of the conditions of the EMPr, to ensure that the proposed access road will not impact on potential heritage resources.

- While the Proposed Amended Option avoids the large MSA factory site on Knapdaar, aerial photographs (Google Earth) indicate circular features (kraals?) on the landscape in proximity to the access road connecting WTG47 with WTG46. These kraals vary between 30m and 90m from the stone kraals.

It is not possible to verify whether these stone “circles” reflect pre-colonial stone kraals without a field survey. It is possible that they may be natural phenomena.

It is recommended that a walk down is undertaken as part of the conditions of the EMPr, to ensure that the proposed access road will not impact on potential heritage resources.

- The access road for the Proposed Amended Option connecting WTG45 with WTG37 will run within 90m of a series of at least three (3) kraals. The kraals may be associated with a farm building but the scale does not permit this to be determined. The kraal is located some 120m to the south-west of WTG37.

It is not possible from the aerial photography to determine whether these are modern kraals with wire fencing, or older stone kraals. The age of the kraals can only be determined from a field assessment.

It is recommended that the proposed access road is acceptable but if there is any reason to move the access road any closer to the kraals, then a walk down is undertaken as part of the conditions of the EMPr.

- The access road for the Proposed Amended Option linking WTG21 with WTG 60 runs 200m from a square kraal, overlooking a dry river. The kraal (?) falls outside the boundaries of the WEF.

The age of the kraal can only be determined from a field assessment.

It is recommended that the proposed access road is acceptable but if there is any reason to move the access road any closer to the kraals, then a walk down is undertaken as part of the conditions of the EMPr.

General mitigation:

The best way to manage impacts to archaeological material is to avoid impacting them. This means micro-adjusting turbine positions where feasible, or routing access roads around sensitive areas.

Construction Phase:

- The Proposed Amended Option avoids the most significant archaeological sites identified in the 2011 survey. No further mitigation is required.
- Turbines should be placed at least 500m from heritage sites, i.e. buildings older than 60 years. Old buildings should be fenced off during construction to avoid vandalism. If buildings are re-used during the construction of the WEF, they should be assessed and a permit from SAHRA may be necessary if they are renovated.
- If graves are uncovered, work must stop in that area immediately and the SAHRA Burials Unit notified. An archaeologist will be asked to investigate, and various procedures may be proposed, including covering up the human remains and moving the turbines, etc. elsewhere. If exhumation is approved, this may be a lengthy process and costs will be for the developer.
- Avoid constructing access roads along the lower slopes of valleys and along river banks to avoid impacting on significant sites and stone kraal complexes;
- Ensure access roads avoid passing in close proximity to farmsteads and associated farm buildings older than 60 years. In general a 400m buffer should be implemented around farmsteads particularly if the farm buildings are older than 60 years. This buffer can be reduced if the building contains no elements of heritage significance;
- Colonial kraals are generally highly visible and construction workers will be able to identify them. However, pre-colonial stone kraals will likely only be identified by a trained archaeologist – for this reason a walk down of the revised layout should be undertaken as part of the conditions of the EMPr ;
- All farm cemeteries and individual graves should be avoided. A buffer of at least 15 m should be enforced around them. They are often difficult to identify, and for this reason a walk down of the revised layout should be undertaken as part of the conditions of the EMPr;
- If any human remains are uncovered during the construction phase, work in that area should stop immediately and the South African Heritage Resources Association (SAHRA) must be notified;
- Guarantees for demolition of turbines after their useful life must be in place as a condition of approval.

Operational Phase:

None.

c) Conclusion

After consideration of the significance of the heritage resources (identified during the 2010 heritage survey), the heritage specialists concluded that the proposed reduction in the number of WTGs is generally positive from a heritage perspective.

If the recommendations put forward in the Addendum to the Heritage Report are implemented, then the Proposed Amended Option is supported (ACO Associates, 2015).

Refer to **Appendix C8** for the Addendum to the Heritage Report.

3.1.9 Palaeontology impacts

The proposed De Aar 2 South WEF project on the plateau near De Aar is located in an area of the Karoo that is underlain by potentially fossiliferous sedimentary rocks of Palaeozoic and younger, probably Quaternary age, notably the Karoo Supergroup (Almond 2012a). Dr John Almond undertook as re-assessment of potential impacts on palaeontological resources associated with the proposed amendments to the project description of the WEF (refer to Appendix C9), the findings of which are summarised below.

a) Potential Impacts

Construction Phase Impacts:

The construction phase of this renewable energy development will entail numerous, but mostly shallow, excavations into the superficial sediment cover and in some areas into the underlying bedrock as well. These include, for example, excavations for the wind turbine foundations, underground cables, new electricity transmission lines and substations, as well as new gravel access roads and any control / administrative buildings. In addition, substantial areas of bedrock will be sealed-in or sterilized by infrastructure such as lay-down and standing areas for the wind turbines as well as new access roads.

The increased size of the WTG foundations will entail the disturbance of a larger volume of bedrock for each WTG location in the Proposed Amended Option compared to the Authorised Option. However, this is more than compensated by the greatly reduced number of WTG (from 103 down to 61) in the Proposed Amended Option. Anticipated impacts on fossil heritage resources at the surface or underground are therefore significantly *lower* in the case of the Proposed Amended Option.

As outlined in the original palaeontological assessment report (Almond 2012), the majority of proposed WTG locations are underlain by unfossiliferous dolerite or superficial deposits (soil / colluvium / alluvium *etc*) of low palaeontological sensitivity. This applies equally to the layout in the Proposed Amended Option (Almond, 2015).

A brief assessment of the impact significance (before and after mitigation) of the Proposed Amended Option for the De Aar 2 South WEF in terms of palaeontological heritage resources is given in Table 3.21 below. Only the construction phase is considered here since further significant impacts are not anticipated during the operational and decommissioning phases. It is concluded that the impact significance of the proposed development, both before and after mitigation, is Low, and associated cumulative impacts are likewise probably Low.

Table 3.25: Assessment of impacts of the proposed De Aar 2 South WEF (Proposed Amended Option) on fossil heritage resources during the construction phase of the development (*N.B.* Significant impacts are *not* anticipated during the operational and decommissioning phases). (Source: Almond, 2015)

Nature of impact: Disturbance, damage, destruction or sealing-in of scientifically valuable fossil remains preserved at or beneath the ground surface within the development area, most notably by surface clearance and bedrock excavations during the construction phase (*e.g.* WTG foundations)		
	Without mitigation	**With mitigation**
Extent	Local (restricted to development footprint)	Local (restricted to development footprint)
Duration	Impacts occur only during construction phase but are permanent in effect	Impacts occur only during construction phase but are permanent in effect
Magnitude	Low	Low
Probability	Low	Low
Significance	**LOW**	**LOW**
Status	Negative	Negative (loss of fossils) & positive (improved fossil database following mitigation)
Reversibility	Irreversible	Irreversible
Irreplaceable loss of resources	Possible, but the limited fossil resources concerned may well also be represented outside the development area (*i.e.* not unique)	Possible, but the limited fossil resources concerned may well also be represented outside the development area (*i.e.* not unique)
Can impacts be mitigated?	Yes	Yes.
Mitigation: Monitoring of all substantial bedrock excavations for fossil remains by ECO, with reporting of substantial new palaeontological finds (notably fossil vertebrate bones & teeth) to SAHRA for possible specialist mitigation.		
Cumulative impacts: Unknown (Insufficient data on local alternative energy and other developments available) but probably LOW given rarity of fossil reports from the region and high levels of dolerite intrusion in the De Aar plateau region.		
Residual impacts: Negative impacts due to loss of local fossil heritage will be partially offset by *positive* impacts resulting from mitigation (*i.e.* improved palaeontological database).		

Operational Phase Impacts:

None anticipated.

Cumulative Impacts:

Given the low overall palaeontological sensitivity of the Eastern Plateau region near De Aar, and the widespread occurrence elsewhere in the Great Karoo of most of the fossils so far recorded there, the successive or concurrent development here of the two wind energy facilities that have been proposed by Longyuan Mulilo De Aar 2 South (Pty) Ltd and Longyuan Mulilo De Aar 2 North (Pty) Ltd do not pose a significant cumulative impact on local fossil heritage. Potential cumulative impacts have accordingly been rated as "Low".

b) Mitigation

No additional mitigation required.

c) Conclusion

The proposed Amended Option for the Longyuan Mulilo De Aar 2 South Wind Energy Facility is of similar "Low" impact significance as far as palaeontological heritage resources are concerned to the Authorized Option assessed in the original palaeontological assessment. Indeed, anticipated negative impacts on fossils preserved at or beneath the surface of the ground are probably significantly *lower* in the case of the Proposed Amended Option, given the substantially smaller number of wind turbines involved, and hence smaller volume of potentially fossiliferous bedrock that will be excavated during construction. The conclusions and recommendations of the original palaeontological heritage assessment report (Almond, 2012) for the proposed WEF situated on the plateau (south) near De Aar therefore apply equally to the Authorised Option and to the Proposed Amended Option.

Refer to **Appendix C9** for the Paleontological Addendum Report.

3.2 AMENDMENT OF TYPOGRAPHICAL ERROR

No negative or positive environmental impacts will occur if the typographical error, as outlined in Section 2 is amended. The EA would however then contain the correct description relating to the permanent hard standings adjacent to each turbine, as assessed in the original EIA for the project.

3.3 SUMMARY OF IMPACTS ASSOCIATED WITH THE PROPOSED CHANGES TO THE PROJECT DESCRIPTION AND LAYOUT

A summary of the potential impacts for the construction and operational phases associated with the proposed De Aar 2 South WEF (i.e. approved option (authorized WEF) versus the amended option (proposed amendments as outlined in Section 2)) is provided in Table 3.26 below. The last column provides an indication of whether or not a change in significance of findings is apparent between the authorized WEF and proposed amended WEF.

High negative	**Red**
Medium negative	**Orange**
Low negative	**Blue**
Very Low negative	**Green**
Positive impact	**Yellow**
Negligible	**Grey**

Table 3.26: Summary of impacts associated with proposed amendments to the project description

Impact	*Authorised Option (Authorised WEF)*		*Proposed Amended Option*		*Changes to impact significance rating*
	Without Mitigation	*With mitigation*	*Without Mitigation*	*With mitigation*	
CONSTRUCTION PHASE					
Ecological Impacts:					
Loss or fragmentation of vegetation	**Medium - Low**	**Medium – Very Low**	**Medium - Low**	**Medium – Very Low**	**None**
Loss of individuals of protected tree species	**Very Low (-)**	**Very Low (-)**	**Very Low (-)**	**Very Low (-)**	**None**
Loss of individuals of protected plant species	**Very Low (-)**	**Very Low (-)**	**Very Low (-)**	**Very Low (-)**	**None**
Avifauna:					
Habitat loss	**Low-Medium**	**Low (-)**	**Low (-)**	**Low (-)**	**Yes**
Disturbance/ Displacement	**High (-)**	**Medium (-)**	**Medium – High (-)**	**Medium (-)**	**Yes**
Fresh water					
Limited disturbance of freshwater related habitats at the construction sites	**Low (-)**	**Very Low (-)**	**Low (-)**	**Very Low (-)**	**None**
Disturbance of habitat & possibly impedance/ diversion of flow at stream /drainage line crossings or adjacent to freshwater features	**Low (-)**	**Very Low (-)**	**Low (-)**	**Very Low (-)**	**None**
Bats					
Destruction of bat roosts due to earthworks and blasting	**Low (-)**	**Very Low (-)**	**Low (-)**	**Very Low (-)**	**None**
Artificial lighting	**Low (-)**	**Very Low (-)**	**Very Low (-)**	**Very Low (-)**	**Yes**
Foraging habitat loss	**Low (-)**	**Very Low (-)**	**Low (-)**	**Very Low (-)**	**None**
Noise					
Noise	**Low (-)**	**Low (-)**	**Low (-)**	**(Very) Low (-)**	**Yes**
Visual Impact					

Impact of initial site works, construction camps, site set up, laying services, ground works	Medium (-)	Medium-Low (-)	Medium (-)	Medium-Low (-)	None
Impact of construction of access roads, hauling and delivery of construction materials	Medium (-)	Low (-)	Medium (-)	Low (-)	None
Agriculture					
Agriculture	Low (-)	Low (-)	Low (-)	Low (-)	None
Heritage and Archaeology					
Archaeology	Medium (-)	Low (neutral)	Medium (-)	Low(neutral)	None
Built Environment	Medium (-)	Low (neutral)	Medium (-)	Low (neutral)	None
Cemeteries and Graves	High (-)	Medium (neutral)	High (-)	Medium (neutral)	None
Palaeontology					
Palaeontology	Low (-)	Low (-)	Low (-)	Low (-)	None

Impact	*Approved Alternative*		*Amended Alternative*		*Changes to impact significance rating*
	Without Mitigation	*With mitigation*	*Without Mitigation*	*With mitigation*	
OPERATIONAL PHASE					
Ecological Impacts					
Spread of alien plants	Medium (-)	Very Low (-)	Medium (-)	Very Low (-)	None
Avifauna impacts					
Disturbance/ Displacement	High (-)	Medium (-)	Medium (-)	Medium - Low (-)	Yes
Mortality	Medium-High	Medium (-)	Medium (-)	Medium (-)	Yes
Impact on Bats					
Bat mortalities	High (-)	Medium (-)	High (-)	Low (-)	Yes
Freshwater impacts:					
Disturbance of freshwater habitats at stream / drainage line crossings or adjacent to the freshwater features	Very Low (-)	Very Low (-)	Very Low (-)	Very Low (-)	None
Noise Impact:					
Noise	Low (-)	Low (-)	Low (-)	(Very) Low (-)	None
Visual Impact:					

Visual	**High (-)**	**High (-)**	**High (-)**	**High (-)**	**None**
Agricultural impacts:					
Agriculture	**Low (-)**	**Low (-)**	**Low (-)**	**Low (-)**	**None**
Heritage and archaeological impacts:					
Impacts to the Cultural Landscape	**Medium (-)**	**Low (neutral)**	**Medium (-)**	**Low (neutral)**	**Yes**
Palaeontological impacts:					
Palaeontology	**Low (-)**	**Low (-)**	**Low (-)**	**Low (-)**	**None**

From the above tables it is evident that there are numerous changes (i.e. reductions) to the significance of impacts associated with the proposed amended WEF compared to the authorised WEF.

Ecology: The significance of impacts associated with the proposed amended option is the same as those for the authorised option, according to the impact assessment methodology. However, the ecology specialist stated that there is a significant reduction in the actual footprint area associated with the amended option in comparison to the authorised option, which is to the benefit of the ecological receiving environment. The potential impact on natural vegetation by the internal access roads is the only impact with a significance of **Medium (negative)** after mitigation. Other potential impacts are either **Low (negative)** or can be reduced to **Low (negative)** or **Very Low (negative)** with mitigation.

Avifauna: The proposed amendments will result in changes (reduction) to the significance of potential avifauna impacts. During the construction phase impacts, habitat loss impacts before mitigation has changed (reduced) from **Medium - Low (negative)** to **Low (negative)**. The impact significance for disturbance and displacement prior to construction changed (reduced) from **High** to **Medium – High (negative)**. However, the post-mitigation remains unchanged (**Medium (negative))** especially in light of the priority species and the raptor community. In terms of operational phase impacts, pre- and post-mitigation significance for disturbance and displacement impacts during operation of the WEF changed from **High** to **Medium (negative)** and **Medium (negative)** to **Low - Medium (negative)** respectively. In terms of mortality (collision risks), pre-mitigation significance has been changed (reduced) from **Medium - High** to **Medium (negative).**

Bats: The proposed amendments will result in some changes (reduction) to the significance of potential impacts on bats. During the construction phase impacts, destruction of bat roosts due to earthworks and blasting would remain **Low (negative),** before mitigation, and **Very Low (negative)** after mitigation with the proposed amendments. The proposed amended option would reduce the significance of the potential impact relating to artificial lighting before mitigation from **Low (negative)** to **Very Low (negative)**. The impact significance, after mitigation, would remain the same for the proposed amended option, i.e. **Very Low (negative)**. Similarly, the significance of the foraging habitat loss impact would remain **Low (negative)** before mitigation, and **Very Low (negative)** after mitigation, with the proposed amendments. In terms of bat mortalities, the significance of this

potential impact would remain **High (negative)** before mitigation, however after mitigation would reduce from **Medium (negative)** for the authorised WEF to **Low (negative)** for the proposed amended project description.

Fresh water: The proposed amendments will not result in a change to the significance of this potential impact, namely **Low (negative)** significance without mitigation, and **Very Low (negative)** with mitigation for both the construction and operational phases. The freshwater specialist highlighted that one can expect that the proposed amended project description and revised layout would potentially impact even less on the freshwater features in the area (Belcher, 2015).

Noise: The proposed amendments would result in a reduction in the significance of construction and operational phase noise impacts, from **Low (negative)** (authorised option) to **Very Low**[10] **(negative)** (proposed amended option).

Visual: The proposed amendments will not result in a change to the significance of construction and operational phase impacts. However the degree of the **High negative** rating for the operational phase would be less for the proposed amended option than for the authorised option, due to less clutter. Therefore its visual significance would reduce (Hansen, 2015).

Agricultural impacts: The proposed amendments will not result in a change to the significance of this potential impact. The impact severity falls within the same category **Low (negative)** as the authorised project, however, the scale of its impact due to the reduced overall footprint, will in reality be even less than previously proposed.

Heritage and Archaeology: The proposed amendments will not result in a change to the significance of potential impacts on archaeological materials, the built environment and/or cemeteries and graves. The significance of potential impacts on archaeological and built environment resources are rated as **Medium (negative)** and **Low (neutral)** before and after mitigation respectively, for both the Authorised and proposed Amended Options, **High (negative)** and **Medium (neutral)** for potential impacts on cemeteries and graves pre- and post- mitigation respectively, and **Medium (negative)** (pre-mitigation) and **Low (neutral)** (post-mitigation) for impacts on the cultural landscape during the operational phase. The specialist heritage investigation stated that the reduction of the number of WTGs will result in a positive impact on the Cultural Landscape of the area. The proposed reduction in the number of WTGs is generally positive from a heritage perspective.

Palaeontology: The proposed amendments will not result in a change to the significance of this potential impact, i.e. **Low (negative)** both before and after mitigation for the construction and operational phases.

[10] Morne De Jager indicated that the EIA criteria used for his impact assessment does not include “very low” as one of the possible significance rating, only “low”. He indicated that if there was other criteria (specifically, “very low”) he would have used that in the assessment table in terms of the significance of impacts associated with the proposed amendments. The text of the report therefore states that the proposed changes will have a reduced impact significance (pers comm. De Jager, 2015).

3.4 CHANGES TO THE EMPR

This report does not contain a dedicated Environmental Management Programme report (EMPr) given that the "Life Cycle EMPr" (dated April 2012) included in the Final Environmental Impact Assessment Report (2012) for the project (refer to Annexure M of the Final EIA Report included as Appendix G hereto) has not been submitted to DEA as yet for approval. The EMPr will be finalised and submitted to DEA for approval, together with the Final Layout, as required in terms of Conditions of Authorisation 13 and 15, once the project has obtained preferred bidder status.

The proposed amendments to the project description have, in most instances, not required changes to or additions to the recommended mitigation measures for the project. Additional recommendations in terms of potential heritage impacts are included in the Addendum to the heritage report (Appendix C8) in response to the amended preliminary layout, as outlined in Section 3.1 above, and must be addressed in the final EMPr, where relevant. Similarly, refinements to the mitigation measures put forward in the addendum to the avifauna and bat studies (in light of the findings of the preconstruction monitoring programmes), and noise studies must be included in the Final EMPr, where relevant.

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4 PUBLIC PARTICIPATION PROCESS

A public participation process is being undertaken to ensure that potential and registered I&APs are given an opportunity to comment on the proposed amendments to the EA for the proposed wind energy facility. The public participation process includes the following:

- Notification of all previously registered I&APs for the proposed project of the Application for Amendment of the EA:
    - A letter of notification has been distributed to all affected landowners, to notify them of the Application for Amendment of the EA. Refer to Appendix 3 of the Application for Amendment of the EA for proof of notification.
    - A letter of notification has been distributed to all registered[11] I&APs, notifying registered I&APs of the Application for Amendment of the EA and opportunity to comment (30 day comment period) on the Application for Amendment of the EA and associated report. Refer to Appendix F.

- Notification of all potential I&APs
    - Placement of a site notice, notifying potential (and registered) I&APs of the Application for Amendment of the EA. The notice provides a brief description of the proposed amendment of the EA, and invites members of the public to register as I&APs and submit any comments on the proposed EA Amendment Application. (Refer to Appendix F for a copy of the Site Notice)
    - Placement of advertisement in the local *Echo* and regional *Volksblad* newspapers providing notification of the proposed amendment of the EA, and inviting members of the public to register as I&APs and raise any issues or concerns, as part of the 30 day comment period. (Refer to Appendix F for a copy of the advertisements).

- The relevant State Departments have been provided with copies of the Amendment Application and associated Environmental Assessment Report and will also be given 30 days to consider the proposed amendments and submit any comments that they may have. Relevant State Departments include:
    - Department of Agriculture, Forestry and Fisheries: Directorate: Land Use and Soil Management
    - Department of Water and Sanitation
    - Department of Agriculture (Northern Cape)
    - Department of Energy (Northern Cape)
    - Northern Cape Department of Environment and Nature Conservation
    - Northern Cape Department of Transport, Safety and Liaison
    - Northern Cape Department of Roads and Public Works
    - Heritage Northern Cape
    - South African Heritage Resources Agency

- All potential and registered I&AP's (including relevant State Departments) will be given an

[11] Previously registered I&APs for the original EIA and amendment of the EA application processes.

opportunity to review and comment on the Application for Amendment of the EA and associated report for a 30 day comment period **i.e. from 4 August – 7 September 2015**. A hard copy of the report has been lodged at the De Aar Public Library, and has also been made available for download on the Holland & Associates Environmental Consultants website (www.hollandandassociates.net) during the comment period.

- All comments submitted by I&APs will be collated, summarised and responded to in a Comments and Response Report (CRR), which will be submitted to DEA for decision making, together with the final Environmental Assessment Report.
- Registered I&APs will be notified, in writing, of DEA's decision.

5 CONCLUSIONS AND RECOMMENDATIONS

Based on the findings of the re-assessment of potential environmental impacts associated with the application for amendment of the environmental authorisation, the following advantages of the proposed amendments are evident:

- Aligning the De Aar 2 South WEF to current international WTG models (given advances in WTG technology since the project was authorised in 2013), would not increase the significance of potential negative impacts associated with the approved project.
- According to the Applicant, the general benefits of using larger sized turbines, compared to older generation turbines are:
  - Improved grid code compliance and voltage regulation, providing a more secured energy supply;
  - Improved warranted power and noise curves;
  - Decrease in WTG load fatigue, maintenance costs and downtime;
  - Decrease in the road area coverage per installed capacity;
  - More efficiently yielding the wind energy resource, and reducing the need for further WEF development to increase the total installed capacity.
- The proposed amendments are considered positive in terms of all potential impacts assessed. The proposed amendments will result in a reduction in the significance of avifauna, bat and noise impacts. In terms of potential ecological, freshwater, visual, agricultural and heritage impacts, where the significance rating of impacts have remained the same as the authorized WEF, the specialists have confirmed that the proposed amended option is preferable to the authorized WEF, given the reduction in the footprint of the facility and number of turbines, which would minimize the potential impacts.
- The correction of the one typographical error in the EA relating to the footprint of the permanent hard standings adjacent to each turbine would ensure that the correct project description, as described and applied for in the Final EIA Report (April 2012) for the project, is included in the Environmental Authorisation.

The proposed amendments will not result in an increase in the significance of any of the potential environmental impacts associated with the proposed project. Accordingly, there are no notable disadvantages to the proposed amendments.

Given that no significant additional impacts are associated with the proposed amendments to the project description and layout, and that numerous improvements (reductions) to the impact significance exists between the authorised WEF and proposed amended project, it is recommended that the proposed amendments, as described in Section 2, be considered for approval. The proposed amended option will support technological improvements which will result in a more efficient electricity generating facility.

Any additional mitigation measures included in this report as a result of the proposed amendment of the project (as outlined in Section 3) must be included in the final EMPr before submission to DEA for final approval, as required in terms of Conditions of Authorisation 13 and 15 of the EA.

6 REFERENCES

ACO Associates cc., 2015. *Addendum: Proposed Wind Energy Facility Situated on the Eastern Plateau (South) near De Aar, Northern Cape Province*. June 2015.

Almond, J.E. 2015. *Proposed application for amendment of the Environmental Authorisation for the proposed Wind Energy Facility situated on the Eastern Plateau (South) near De Aar, Northern Cape Province (DEA Ref No: 12/12/20/2463/AM3): Addendum to Specialist Paleontological Impact Assessment.* July 2015.

Animalia Zoological & Ecological Consultation CC. 2015. *Addendum to the Specialist Bat (Chiroptera) Sensitivity Assessment - For the proposed Wind Energy Facility situated on the Eastern Plateau (South) near De Aar in the Northern Cape.* 17 July 2015.

Aurecon. 2012. *Proposed Wind Energy Facilities (North & South) situated on the Eastern Plateau near De Aar, Northern Cape: Final EIAR*. Report No. 5933A

BlueScience, 2015. *Addendum to Freshwater Assessment for the Proposed Longyuan Mulilo De Aar 2 South Wind Energy Facility, Northern Cape.* July 2015.

Chris Van Rooyen Consulting. 2015. *Comments on the Addendum to the Avifaunal Impact Assessment conducted for the proposed Wind Energy Facility on the Eastern Plateau (South) near De Aar, Northern Cape Province. (DEA REF NO.:12/12/20/2463/AM3).* 21 July 2015.

Enviro-Acoustic Research, cc. 2015. *Proposed Wind Energy Facility situated on the eastern plateau (South) near De Aar, Northern Cape: Addendum to Environmental Noise Impact Assessment.* July 2015.

Hoare, D. 2015. *Addendum to EIA Report: Specialist ecological study on the potential impacts of the proposed Wind Energy Facility on the Eastern Plateau (South) near De Aar, Northern Cape. 3rd Draft.*

Harebottle, D.M. 2015. *Addendum to the Avifauna Impact Assessment conducted for the proposed wind energy facility on the Eastern Plateau (South), ear De Aar, Northern Cape Province. Application for Amendment of Environmental Authorisation*. July 2015.

Karen Hansen Landscape Architects. 2015. *Proposed application for amendment of the Environmental Authorisation for the proposed Wind Energy Facility situated on the Plateau (South) near De Aar, Northern Cape Province (DEA Ref No.: 12/12/20/2463/AM3).* June 2015.

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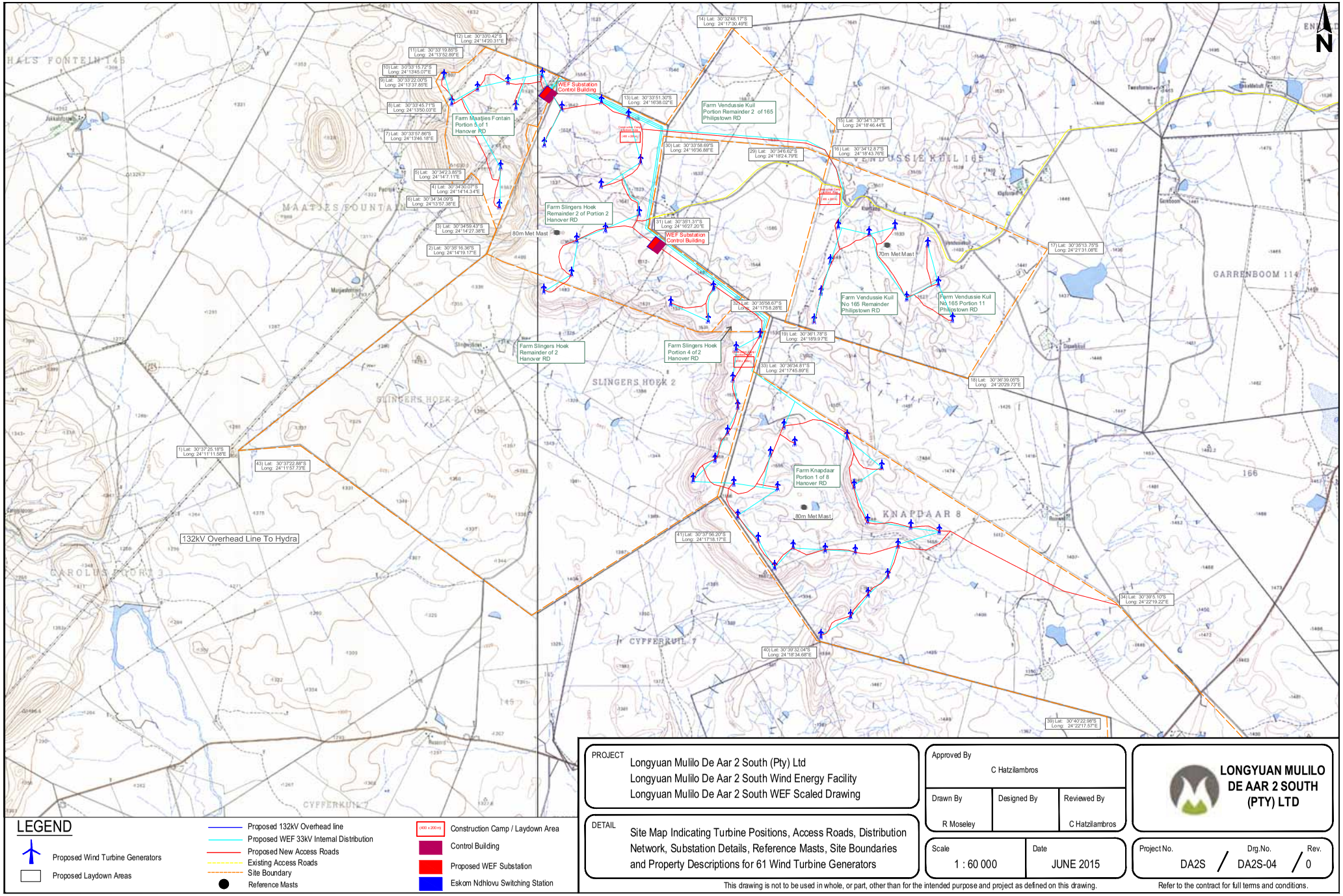
APPENDIX A:

Amended layout showing turbine positions, access roads and distribution network



PROJECT
Longyuan Mulilo De Aar 2 South (Pty) Ltd
Longyuan Mulilo De Aar 2 South Wind Energy Facility
Longyuan Mulilo De Aar 2 South WEF Scaled Drawing

DETAIL
Site Map Indicating Turbine Positions, Access Roads, Distribution Network, Substation Details, Reference Masts, Site Boundaries and Property Descriptions for 61 Wind Turbine Generators

Approved By		
C Hatzilambros		
Drawn By	Designed By	Reviewed By
R Moseley		C Hatzilambros

Scale	Date
1 : 60 000	JUNE 2015

LONGYUAN MULILO DE AAR 2 SOUTH (PTY) LTD

Project No.	Drg.No.	Rev.
DA2S	DA2S-04	0

APPENDIX B:

Application for Amendment of the EA Form

environmental affairs
Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

Application for amendment of an environmental authorisation in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended, and the Environmental Impact Assessment Regulations 2014

Kindly note that:

1. This form must be used to apply for the amendment of an environmental authorisation. An amendment includes:
   a) adding, substituting, removing or changing a condition or requirement of an environmental authorisation, or
   b) updating or changing any details or correcting a technical error.

2. This form is current as of 08 December 2014. It is the responsibility of the Applicant / EAP to ascertain whether subsequent versions of the form have been published or produced by the competent authority.

3. The required information must be typed within the spaces provided in the form. The sizes of the spaces provided are not necessarily indicative of the amount of information to be provided. It is in the form of a table that can extend itself as each space is filled with typing.

4. Incomplete applications may be rejected or returned to the applicant for amendment.

5. The use of "not applicable" in the form must be done with circumspection. Where it is used in respect of material information that is required by the competent authority for assessing the application, this may result in the rejection of the application as provided for in the regulations.

6. **No faxed or e-mailed applications will be accepted.**

7. Unless protected by law, all information contained in and attached to this application, will become public information on receipt by the competent authority. Upon request during any stage of the application process, the applicant / EAP must provide any registered interested and affected party with the information contained in and attached to this application.

8. This form must be submitted to the Department at the postal address given below or by delivery thereof to the Registry Office of the Department. Should the application form and attached reports not be submitted to the addresses given below it will be rejected.

9. Proof of payment of the prescribed fee of R2000 must accompany the submission of this form, unless an exclusion applies (see section 1 below). The application will not be processed without proof of payment unless one of the exclusions provided for in the fee Regulations is applicable AND such information in the exclusion section of this application form has been confirmed by this Department.

DEPARTMENTAL DETAILS

Postal address:
Department of Environmental Affairs
Attention: Director: Integrated Environmental Authorisations

Private Bag X447
Pretoria
0001

Physical address:
Department of Environmental Affairs
Attention: Director: Integrated Environmental Authorisations
Environment House
473 Steve Biko Road
Arcadia
Pretoria

Queries must be directed to the Directorate: Integrated Environmental Authorisations at:
Tel: (012) 399-9372 Email: EIAAdmin@environment.gov.za

Please note that this form must be copied to the relevant provincial environmental department(s)
View the Department's website at http://www.environment.gov.za/ for the latest version of the documents.

1. PROOF OF PAYMENT

Applicants are required to tick the appropriate box below to indicate that either proof of payment is attached or that, in the applicant's view, an exclusion applies. Proof and a motivation for exclusions must be attached as **Appendix 1** of this application form.

Proof of payment attached as **Appendix 1** [X]

Exclusion applies [ ]

An applicant is excluded from paying fees if:

- The activity is a community based project funded by a government grant; or
- The applicant is an organ of state.

TYPE OF EXCLUSION	Tick where applicable. Proper motivation must be attached to the application
The activity is a community based project funded by a government grant	
The applicant is an organ of state	

Department of Environmental Affairs' details for the payment of application fees

Payment Enquiries:
Tel: 012 399 9119
Email: eiafee@environment.gov.za

Banking details:
ABSA Bank
Branch code: 632005
Account number: 1044 2400 72
Current account
Reference number : **12/12/20/2463/1**…(application reference number to be used)

Proof of payment must accompany the application form:

Tax exemption status:
Status: Tax exempted

2. APPLICATION DETAILS

Name of person to whom the environmental authorisation was issued:	Longyuan Mulilo De Aar 2 South (Pty) Ltd Mr Johnny Hamilton Cullum/ Ms Karen Versfeld (now Mrs Karen Low)		
Contact person:	Mrs Karen Low		
Postal address:	PO Box 50		
	Cape Town International Airport		
	Postal code:	7525	
Telephone:	(021) 934 5278	Cell:	
E-mail:	karen@mulilo.com	Fax:	(021) 935 0505
Environmental Assessment Practitioner (EAP):	Nicole Holland t/a Holland & Associates Environmental Consultants		
Contact person:	Nicole Holland		
Postal address:	P.O. Box 31108		
	Tokai		
	Postal code: 7966		
Telephone:	083 4645246	Cell:	083 4645246
E-mail:	nicole@hollandandassociates.net	Fax:	086762 6126
EAP Qualifications:	BSc (Hons) Environmental and Geographical Science		
EAP Registrations/Associations:	Ms. Holland is registered with the South African Council for Natural Scientific Professions (Reg No. : 400306\06). Member of the IAIAsa (International Association for Impact Assessment (Western Cape branch)) Founding Member of the Environmental Assessment Practitioners Association of South Africa		
Name of landowner if the person to whom the environmental authorisation has been issued is not the owner:	Landowner contact details are included in **Appendix 3.**		
Contact person:			
Postal address:			
	Postal code:		
Telephone:		Cell:	
E-mail:		Fax:	
	In instances where there is more than one landowner, please attach a list of landowners with their contact details to the back of this page, together with copies of the notices given to these landowners about the amendment application. **Refer to Appendix 3.**		

Project Description:	Longyuan Mulilo De Aar 2 South (Pty) Ltd (hereafter referred to as Longyuan Mulilo De Aar 2 South) was granted an Environmental Authorisation (EA) on 1 March 2013 for the establishment of a wind energy facility (WEF) on the eastern plateau of De Aar, Northern Cape. The site is approximately 12,832ha in extent and consists of 8 portions of 4 farms. The project description in the EA currently indicates that the project would comprise of *"The construction of approximately 103 wind turbines with a potential capacity of 155 - 258 MW*". (The potential generation capacity of the WEF has however been limited to 140MW in accordance with the Department of Energy's cap on maximum megawatts). Infrastructure associated with the authorised WEF includes: • *A permanent hard standing made of compacted gravel and approximately 50 m x 40 m would be constructed adjacent to each turbine location for the crane.* • *A total of three construction laydowns in the south would be required with each having a footprint of approximately 200 x400m.* • *Gravel surface access roads of approximately 4m wide would also be required between each turbine.* • *Cables connecting each turbine would interconnect with overhead transmission lines that will follow the route of the access roads. Each turbine would have a transformer that steps up the voltage from 690 Volt to 22kilovolt (kV). This transformer is housed within each turbine tower or immediately outside the turbine.* • *The cabling between the turbines would traverse the site to the three substations, where the power from all the turbines would be metered.* • *The proposed substations and associated control buildings would have a footprint of approximately 200 x 100m.* • *The electricity distribution infrastructure comprises of three existing distribution lines (1 x 132kV, 2 x 400kV and 2 x 220kV) traversing the site. The transmission lines terminate at Eskom's Hydra Substation located 9.5km to the north east of De Aar.* The purpose of this Application for Amendment of the Environmental Authorisation is to apply for an amendment of the project description, as outlined in Section 4.2 below.
Farm name, Erf No., portion etc:	Landowner list and property details are included in **Appendix 3.**
Physical address where authorised activity is taking or will take place:	Please refer to Appendix 3. Slingers Hoek (Farm No. 2 Remainder of Portion 2 and Remainder); Slingers Hoek (Farm No. 2 Portion 4); Knapdaar (Farm No. 8 Portion 1); Maatjes Fontain Farm (Farm No. 1 Portion 5); Vendussie Kuil (Farm No. 165 Remainder of Portion 2); Vendussie Kuil (Farm No. 165 Portion 11 and Remainder) within the Emthanjeni Local Municipality and Renosterberg Local Municipality in the Northern Cape Province.
Magisterial District or Town:	Emthanjeni Local Municipality and Renosterberg Local Municipality

Departmental reference number of the previous environmental authorisation in respect of which an amendment is applied for:	12/12/20/2463/1
Date of issue of environmental authorisation:	Environmental Authorisation for the proposed project was granted by DEA on 1 March 2013. An Application for Amendment of the EA was submitted by the Applicant to DEA in May 2013 to change the Special Purpose Vehicle (SPV) name from "Mulilo Renewable Energy (Pty) Ltd" to "Longyuan Mulilo De Aar 2 South (Pty) Ltd". This amendment of the EA was granted by DEA on 21 May 2013. On the 10 July 2014, the Applicant submitted an Application for Amendment of the Environmental Authorisation to DEA for the following amendments: Amendment to extend the validity period; amendment to the property descriptions of the EA; and amendments to Conditions 43, 44 and 45. The amendment of the EA was granted by DEA on 14 August 2014.
Activity/ies for which authorisation was granted:	The EIA listed activities for which environmental authorisation has been granted includes the Items 10, 11 and 18 of GN R.544, Item 1 of GN R. 545 and Item 14 of GN R.546 published in terms of the NEMA EIA Regulations (2010).
Please Note: A certified copy of the environmental authorisation must be attached to this application as Appendix 2.	

3. DETAILS OF IMPLEMENTATION OF PREVIOUS ENVIRONMENTAL AUTHORISATION

Was the activity commenced with during the validity period of the environmental authorisation? If yes, please describe the implementation of the previous environmental authorisation to date:	~~YES~~	**NO**
The activity has not yet commenced.		

4. AMENDMENTS APPLIED FOR AND RELATED INFORMATION

Please indicate which of the following is relevant:

4.1. The holder of an environmental authorisation may at any time apply to the relevant competent authority for the amendment of the authorisation if:

(a) there is a material change in the circumstances which existed at the time of the granting of the environmental authorisation;	**YES**	~~NO~~
(b) there has been a change of ownership in the property and transfer of rights and obligations must be provided for; or	~~YES~~	**NO**
(c) any detail contained in the environmental authorisation must be amended, added, substituted, corrected, removed or updated.	**YES**	~~NO~~

4.2. Describe the amendments that are being applied for:

Amendment of Environmental Authorisation: Amendment of Project Description:

The Applicant proposes to increase the generating size of the wind turbine generators (WTG) in order to align to current international WTG models while reducing the number of WTG on the WEF. The following changes to the WTG parameters are proposed:

- Increasing hub heights from 100 m to 120m
- Increasing blade lengths from 60 m to 80m
- Increasing WTG generation size from 2.3MW to 4.0MW

Note: The generation capacity of the WEF would be a maximum of 140MW (in accordance with the Department of Energy's cap on maximum megawatts).

Table 1 below outlines the proposed project components to be amended, the approved description of the components, as well as the proposed amendment.

Table 1: Proposed amendments to project description

Component	Approved	Proposed amendment
Number of turbines	103	61 Turbines @ 2.3MW per turbine (to 30 Turbines @ 4MW per turbine). The maximum of 61 will be applied for.
Generation capacity per turbine	1.5 - 2.5MW	2.3MW – 4.0MW
Generation capacity of the WEF	155 - 258MW	140 MW
Rotor / blade diameters	120m	(min) 100m (max) 160m (Note: The maximum of 160m is being applied for)
Hub height	100m	(min) 90m (max) 120m (Note: The maximum of 120m is being applied for)
Construction Hardstand Pad	"20" 40m x 50m (adjacent to each turbine) (Note: it is apparent that the "20" is a typographical error in the EA. Refer to Section 4.2 and 4.3 below in this regard).	40m x 50m (adjacent to each turbine)
Permanent affected area (foundation size)	16 x 16m and 2 m deep	18,4m diameter, that narrows up to 10,6m at the surface (the visible portion) once the foundation is completed. Depth : 3,5m

(Note: The Application for amendment of the EA will assess the "worst case scenario" of 61 turbines @ 2.3MW per turbine with the understanding that should the Applicant use 4MW turbines (which will be the same dimensions as the 2.3MW turbines) then the Applicant would reduce the number of turbines to 30. The maximum turbine dimensions will be assessed and applied for. It is furthermore noted that the generation capacity of the WEF is limited to 140MW. Even though 61 turbines of 2.3MW = 145MW, the Applicant will be limited to 140MW).

These changes would result in an increase of the turbine tower-base diameter from 15m to 20m and the construction pad would remain 40m x 50m.

It must be understood that these are the upper limits of possible future WTG sizing, and if the De Aar 2 South WEF is to be constructed in the next few years, the actual WTG sizing will be in the middle range.

Refinements to the WEF layout are also proposed. Refer to Figure 1 below and Figure 2 included in **Appendix 4** for the updated layout. It should be noted however that, as required in terms of Condition 13 of the EA, the Applicant will still submit a final layout plan and Environmental Management Programme (EMPr) for the entire wind energy facility for approval to the Department, prior to commencement of the activity, utilising all available biodiversity information.

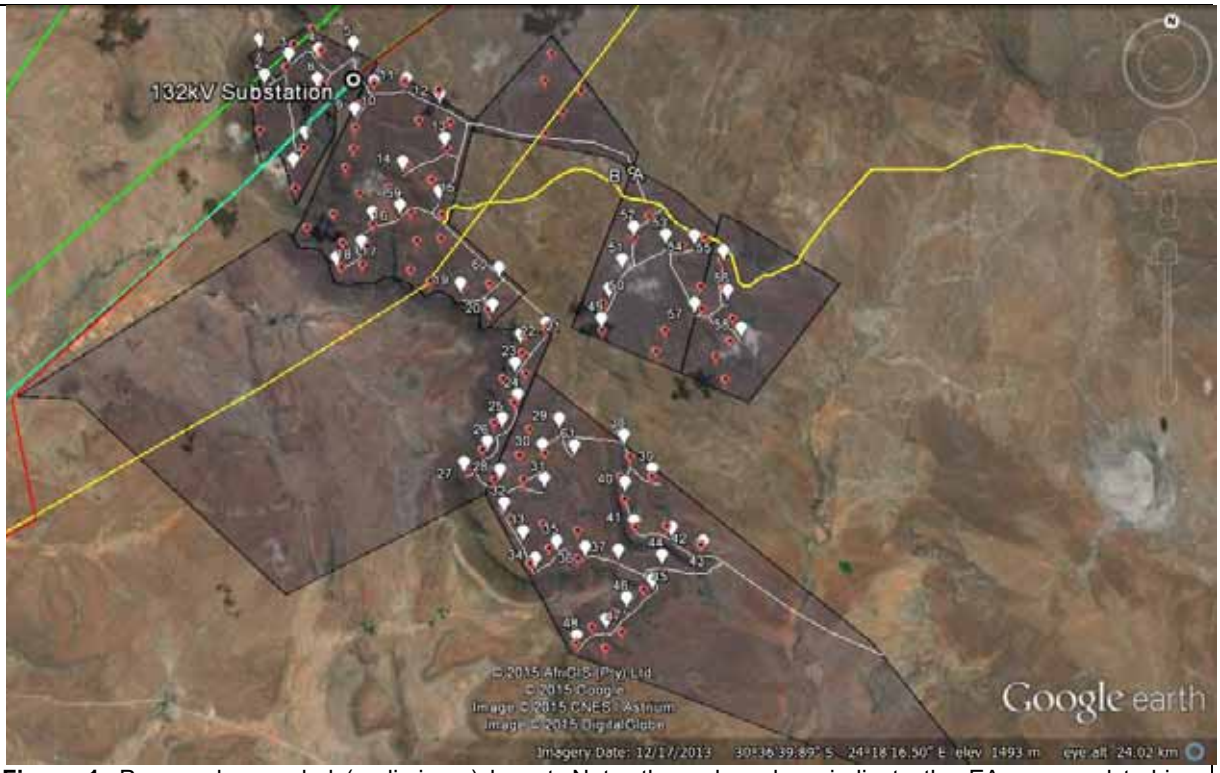


Figure 1: Proposed amended (preliminary) layout. Note: the red markers indicate the EA approved turbine positions and white markers indicate the new revised turbine positions. Transmission lines are blue red, green and yellow. Access road also in yellow.

The abovementioned proposed amendments to the project description of the project will require an **amendment to the section of the Environmental Authorisation titled "Activities Authorised"**, specifically page 5 of the EA, **sub-section titled "*The infrastructure associated with this facility includes*"**, which currently describes the proposed project as:

"- the construction of approximately 103 turbines with a potential capacity of 155 - 258 MW".

The proposed amendment of this sentence on page 5 of the EA is as follows:

"- the construction of approximately 61 turbines (with a generation capacity of 2.3MW per turbine) to 30 turbines (with a generation capacity of 4MW per turbine). The generation capacity of the WEF would be 140 MW".

Correction of a typographical error in the description of associated infrastructure on page 5 of the EA:

There is a typographical error on page 5 of the Environmental Authorisation dated 1 March 2013 relating to one of the associated infrastructure descriptions. In particular, the EA refers to:

"A permanent hard standing made of compacted gravel and approximately 20 50 m x 40 m would be constructed adjacent to each turbine location for the crane ".

The Applicant requests that the editorial error be corrected in the EA by removing the number "20", given that there would be a hard standing area adjacent to each turbine (as indicated in the remainder of the description), and therefore more than 20 hard standing areas would be required. It is therefore requested that the sentence be amended as follows:

"A permanent hard standing made of compacted gravel and approximately 50 m x 40 m would be constructed adjacent to each turbine location for the crane".

4.3. Please provide the reasons and/or a motivation for the application for amendment:

Amendment of Environmental Authorisation (amendment of project description):

As onshore wind energy facilities (WEF) receive continued support worldwide from governments and energy regulators, technological improvements are being seen on a constant basis. In order to ensure that a wind energy facility has the smallest possible footprint per total installed capacity, the wind turbine generators (WTG) are evolving in higher yielding and more efficient generating units. As the engineering loads and fatigues are better understood on the units, it allows the designers and engineers to design the most optimal and highest yielding WTGs for the specific terrain and climatic conditions.

The general benefits of using larger sized turbines, compared to older generation turbines are:

- Improved grid code compliance and voltage regulation, providing a more secured energy supply;
- Improved warranted power and noise curves;
- Decrease in WTG load fatigue, maintenance costs and downtime;
- Decrease in the road area coverage per installed capacity;
- More efficiently yielding the wind energy resource, and reducing the need for further WEF development to increase the total installed capacity.

According to the Applicant, the proposed location for the De Aar 2 South WEF is adequately positioned for a Wind Energy Facility, due to the following attributes:

- Excellent consistent wind resource;
- Eskom substation positioned close to the WEF, with minimal distance required for the transmission lines to be built;
- Most accessible positions have been chosen, with the least impact on the environment and construction costs; and
- The Wind Energy Facility is located in a central position in the Northern Cape/ Eskom Grid, thereby being able to offset any electrical loses that occur due to transmitting electricity to the region.

Amendment/correction of typographical error:

It is apparent that the Draft EIA Report for the project included the sentence "*A permanent hard standing made of compacted gravel and approximately 20 50 m x 40 m would be constructed adjacent to each turbine location for the crane*". The typographical error was corrected in the Final EIA Report (April 2012), which indicated that the number "20" must be deleted from the sentence. This was indicated using a strikethrough in the Final EIA Report. The sentence in the Final EIA Report was therefore as follows: "*A permanent hard standing made of compacted gravel and approximately ~~20~~ 50 m x 40 m would be constructed adjacent to each turbine location for the* crane". It is imperative that the correct project description is included in the Environmental Authorisation and that the editorial error be corrected, given that more than 20 hard standing areas would be required, as there would be a hard standing area adjacent to each turbine (as indicated in the remainder of the description).

4.4. Should the amendment being requested result due to 4.1 (b) above, you are requested to furnish the Department with a written undertaking that the new holder of the environmental authorisation is willing and able to assume responsibility of the environmental authorisation issued. Provide a short motivation and explanation below:

Not Applicable

5. ENVIRONMENTAL IMPACTS

5.1. Describe any negative environmental impacts that may occur if the application for amendment is granted, amongst others information on any increases in air emissions, waste generation, discharges to water and impacts of the natural or cultural environment must be included.

Amendment of Environmental Authorisation (amendment of project description):

The potential negative environmental impacts that may occur if the application for amendment is granted, and that were assessed as part of the original EIA for the project include the following:

- Impact on ecology
- Impact on avifauna
- Impact on bats
- Impact on freshwater resources
- Impact on heritage resources
- Palaeontology Assessment
- Visual Impact
- Impact on noise
- Impact on agricultural land

The proposed amendment of the project description, as outlined in Section 4.2 above, may have implications in terms of the abovementioned environmental impacts. Accordingly, each of the specialists that undertook specialist studies for the original EIA for the proposed De Aar 2 South WEF in 2012, will be requested to undertake a re-assessment of the abovementioned potential impacts (within their area of expertise), to determine the implications of the proposed amendments in terms of potential environmental impacts. The results of the updated specialist studies will be summarised and included in a report on the Application for Amendment of the Environmental Authorisation (which will be referred to as an Environmental Assessment Report) (as per Regulation 32 (a)(i) of GN R 982), which will be made available to I&APs for a 30 day comment period. Note: should the proposed amendment of the project description result in updates to the mitigation measures put forward by the specialists, the EMP would be amended accordingly in due course, when it is submitted to DEA for final approval, as required in terms of Conditions of Authorisation 15 and 16 of the EA.

Amendment/correction of typographical error:

No negative environmental impacts will occur if the typographical error is amended.

5.2. Describe any negative environmental impacts that may occur if the application for amendment is **not** granted.

Amendment of Environmental Authorisation (amendment of project description):

Not authorising the proposed amendment, which includes a reduction in the number of turbines at the WEF whilst increasing the generating size of the WTG's (in order to align to current international WTG models), would result in a greater environmental footprint of the proposed facility. While this has already been authorised by DEA, the opportunity to reduce the footprint and therefore minimise associated negative impacts (e.g. ecological impacts) would be lost if the amendment is not granted.

Further information regarding potential negative environmental impacts that may occur if the application for amendment is not granted will be apparent once the updated specialists studies have been completed. The updated specialist studies will be summarised and included in an Environmental Assessment Report for the proposed amendment application, which will be made available to I&APs for a 30 day comment period, before being submitted to your Department for decision making.

Amendment/correction of typographical error: No negative environmental impacts will occur if the typographical error is not amended. However, the EA would contain an erroneous and contradictory description of the permanent hard standings required, as it would limit the number of hard standings to "20", whilst indicating that a hard standing would be constructed adjacent to each turbine (103 were authorised in the EA).

5.3. Describe any positive environmental impacts that may occur if the application for amendment is granted, amongst others information on any reduction in the ecological footprint, air emissions, waste generation and discharges to water must be included.
Amendment of Environmental Authorisation (amendment of project description): Should the requested amendment be granted then the project can be prepared for a Bid submission to the IPP Procurement Programme. If the project is awarded Preferred Bidder Status, then all anticipated positive impacts identified in the environmental assessment, such as job creation, increased expenditure in South Africa, both to procure services (e.g. transportation services) and materials (e.g. road building materials), and increased supply in electricity, would be realised. Additional positive impacts may result from the reduced environmental footprint of the WEF (given the proposed reduction in the number of turbines from the approved 103 to 61). Such positive impacts would likely entail a reduction in the significance of potential negative impacts associated with the authorised WEF, including for example, potential ecological impacts. These impacts will only be apparent once the updated specialist studies have been completed. The results of the updated specialist studies will be summarised and included in an Environmental Assessment Report for the proposed amendment application, which will be made available to I&APs for a 30 day comment period, and will thereafter be submitted to DEA for decision making.
Amendment/correction of typographical error: No positive environmental impacts will occur if the typographical error is not amended. However, the EA would then contain the correct associated infrastructure details.

6. AUTHORISATION FROM OTHER GOVERNMENT DEPARTMENTS

6.1. Are any permission, licenses or other authorisations required from any other departments before the requested amendments can be effected?	~~YES~~	**NO**

If yes, please complete the table below.

Name of department and contact person	Authorisation required	Authorisation applied for (Yes/ No)
Not Applicable		

7. RIGHTS OR INTERESTS OF OTHER PARTIES

In your opinion, will this proposed amendment adversely affect the rights and interests of other parties?	**YES**	~~NO~~
Please provide a detailed motivation of your opinion. The proposed amendment of the project description constitutes a "change of scope" where such change may result in an increased level or nature of impact where such level or nature of impact was not- (a) assessed and included in the initial application for environmental authorisation; or (b) taken into consideration in the initial environmental authorisation (refer to Regulation 31 of GN R. 982). In light of the above, a public participation process is required, as indicated in Regulation 32 of GN R 982.		

NOTE: The Department is entitled to request further information if it believes it is necessary for the consideration of the application. If the application is for a substantive amendment or if the rights or interests of other parties are likely to be adversely affected, the Department will instruct the applicant to conduct a public participation process and to conduct any investigations and assessments that it deems necessary.

8. DECLARATION:

I, Johnny Cullum, declare that I will comply with all my legal obligations in terms of this application and provide accurate information to everyone concerned in respect to this application.

Signature of the applicant:

Name of company or organisation: Langyuan Mudilo De Aar 2 South (Pty) Ltd

Date: 19/06/2015

APPENDIX 1
PROOF OF PAYMENT/ MOTIVATION FOR EXCLUSION

Absa Online: Notice of Payment

17 June 2015

Dear MULILO RENEWABLE PROJECT DEVELOPMENTS (PTY)

Subject: Notice Of Payment: Dept Environmental A

Please be advised that you made a payment to Dept Environmental A as indicated below.

Transaction number:	**8029976F22-13**
Payment date:	**20150617**
Payment made from:	**MRPD Cheque**
Payment made to:	**Dept Environmental A**
Beneficiary bank name:	**ABSA BANK**
Beneficiary account number:	**1044240072**
Bank branch code:	**632005**
For the amount of:	**2,000.00**
Immediate interbank payment :	N
Reference on beneficiary statement:	**12/12/20/2463/1**
Additional comments by payer:	**-**

Please remember that the following apply to Absa Online payments to non-ABSA bank accounts.

- Payments made on weekdays before 15:30 will be credited to the receiving bank account by midnight of the same day.
- Payments made on weekdays after 15:30 will be credited by midnight of the following day.
- Payments made on a Saturday, Sunday or Public holiday will be credited to the account by midnight of the 1st following weekday.

If you need more information or assistance, please call us on 08600 08600 or +27 11 501 5110 (International calls).

If you have made an incorrect internet banking payment, please send an email to digital@absa.co.za

Yours sincerely

General Manager: Digital Channels

APPENDIX 2
CERTIFIED COPY OF ENVIRONMENTAL AUTHORISATION

APPENDIX 3
PROPERTY AND LANDOWNER DETAILS
(including: Landowner details; Letters of Notification to Landowners & Proof of Notification)

AFFECTED LANDOWNERS		
Farm 1	Name	Slingers Hoek The Remainder of Portion 2 of the Farm Slingers Hoek, Farm Number 2, in the Renosterberg Municipality, Division of Hanover, Province of the Northern Cape
	Number	2
	Portion	2 (remaining extent)
	Hectares	1412.3838
	Title deed number	T57794/1999
	District	Renosterberg Municipality, Division of Hanover
	Nearest town	Philipstown
	Province	Northern Cape
	Land owner / contact	Marietha van der Merwe
	Postal Address	P O Box 345, De Aar, 7000
	Telephone	053 631 7168
Farm 2	Name	Slingers Hoek Remaining Extent of the Farm Slingers Hoek, Farm Number 2, in the Renosterberg Municipality, Division of Hanover, Province of the Northern Cape
	Number	2
	Portion	0 (remaining extent)
	Hectares	4219.1954
	Title deed number	T60004/1994
	District	Renosterberg Municipality, Division of Hanover
	Nearest town	Philipstown
	Province	Northern Cape
	Land owner / contact	Johan Hendrik Petrus van der Merwe
	Postal Address	Slingershoek, Posbus 53, De Aar, 7000
	Telephone	053 631 0504
Farm 3	Name	Slingers Hoek Portion 4 of the Farm Slingers Hoek, Farm Number 2, in the Renosterberg Municipality, Division of Hanover, Province of the Northern Cape
	Number	2
	Portion	4
	Hectares	56.5311
	Title deed number	T57794/1999
	District	Renosterberg Municipality, Division of Hanover
	Nearest town	Philipstown
	Province	Northern Cape
	Land owner / contact	Marietha van der Merwe
	Postal Address	P O Box 345, De Aar, 7000
	Telephone	053 631 7168
Farm 4	Name	Knapdaar Portion 1 of the Farm Knapdaar, Farm Number 8, in the Renosterberg Municipality, Division of Hanover, Province of the Northern Cape
	Number	8
	Portion	1
	Hectares	4617.5640
	Title deed number	T64553/1996
	District	Renosterberg Municipality, Division of Hanover
	Nearest town	Philipstown
	Province	Northern Cape

	Land owner / contact	Elsje Magdalena Vermeulen
	Postal Address	P O Box 429, De Aar, 7000
	Telephone	083 380 9913
Farm 5	Name	Maatjes Fountain Portion 5 of the Farm Maatjes Fountain, Farm Number 1, in the Renosterberg Municipality, Division of Hanover, Province of the Northern Cape
	Number	1
	Portion	5
	Hectares	504.7172
	Title deed number	T13665/1964
	District	Emthanjeni Municipality, Division of Hanover
	Nearest town	Philipstown
	Province	Northern Cape
	Land owner / contact	Diepfontein Boedery Bk DP van den Heever
	Postal Address	P O Box 70, De Aar, 7000
	Telephone/ Email	vdh@vodamail.co.za
Farm 6	Name	Vendussie Kuil The Remainder of Portion 2 of the Farm Vendussie Kuil, Farm Number 165, in the Renosterberg Municipality, Division of Philipstown, Province of the Northern Cape
	Number	165
	Portion	2 (remaining extent)
	Hectares	434.3345
	Title deed number	T110355/2004
	District	Renosterberg Municipality, Division of Philipstown
	Nearest town	Philipstown
	Province	Northern Cape
	Land owner / contact	Diepfontein Boedery Bk DP van den Heever
	Postal Address	P O Box 70, De Aar, 7000
	Telephone/ Email	vdh@vodamail.co.za
Farm 7	Name	Vendussie Kuil Remaining Extent of the Farm Vendussie Kuil, Farm Number 165, in the Renosterberg Municipality, Division of Philipstown, Province of the Northern Cape
	Number	165
	Portion	0 (remaining extent)
	Hectares	752.9016
	Title deed number	T54369/2012
	District	Renosterberg Municipality, Division of Philipstown
	Nearest town	Philipstown
	Province	Northern Cape
	Land owner / contact	Petrus Johannes Venter
	Postal Address	Kranskop, Posbus 78, Philpstown, 8795
	Telephone/ Email	kranskopboerdery@gmail.com
Farm 8	Name	Vendussie Kuil Portion 11 of the Farm Vendussie Kuil, Farm Number 165, in the Renosterberg Municipality, Division of Philipstown, Province of the Northern Cape
	Number	165
	Portion	11
	Hectares	782.8702

	Title deed number	T54369/2012
	District	Renosterberg Municipality, Division of Philipstown
	Nearest town	Philipstown
	Province	Northern Cape
	Land owner / contact	Petrus Johannes Venter
	Postal Address	Kranskop, Posbus 78, Philpstown, 8795
	Telephone/ Email	kranskopboerdery@gmail.com

Holland & Associates
Environmental Consultants
Impact Assessments - Environmental Management Programs - Compliance Monitoring - Process Review

22 June 2015

Dear Interested and/or Affected Party

PROPOSED APPLICATION FOR AMENDMENT OF THE ENVIRONMENTAL AUTHORISATION FOR THE PROPOSED WIND ENERGY FACILITY SITUATED ON THE EASTERN PLATEAU (SOUTH) NEAR DE AAR, NORTHERN CAPE PROVINCE (DEA REF NO.: 12/12/20/2463/1)

Notification of Application for Amendment of the Environmental Authorisation

The purpose of this letter is to inform all affected landowners that Longyuan Mulilo De Aar 2 South (Pty) Ltd (hereafter referred to as the Applicant) is applying for an amendment of the Environmental Authorisation in terms of the National Environmental Management Act (No. 107 of 1998) (NEMA) and Environmental Impact Assessment (EIA) Regulations (2014) for the proposed De Aar 2 South wind energy facility (WEF) near De Aar in the Northern Cape Province. Refer to Appendix 1 for the properties on which the proposed WEF would be located.

A brief background to the proposed project as well as a summary of the Application for Amendment of the Environmental Authorisation and associated public participation process is included herewith for your information.

1. Background

Mulilo Renewable Energy (Pty) Ltd[1] applied for Environmental Authorisation[2] from the Department of Environmental Affairs (DEA) in 2011 to establish a Wind Energy Facility (WEF) and associated infrastructure on the eastern plateau of De Aar (approximately 20 km to the east of the town) (referred to herein as the "De Aar 2 South WEF"). The proposed development site is approximately 12,832ha in extent and consists of 8 portions of 4 farms. The original proposed WEF comprised approximately 103 turbines, each with a generation capacity of 1.5 - 2.5MW. (Note that the potential generation capacity of the WEF has subsequently been limited to 140MW in accordance with the Department of Energy's cap on maximum megawatts, although 258MW was authorised).

[1] Now known as Mulilo Renewable Project Developments
[2] The Application for Environmental Authorisation entailed undertaking an Environmental Impact Assessment (EIA) process in terms of the NEMA (No.107 of 1998) EIA Regulations (2010)

The EIA process for the proposed project was completed by Aurecon South Africa (Pty) Ltd in 2012 and Environmental Authorisation for the proposed project was granted by DEA on 1 March 2013. The infrastructure associated with the WEF, as described and authorised in the DEA Environmental Authorisation dated 1 March 2013, includes the following:

- *"The construction of approximately 103 wind turbines with a potential capacity of 155 - 258 MW.*
- *A permanent hard standing made of compacted gravel and approximately 20[3] 50 m x 40 m would be constructed adjacent to each turbine location for the crane.*
- *A total of three construction laydowns in the south would be required with each having a footprint of approximately 200 x400m.*
- *Gravel surface access roads of approximately 4m wide would also be required between each turbine.*
- *Cables connecting each turbine would interconnect with overhead transmission lines that will follow the route of the access roads. Each turbine would have a transformer that steps up the voltage from 690 Volt to 22kilovolt (kV). This transformer is housed within each turbine tower or immediately outside the turbine.*
- *The cabling between the turbines would traverse the site to the three substations, where the power from all the turbines would be metered.*
- *The proposed substations and associated control buildings would have a footprint of approximately 200 x 100m.*
- *The electricity distribution infrastructure comprises of three existing distribution lines (1 x 132kV, 2 x 400kV and 2 x 220kV) traversing the site. The transmission lines terminate at Eskom's Hydra Substation located 9.5km to the north east of De Aar".*

An Application for Amendment of the EA was submitted by the Applicant to DEA in May 2013 to change the Special Purpose Vehicle (SPV) name from "Mulilo Renewable Energy (Pty) Ltd" to "Longyuan Mulilo De Aar 2 South (Pty) Ltd". This amendment of the EA was granted by DEA on 21 May 2013. On the 10 July 2014, the Applicant submitted a second Application for Amendment of the Environmental Authorisation to DEA for the following amendments: Amendment to extend the validity period; amendment to the property descriptions of the EA; and amendments to Conditions 43, 44 and 45. The amendment of the EA was granted by DEA on 14 August 2014.

The Applicant now proposes to amend the project description of the proposed WEF as outlined in Section 2 below. The proposed amendments will require re-assessment of the potential impacts associated with the proposed project, as required in terms of the National Environmental Management Act (No. 107 of 1998) Environmental Impact Assessment (EIA) Regulations (2014).

Holland & Associates Environmental Consultants has been appointed by the Applicant to undertake the requisite Application for Amendment of the Environmental Authorisation for the proposed project, in accordance with the National Environmental Management Act (NEMA) (No. 107 of 1998) EIA Regulations (2014).

2. Application for Amendment of the Environmental Authorisation

2.1 Description of proposed amendments to project description

As onshore wind energy facilities (WEF) receive continued support worldwide from governments and energy regulators, technological improvements are being seen on a constant basis. In order to ensure that a wind energy facility has the smallest possible footprint per total installed capacity, the

[3] Refer to Section 2.2. below regarding the proposed amendment of this typographical error in the EA

wind turbine generators (WTG) are evolving in higher yielding and more efficient generating units. As the engineering loads and fatigues are better understood on the units, it allows the designers and engineers to design the most optimal and highest yielding WTGs for the specific terrain and climatic conditions.

The De Aar 2 South WEF wishes to increase the generating size of the WTG in order to align to current international WTG models while reducing the number of WTG's on the WEF. The following changes to the WTG parameters are proposed:

- Increasing hub heights from 100 m to 120m
- Increasing blade lengths from 60 m to 80m
- Increasing WTG generation size from 2.3MW to 4.0MW

Note: The generation capacity of the WEF would be a maximum of 140MW (in accordance with the Department of Energy's cap on maximum megawatts).

Component	Approved	Proposed amendment
Number of turbines	103	61 Turbines @ 2.3MW per turbine (to 30 Turbines @ 4MW per turbine). The maximum of 61 will be applied for.
Generation capacity per turbine	1.5 - 2.5MW	2.3MW – 4.0MW
Generation capacity of the WEF	155 - 258MW	140 MW
Rotor / blade diameters	120m	(min) 100m (max) 160m
Hub height	100m	(min) 90m (max) 120m
Construction Hardstand Pad	"20" 40m x 50m (adjacent to each turbine) (Note: it is apparent that the "20" is a typographical error in the EA. Refer to Section 2.2 below in this regard).	40m x 50m (adjacent to each turbine)
Permanent affected area (foundation size)	16 x 16m and 2 m deep	18,4m diameter, that narrows up to 10,6m at the surface (the visible portion) once the foundation is completed. Depth : 3,5m

(Note: The Application for amendment of the EA will assess the "worst case scenario" of 61 turbines @ 2.3MW per turbine with the understanding that should the Applicant use 4MW turbines (which will be the same dimensions as the 2.3MW turbines) then the Applicant would reduce the number of turbines to 30. The maximum turbine dimensions will be assessed and applied for. It is furthermore noted that the generation capacity of the WEF is limited to 140MW. Even though 61 turbines of 2.3MW = 145MW, the Applicant will be limited to 140MW).

These changes would result in an increase of the turbine tower-base diameter from 15m to 20m and the construction pad would remain 40m x 50m.

It must be understood that these are the upper limits of possible future WTG sizing, and if the De Aar 2 South WEF is to be constructed in the next few years, the actual WTG sizing will be in the middle range. The general benefits of using larger sized turbines, compared to older generation turbines are:

- Improved grid code compliance and voltage regulation, providing a more secured energy supply;
- Improved warranted power and noise curves;
- Decrease in WTG load fatigue, maintenance costs and downtime;
- Decrease in the road area coverage per installed capacity;
- More efficiently yielding the wind energy resource, and reducing the need for further WEF development to increase the total installed capacity (Mulilo Renewable Project Developments, May 2015)

The proposed location for the De Aar 2 South WEF is adequately positioned for a Wind Energy Facility, due to the following attributes:

- Excellent consistent wind resource;
- Eskom substation positioned close to the WEF, with minimal distance required for the transmission lines to be built;
- Most accessible positions have been chosen, with the least impact on the environment and construction costs; and
- The Wind Energy Facility is located in a central position in the Northern Cape/ Eskom Grid, thereby being able to offset any electrical loses that occur due to transmitting electricity to the region (Mulilo Renewable Project Developments, May 2015)

Refinements to the WEF layout are also proposed. Refer to Figure 1 for the updated layout. It should be noted that, as required in terms of Condition 13 of the EA, the Applicant will still submit a final layout plan for the entire wind energy facility for approval to the Department, prior to commencement of the activity.

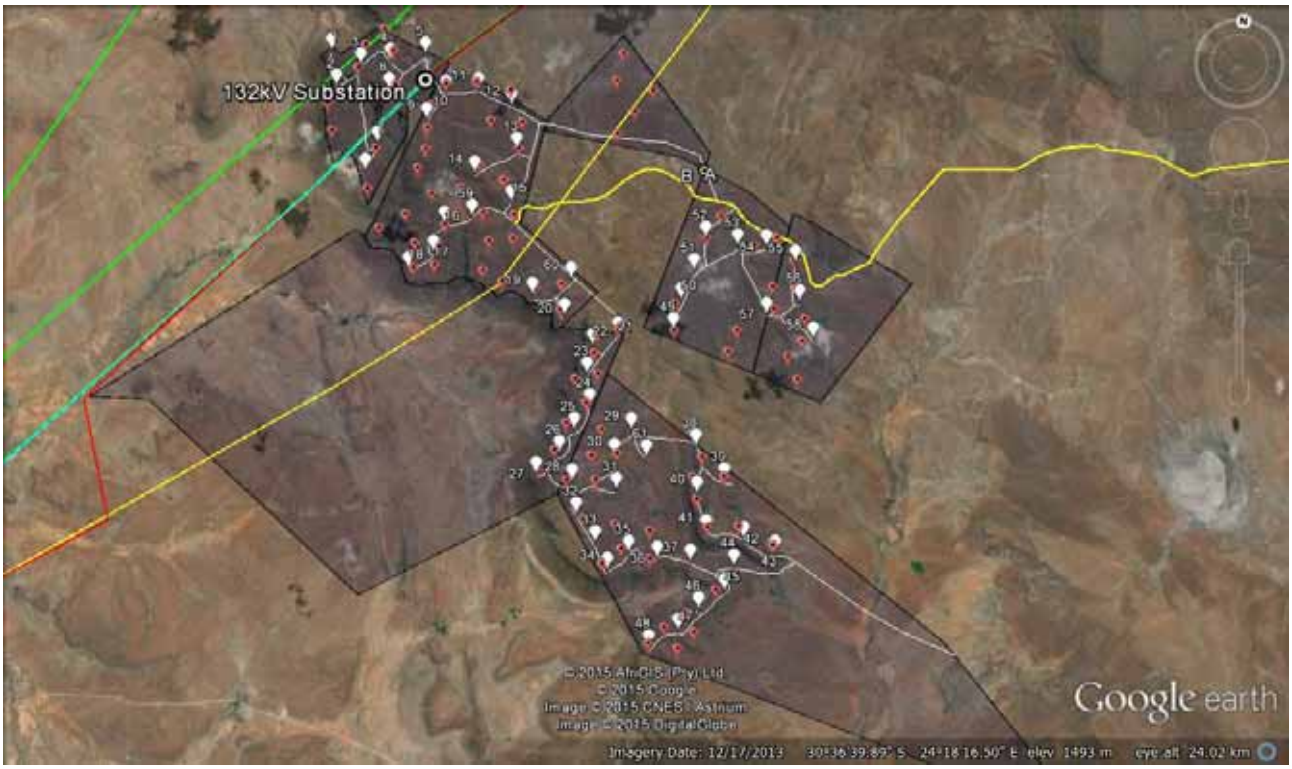


Figure 1: Proposed amended (preliminary) layout. Note: the red markers indicate the EA approved turbine positions and white markers indicate the new revised turbine positions

2.2 Amendment of Environmental Authorisation

The abovementioned proposed amendments to the project description of the project will require an amendment to the section of the Environmental Authorisation titled "*The infrastructure associated with this facility includes*", specifically page 5 of the EA, which currently describes the proposed project as:

> *"- the construction of approximately 103 turbines with a potential capacity of 155-258 MW".*

The proposed amendment of this sentence on page 5 of the EA is as follows:

> *"- the construction of approximately 61 turbines (with a generation capacity of 2.3MW per turbine) to 30 turbines (with a generation capacity of 4MW per turbine). The generation capacity of the WEF would be 140 MW".*

Correction of a typographical error in the description of associated infrastructure on page 5 of the EA:

There is a typographical error on page 5 of the Environmental Authorisation dated 1 March 2013 relating to one of the associated infrastructure descriptions. In particular, the EA refers to:

> *"A permanent hard standing made of compacted gravel and approximately 20 50 m x 40 m would be constructed adjacent to each turbine location for the crane ".*

The Applicant requests that the editorial error be corrected in the EA by removing the number "20", given that there would be a hard standing area adjacent to each turbine (as indicated in the remainder of the description), and therefore more than 20 hard standing areas would be required. It is therefore requested that the sentence be amended as follows:

> *"A permanent hard standing made of compacted gravel and approximately 50 m x 40 m would be constructed adjacent to each turbine location for the crane".*

3. Public Participation Process

A public participation process is being undertaken to ensure that registered I&APs (including affected landowners) are given an opportunity to comment on the proposed amendments to the Environmental Authorisation for the proposed wind energy facility. The public participation process includes the following:

- The Application for Amendment of the Environmental Authorisation and associated Environmental Assessment Report will be lodged for review and comment at the De Aar Public Library as well as on the Holland & Associates Environmental Consultants website (www.hollandandassociates.net) in July 2015.
- Registered I&APs will be notified in writing of the 30 day comment period in which to submit their comments or concerns on the application and associated assessment report, by means of letters sent by post, fax and/or e-mail.
- I&APs will have 30 days to submit their written comments on the Application for Amendment of the Environmental Authorisation to Holland & Associates Environmental Consultants.
- Comments submitted by I&APs will be collated and summarised in a Comments and

Response Report (CRR), which will summarise the issues raised and provide the Applicant's / project teams responses.

- Registered I&APs will be notified, in writing, of DEA's decision

4. Way Forward

The Application for Amendment of the Environmental Authorisation is scheduled to be submitted to DEA in the week of 22 June 2015. Thereafter, a report on the Application for Amendment of the Environmental Authorisation (which will be referred to as an Environmental Assessment Report), outlining the proposed amendments, motivation for the amendment and environmental impacts associated with the proposed amendments, will be lodged for a 30 day public comment period. All registered Interested and Affected Parties will be notified in due course of the availability of the Environmental Assessment Report for review and comment.

All comments received by I&APs will be responded to in a Comments and Response Report, and will be submitted to DEA for consideration together with the Environmental Assessment Report at the end of the 30 day I&AP comment period. DEA will then conclude their review and decision making process for the amendment application. Once DEA issues their decision on the proposed amendment application, all registered I&APs will be notified in writing of the outcome of DEA's decision.

Should you require any further information or have any queries please contact the undersigned.

Yours sincerely

BARRY WIESNER
E-Mail: barry@hollandandassociates.net; Mobile: 082 463 6221
For: Holland & Associates - Environmental Consultants

Holland & Associates
Environmental Consultants
Impact Assessments - Environmental Management Programs - Compliance Monitoring - Process Review

22 Junie 2015

Geagte Belanghebbende en/of Geaffekteerde Party

BEOOGDE AANSOEK VIR DIE WYSIGING VAN DIE OMGEWINGSMAGTIGING UITGEREIK VIR DIE VOORGESTELDE WINDENERGIE-AANLEG OP DIE OOSTELIKE PLATO (SUID) NABY DE AAR, NOORD-KAAPPROVINSIE: KENNISGEWING VAN WYSIGING VAN OMGEWINGSMAGTIGING (DOS VERWYSINGSNOMMER: 12/12/20/2463/1)

Kennisgewing van 'n Aansoek vir die Wysiging van die Omgewingsmagtiging

Die doel van hierdie brief is om alle geaffekteerde grondeienaars in kennis te stel dat Longyuan Mulilo De Aar 2 South (Edms) Bpk (hierna die Applikant genoem) aansoek doen vir 'n wysiging van die Omgewingsmagtiging (OM) wat kragtens die Wet op Nasionale Omgewingsbestuur (Nr. 107 van 1998) (NEMA) en die Regulasies (2014) vir Omgewingsinvloedbepalings (OIB) uitgereik is vir die voorgestelde De Aar 2 South windenergie-aanleg (WEA) naby De Aar in die Noord-Kaapprovinsie. Verwys na Bylae 1 vir die lys van eiendomme waarop die voorgestelde WEA-aanleg opgerig sal word.

Vir u inligting word 'n kort agtergrond tot die voorgestelde projek hierby ingesluit, asook 'n opsomming van die Aansoek vir die Wysiging van die Omgewingsmagtiging en die gepaardgaande proses van openbare deelname.

1. Agtergrond

Mulilo Renewable Energy (Edms) Bpk[1] het in 2011 by die Departement van Omgewingsake (DOS) aansoek gedoen vir 'n Omgewingsmagtiging[2] om 'n Windenergie-aanleg (WEA) en gepaardgaande infrastruktuur op die oostelike plato by De Aar (ongeveer 20 km oos van die dorp) op te rig (word hierna die "De Aar 2 South WEA" genoem). Die beoogde terrein vir die ontwikkeling is ongeveer 12,832ha groot en bestaan uit 8 gedeeltes van 4 plase. Die oorspronklike voorgestelde WEA sou bestaan het uit ongeveer 103 turbines, elk met 'n opwekkingskapasiteit van 1.5 - 2.5MW. (Neem kennis dat die moontlike opwekkingskapasiteit van die WEA intussen beperk is tot 140MW – in ooreenstemming met die Departement van Energie se boperk op die maksimum megawatt, alhoewel 258MW gemagtig was).

[1] Staan nou bekend as Mulilo Renewable Project Developments
[2] Die Aansoek vir 'n Omgewingsmagtiging behels die uitvoer van 'n Omgewingsinvloedbepalingsproses (OIB) kragtens die NEMA (Nr 107 van 1998) se OIB-regulasies (2010)

Die OIB-proses vir die voorgestelde projek is in 2012 deur Aurecon South Africa (Edms) Bpk voltooi en ‘n Omgewingsmagtiging vir die voorgestelde projek is op 1 Maart 2013 deur die DOS uitgereik. Die volgende infrastruktuur hou onder andere verband met die WEA, soos beskryf en gemagtig deur die DOS se Omgewingsmagtiging wat op 1 Maart 2013 uitgereik is:

- *“Die oprigtingting van ongeveer 103 windturbines met ‘n moontlike kapasiteit van 155 - 258 MW.*
- *‘n Permanente harde blad bestaande uit gekompakteerde gruis, ongeveer 20[3] 50 m x 40 m, sal langs elke turbine aangebring word om ‘n hyskraan te huisves.*
- *‘n Totaal van drie konstruksie-oppervlaktes, elk ongeveer 200m x 400m groot, wat aan die suidekant aangebring sal word.*
- *Gruispaaie, ongeveer 4m breed, wat tussen elke turbine nodig is.*
- *Kabels wat turbines met mekaar verbind sal by die oorhoofse transmissielyne aansluit. Hierdie lyne sal dieselfde roete as die toegangspaaie volg. Elke turbine sal toegerus wees met ‘n transformator wat die stroomspanning van 690 Volt na 22kilovolt (kV) sal opstoot. Hierdie transformator word binne die turbine-toring, of direk daarbuite, geplaas.*
- *Die kabels tussen die turbines sal op terrein na drie substasies geneem word waar die hoeveelheid elektrisiteit vanaf elke turbine gemeter sal word.*
- *Die voorgestelde substasies en verwante kontrolegeboue sal ‘n voetspoor van ongeveer 200 x 100m hê.*
- *Die infrastruktuur wat met die verspreiding van elektrisiteit verband hou sal bestaan uit drie bestaande distribusielyne (1 x 132kV, 2 x 400kV en 2 x 220kV) wat oor die terrein loop. Die transmissielyne eindig by Eskom se Hydra Substasie, ongeveer 9.5km noord-oos van De Aar”.*

‘n Aansoek vir die Wysiging van die OM om die naam van die houer van die Omgewingsmagtiging (OM) van “Mulilo Renewable Energy (Edms) Bpk" na "Longyuan Mulilo De Aar 2 South (Edms) Bpk" te verander is in Mei 2013 ingedien. Die wysiging van die OM is op 21 Mei 2013 deur die DOS goedgekeur. Die Applikant het op 10 Julie 2014 ‘n tweede Aansoek vir die Wysiging van die Omgewingsmagtiging by die DOS ingedien, en wel vir die volgende wysigings: Wysiging van die geldigheidstydperk; wysiging aan die eiendomsbeskrywings in die OM; en wysigings aan Voorwaardes 43, 44 en 45. Hierdie wysigings aan die OM is op 14 Augustus 2014 deur die DOS toegestaan.

Die Applikant doen nou aansoek om die projekbeskrywing van die voorgestelde WEA te wysig soos in Afdeling 2 hieronder uiteengesit. Die voorgestelde wysigings beteken dat die moontlike impakte van die voorgestelde projek herbepaal sal moet word, soos vereis kragtens die Wet op Nasionale Omgewingsbestuur (Nr 107 van 1998) se (2014) Regulasies vir Omgewings-invloedbepalings (OIB).

Holland & Associates Omgewingskonsultante is deur die Applikant aangestel om die nodige Aansoek vir die Wysiging van die Omgewingsmagtiging vir die voorgestelde projek te hanteer in ooreenstemming met die Wet op Nasionale Omgewingsbestuur (NEMA) (Nr. 107 van 1998) se OIB-regulasies (2014).

2. Aansoek vir die Wysiging van die Omgewingsmagtiging

2.1 Beskrywing van voorgestelde wysigings aan die projekbeskrywing

Aangesien landgebaseerde windenergie-aanlegte (WEA) wêreldwyd deur regerings en energiereguleerders ondersteun word, verbeter die tegnologie daarvan ook deurlopend. Om die

[3] Verwys na Afdeling 2.2 hieronder wat die voorgestelde wysiging van hierdie tipografiese fout in die OM betref

kleinste moontlike voetspoor per totale geïnstalleerde kapasiteit van ‘n windenergie-aanleg te verseker, word windturbine-generators (WTG) verbeter tot eenhede wat meer energie op ‘n meer doeltreffende wyse opwek. Soos wat die ingenieursverwante dravermoë en materiaalverswakking van eenhede beter verstaan word, is ontwerpers en ingenieurs in staat om meer doeltreffende WTGs met ‘n beter optimale lewering vir ‘n spesifieke terrein en klimaatstoestande te ontwerp.

Die De Aar 2 South WEA doen aansoek om om die kragopwekkingsvermoë van die WTGs te verhoog deur dit in lyn te bring met huidige internasionale WTG-modelle en terselfdertyd die aantal turbines van die WEA te verminder. Daar word voorgestel dat die volgende veranderings aan die WTGs aangebring word:

- Verhoog die naafhoogte van 100 m tot 120 m
- Verleng die deursnit van die draaivlerke van 60 m tot 80 m
- Vermeerder die WTG se kragopwekkingsgrootte van 2.3MW tot 4.0MW

Neem kennis: Die opwekkingskapasiteit van die WEA sal maksimum 140MW beloop (in ooreenstemming met die Departement van Energie se boperk op die maksimum megawatt).

Komponent	**Goedgekeur**	**Voorgestelde wysiging**
Aantal turbines	103	61 Turbines @ 2.3MW per turbine (of 30 turbines @ 4MW per turbine). Daar sal aansoek gedoen word vir die maksimum van 61 turbines.
Kragopwekkingskapasiteit per turbine	1.5 - 2.5MW	2.3MW – 4.0MW
Kragopwekkingskapasiteit van die WEA	155 - 258MW	140 MW
Deursnit van draaivlerke	120m	(min) 100m (max) 160m
Naafhoogte	100m	(min) 90m (max) 120m
Harde-oppevlakte konstruksieblad	“20” 40m x 50m (langs elke turbine) (Neem kennis: Dit is duidelik dat die “20” ‘n tipografiese fout in die OM is. Verwys na Afdeling 2.2 hieronder in hierdie verband).	40 x 50m (langs elke turbine)
Permanente geaffekteerde gebied (grootte van fondasie)	16 x 16m en 2 m diep	18,4m deursnee, wat vernou na 10,6m by die oppervlakte (sigbare gedeelte) wanneer fondasie voltooi is. Diepte : 3,5m

(Nota: Die Aansoek vir die Wysiging van die OM sal ondersoek instel na die mees nadelige (“worst case”) scenario van 61 turbines @ 2.3MW per turbine met die verstandhouding dat indien die Applikant van 4MW turbines gebruik maak (met dieselfde afmetings as die 2.3MW turbines), die Applikant dan die aantal turbines na 30 sal verminder). Daar sal vir die maksimum turbine-afmetings aansoek gedoen word; en dus beoordeel word. Daar moet verder kennis geneem word dat die opwekkingskapasiteit van die WEA tot 140MW beperk is. Alhoewel 61 turbines van 2.3MW = 145MW, sal die Applikant tot 140MW beperk word).

Hierdie veranderings beteken dat die basisdeursnit van die turbines van 15m tot 20m sal toeneem, maar die harde-oppervlakte konstruksieblad sal 40 x 50m bly.

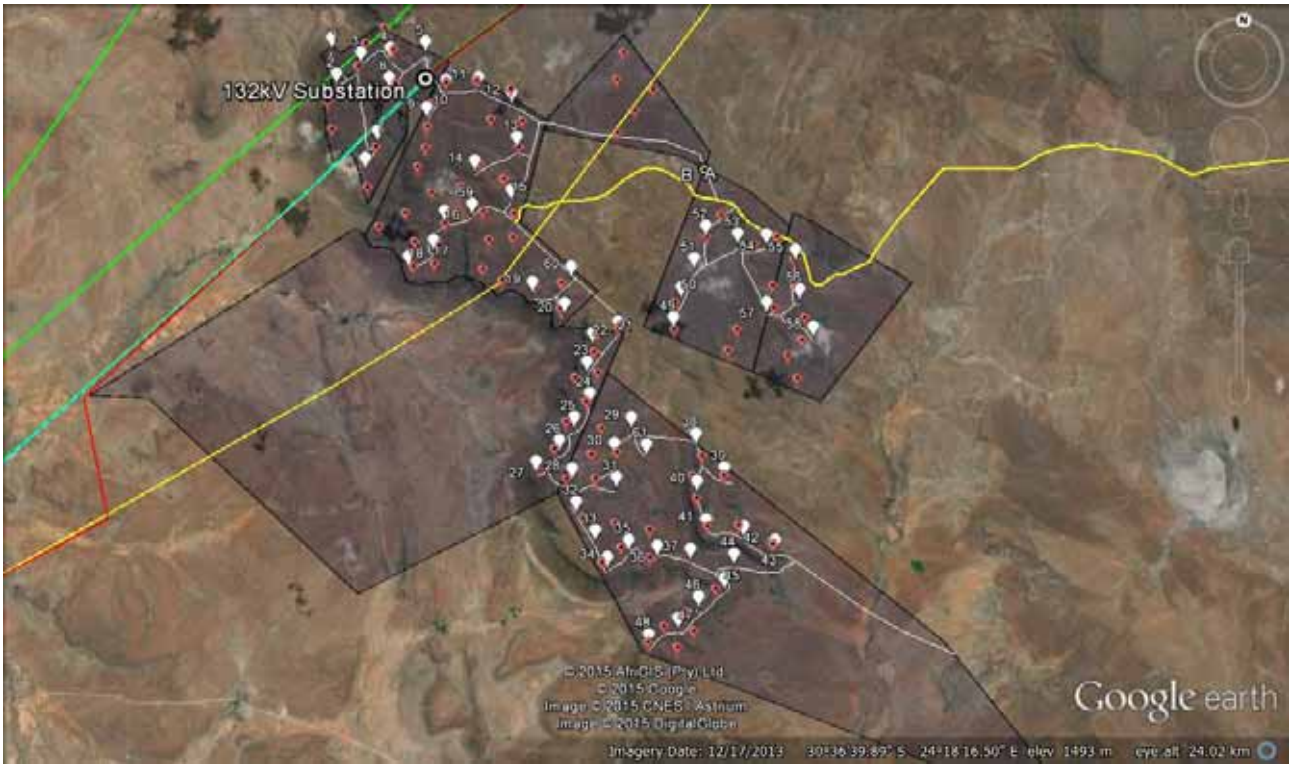
Daar moet kennis geneem word dat hierdie die boonste perk vir die grootte van moontlike toekomstige WTGs is. Indien die De Aar 2 South WEA in die volgende paar jaar opgerig word, behoort die werklike WTG-grootte in die middelorde te wees. Die algemene voordele van die groter turbines teenoor die ouer-generasie turbines is:

- Beter nakoming van netwerkkode en spanningsbeheer, wat ‘n meer versekerde lewering van energie bewerkstellig;
- Verbeterde gewaarborgde elektrisiteit en geraaskurwes;
- Afname in WTG ladingsuitputting, onderhoudskostes en dooie tyd;
- Afname in padoppervlakte per geïnstalleerde kapasiteit;
- Meer doeltreffende lewering van windenergie, en ‘n afname in die behoefte aan verdere WEA-ontwikkeling om die totale geïnstalleerde kapasiteit te verhoog. (Mulilo Renewable Project Developments, Mei 2015.)

Die voorgestelde plasing van die De Aar 2 South WEA is op grond van onderstaande eienskappe geskik vir ‘n Windenergie-aanleg:

- Uitstekende volgehoue bron van wind;
- Eskom-substasie naby die WEA, met ‘n minimale afstand vir transmissielyne wat opgerig moet word;
- Mees toeganklike posisies is gekies, met die minste impak op die omgewing en konstruksiekostes;
- Die windenergie-aanleg is geleë in ‘n sentrale deel van die Noord-Kaap/ Eskomnetwerk, wat dien as kompensasie vir enige elektrisiteitsverliese a.g.v. die transmissie van elektrisiteit na die streek (Mulilo Renewable Project Developments, Mei 2015)

Daar word ook beoog om die uitleg van die WEA te verfyn. Verwys na Figuur 1 vir die opgedateerde uitleg. Neem kennis dat, soos vereis ingevolge Voorwaarde 13 van die OM, die Applikant ‘n finale uitlegplan vir die hele windenergie-aanleg by die Departement vir goedkeuring moet indien voordat enige werksaamhede kan begin.



Figuur 1: (Voorlopige) voorgestelde gewysigde uitleg. Neem kennis: die rooi merke dui die posisies aan van die turbines wat in die OM goedgekeur is, en die wit merkers dui die hersiene posisies van die nuwe turbines aan.

2.2 Wysiging van die Omgewingsmagtiging

Bogenoemde voorgestelde veranderings aan die projekbeskrywing verg ‘n wysiging aan die afdeling van die Omgewingsmagtiging getiteld “*Die infrastruktuur wat verband hou met die aanleg sluit in*”, en spesifiek bladsy 5 van die OM, waarin die voorgestelde projek tans as volg beskryf word:

> *“- die oprigting van ongeveer 103 turbines met ‘n moontlike opwekkingskapasiteit van 155-258 MW”.*

Die voorgestelde wysiging van hierdie sin op bladsy 5 van die OM lees as volg:

> *“-die oprigting van ongeveer 61 turbines (met ‘n opwekkingskapasiteit van 2.3MW per turbine) tot 30 turbines (met ‘n opwekkingskapasiteit van 4MW per turbine). Die opwekkingskapasiteit van die WEA sal 140 MW wees”.*

Regstelling van ‘n tipografiese fout in die beskrywing van ‘n verwante infrastruktuur op bladsy 5 van die OM:

Daar is ‘n tipografiese fout op bladsy 5 van die Omgewingsmagtiging gedateer 1 Maart 2013 wat verband hou met die beskrywing een van die infrastruktuur-aspekte, spesifiek waar die OM verwys na:

> *"‘n Permanente harde blad bestaande uit gekompakteerde gruis, ongeveer 20 50 m x 40 m sal langs elke turbine aangebring word om ‘n hyskraan te huisves”.*

Die applikant versoek dat hierdie tipografiese fout in die OM reggestel word deur die syfer “20” weg te laat, siende dat ‘n harde oppervlak langs elke turbine aangebring sal word (soos in die res van die beskrywing aangedui) en meer as 20 oppervlaktes nodig sal wees. Daar word dus versoek dat die sin as volg verander word:

> *"‘n Permanente harde blad bestaande uit gekompakteerde gruis, ongeveer 50 m x 40 m sal langs elke turbine aangebring word om ‘n hyskraan te huisves”.*

3. Proses van Openbare Deelname

‘n Proses van Openbare Deelname word onderneem om te verseker dat alle geregistreerde B&GPe (wat grondeienaars insluit) geleentheid het om kommentaar te lewer op die voorgestelde wysigings aan die Omgewingsmagtiging vir die voorgestelde windenergie-aanleg. Die proses van openbare deelname sluit die volgende in:

- Die Aansoek vir die Wysiging van die Omgewingsmagtiging en gepaardgaande Omgewingsbeoordelingsverslag sal in Julie 2015 vir oorsig en kommentaar beskikbaar gestel word by die De Aar Openbare Biblioteek, asook op die webblad van Holland & Associates Environmental Consultants, (www.hollandandassociates.net).
- Geregistreerde B&GPe sal skriftelik in kennis gestel word van die 30-dag kommentaartydperk waarbinne hulle hul kommentaar op die aansoek en gepaardgaande beoordelingsverslag per brief kan indien; hetsy per pos, faks of epos.
- B&GPe sal vir 30 die geleentheid hê om hulle skriftelike kommentaar op die Aansoek vir die Wysiging van die Omgewingsmagtiging by Holland & Associates Environmental Consultants in te dien.

- Kommentaar deur B&GPe sal bymekaargesit en in ‘n Kommentaar- en Antwoordverslag (K&AV) opgesom word. Alle kommentaar, tesame met die Applikant/ Projekspan se antwoorde daarop sal in hierdie verslag opgesom word.
- Geregistreerde B&GPe sal skriftelik van die DOS se besluit in kennis gestel word.

4. Volgende Stappe

Die Aansoek vir die Wysiging van die Omgewingsmagtiging is geskeduleer om in die week 22 Junie 2015 by die DOS ingedien te word. Daarna sal ‘n verslag oor die Aansoek vir die Wysiging van die Omgewingsmagtiging (wat die Omgewingsbepalingsverslag genoem word) opgestel word waarin die voorgestelde wysigings, die motivering vir die wysigings en die omgewingsimpakte wat die wysigings tot gevolg het, vir ‘n 30-dag kommentaartydperk beskikbaar gestel sal word. Alle geregistreerde Belanghebbende en Geaffekteerde Partye sal betyds in kennis gestel word van die beskikbaarheid van die Omgewingsbepalingverslag vir oorsig en kommentaar.

Alle kommentaar deur B&GPe sal in ‘n Kommentaar- en Antwoordverslag vervat word, en sal na afloop van die 30-dag B&GP-kommentaartydperk tesame met die Omgewingsbepalingsverslag by die DOS vir oorweging ingedien word. Die DOS sal dan hulle oorsig- en besluitnemingsproses vir die gewysigde aansoek afsluit. Sodra die DOS hulle besluit oor die voorgestelde wysigingsaansoek uitgereik het, sal alle geregistreerde B&Pe skriftelik van die besluit in kennis gestel word.

Tree asseblief met die onderstaande in verbinding indien u enige verdere inligting verlang of navrae het.

Die uwe

BARRY WIESNER
E-pos: barry@hollandandassociates.net; Sel: 082 463 6221
Vir: Holland & Associates - Environmental Consultants

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De Aar 7000

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Addressed to/Geadresseer aan
Johan H P Vander [illegible]
Remaunde Farm
Slingershoek no2
Box 53
Postcode/Postkode [illegible]

Postage paid	R ___ c
Service fee/Diensgeld	R ___ c
Insurance/Versekering	R ___ c
Total/Totaal	R 22.90 c

Insured value of contents
Versekerde waarde van inhoud R ___ c

Enquiries/Navrae
Toll-free number
Tolvry nommer
0800 111 502

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REGISTERED LETTER
GEREGISTREERDE BRIEF — Post Office
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Full tracking and tracing/Volledige volg en spoor

Addressed to/Geadresseer aan
Petrus Johannes V[illegible]
Kranskop
Box 78
Philipstown
Postcode/Postkode [illegible]

Postage paid	R ___ c
Service fee/Diensgeld	R ___ c
Insurance/Versekering	R ___ c
Total/Totaal	R 22.90 c

Insured value of contents
Versekerde waarde van inhoud R ___ c

Enquiries/Navrae
Toll-free number
Tolvry nommer
0800 111 502

Initial of accepting officer / Paraaf van aaneem-beampte

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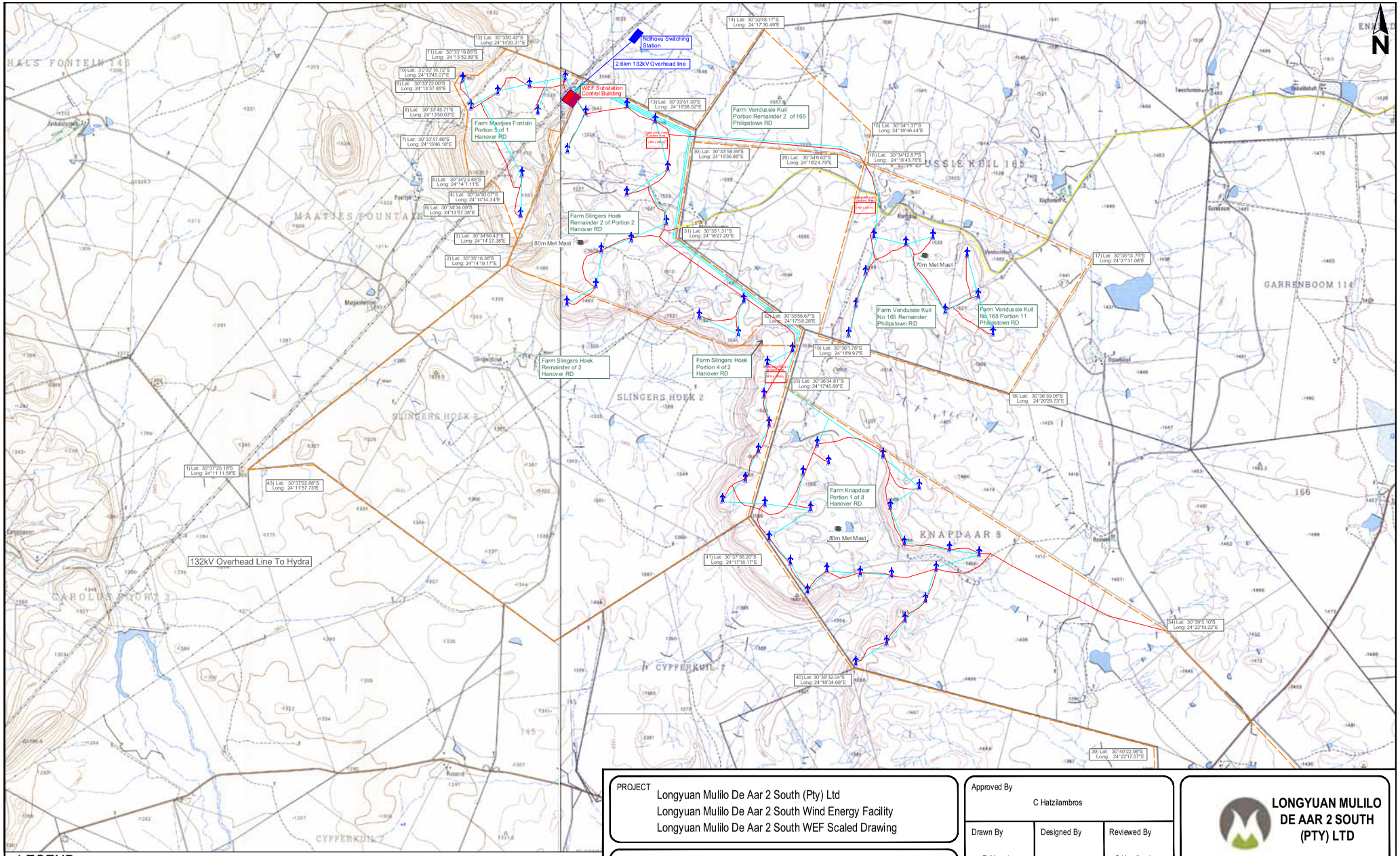
APPENDIX 4
REVISED LAYOUT



PROJECT
Longyuan Mulilo De Aar 2 South (Pty) Ltd
Longyuan Mulilo De Aar 2 South Wind Energy Facility
Longyuan Mulilo De Aar 2 South WEF Scaled Drawing

DETAIL
Site Map Indicating Turbine Positions, Access Roads, Distribution Network, Substation Details, Reference Masts, Site Boundaries and Property Descriptions for 61 Wind Turbine Generators

Approved By		
C Hatzilambros		
Drawn By	Designed By	Reviewed By
R Moseley		C Hatzilambros

Scale	Date
1 : 60 000	MAY 2015

LONGYUAN MULILO DE AAR 2 SOUTH (PTY) LTD

Project No.	Drg.No.	Rev.
DA2S	DA2S-03	0

APPENDIX C:

Specialists Studies
(Addendums to specialist reports, CVs and Specialist Declaration of Interests)

Appendix C1:
Addendum to Ecological Impact Assessment

ADDENDUM TO EIA REPORT:

Specialist ecological study on the potential impacts of the proposed Wind Energy Facility on the Eastern Plateau (South) near De Aar, Northern Cape

(DEA REF NO.: 12/12/20/2463/AM3)

Prepared by

Dr David Hoare
(Ph.D., Pr.Sci.Nat.)

David Hoare Consulting cc
41 Soetdoring Ave
Lynnwood Manor,
Pretoria

for

Holland & Associates Environmental Consultants
PO Box 31108
Tokai
7966

28 July 2015

REPORT VERSION: 3rd Draft

David Hoare Consulting cc
Biodiversity Assessments, Vegetation Description / Mapping, Species Surveys

DECLARATION OF INDEPENDENCE AND SUMMARY OF EXPERTISE

Appointment of specialist

David Hoare of David Hoare Consulting cc was commissioned by the applicant to provide specialist consulting services for an amendment to the Environmental Impact Assessment for the proposed De Aar Eastern Plateau South Wind Energy Facility near De Aar in the Northern Cape Province. The consulting services comprise an assessment of potential impacts on the flora, fauna, vegetation and ecology in the study area by the proposed amendments to the authorised project.

Details of specialist

Dr David Hoare
David Hoare Consulting cc
Postnet Suite no. 116
Private Bag X025
Lynnwood Ridge, 0040

Telephone: 012 804 2281
Cell: 083 284 5111
Fax: 086 550 2053
Email: dhoare@lantic.net

Summary of expertise

Dr David Hoare:

- Dr Hoare has majors in Botany and Zoology with distinction from Rhodes University, Grahamstown, an Honours Degree (with distinction) in Botany from Rhodes University, an MSc (cum laude) from the Department of Plant Science, University of Pretoria, and a PhD in Botany from the Nelson Mandela Metropolitan University, Port Elizabeth with a focus on grassland diversity.
- Registered professional member of The South African Council for Natural Scientific Professions (Ecological Science, Botanical Science), registration number 400221/05.
- Founded David Hoare Consulting cc, an independent consultancy, in 2001.
- Ecological consultant since 1995, with working experience in Gauteng, Mpumalanga, Limpopo, North West, Eastern Cape, Western Cape, Northern Cape and Free State Provinces, Tanzania, Kenya, Botswana, Mozambique and Swaziland.
- Conducted, or co-conducted, over 350 specialist ecological surveys as an ecological consultant. Areas of specialization include general ecology, biodiversity assessments, vegetation description and mapping, plant species surveys and remote sensing of vegetation. Has undertaken work in grassland, thicket, forest, savannah, fynbos, coastal vegetation, wetlands and nama-karoo vegetation, but has a specific specialization in grasslands and wetland vegetation.
- Published six technical scientific reports, 15 scientific conference presentations, seven book chapters and eight refereed scientific papers.
- Attended 15 national and international congresses & 5 expert workshops, lectured vegetation science / ecology at 2 universities and referee for 2 international journals.

Independence

David Hoare Consulting cc and its Directors have no connection with the applicant. David Hoare Consulting cc is not a subsidiary, legally or financially, of the proponent. Remuneration for services by the proponent in relation to this project is not linked to approval by decision-making authorities responsible for authorising this proposed project and the consultancy has no interest in secondary or downstream developments as a result of the authorisation of this project. David Hoare is an independent consultant to the applicant and has no business, financial, personal or other interest in the activity, application or appeal in respect of which he was appointed other than fair remuneration for work performed in connection with the activity, application or appeal. There are no circumstances that compromise the objectivity of this specialist performing such work.

Conditions relating to this report

The findings, results, observations, conclusions and recommendations given in this report are based on the author's best scientific and professional knowledge as well as available information. David Hoare Consulting cc and its staff reserve the right to modify aspects of the report including the recommendations if and when new information may become available from on-going research or further work in this field, or pertaining to this investigation.

This report must not be altered or added to without the prior written consent of the author. This also refers to electronic copies of this report which are supplied for the purposes of inclusion as part of other reports, including main reports. Similarly, any recommendations, statements or conclusions drawn from or based on this report must make reference to this report. If these form part of a main report relating to this investigation or report, this report must be included in its entirety as an appendix or separate section to the main report.

TABLE OF CONTENTS

INTRODUCTION

Terms of reference and approach

On 11 June 2015 David Hoare Consulting cc was appointed by Longyuan Mulilo De Aar 2 South (Pty) Ltd to undertake an update to the original ecological assessment of the study area. The specific terms of reference for the amendment study are as follows:

Compile an addendum to your specialist report addressing the following:

- A The implications of the proposed amendments in terms of the potential impacts(s);
- A re-assessment of the significance (before and after mitigation) of the identified impact(s) in light of the proposed amendments (as required in terms of the 2014 EIA Regulations), for the construction and operational phases, including consideration of the following:
    - Cumulative impacts;
    - The nature, significance and consequence of the impact;
    - The extent and duration of the impact;
    - The probability of the impact occurring;
    - The degree to which the impact can be reversed;
    - The degree to which the impact may cause irreplaceable loss of resources;
    - The degree to which the impact can be avoided, managed or mitigated;
- The addendum to your report must include an impact summary table outlining the findings of the re-assessment in terms of the abovementioned assessment criteria;
- A statement as to whether the proposed amendments will result in a change to the significance of the impact assessed in the original EIA for the proposed project (and if so, how the significance would change). The advantages and disadvantages associated with the proposed change;
- A detailed description of measures to ensure avoidance, management and mitigation of impacts associated with the proposed changes;
- The re-assessment must take into account and address public comments received during the Public Participation Process (PPP) relating to your area of expertise.

This report provides details of the results of the amendment assessment. The findings of the assessment are based on information collected during the original EIA study, including detailed field assessment of the site and surrounding areas.

METHODOLOGY

This amendment to the EIA report contains an assessment of potential impacts associated with the amended option in comparison to the authorised option.

Assessment of impacts

For each impact, the EXTENT (spatial scale), MAGNITUDE and DURATION (time scale) were described (see Table 2 for a description of these criteria and ratings). These criteria were used to ascertain the SIGNIFICANCE of the impact, firstly in the case of no mitigation and then with the most effective mitigation measure(s) in place.

The tables on the following pages show the scale used to assess these variables, and defines each of the rating categories.

Table 2: Assessment criteria for the evaluation of impacts

Criteria	Category	Description
Extent of impact (spatial influence of impact)	Regional	Beyond a 10 km radius of the site
	Local	Within a 10 km radius of the site.
	Site-specific	On site or within 100 m of the site.
Magnitude of impact (at the indicated spatial scale)	High	Natural functions and/or processes are *severely* altered
	Medium	Natural functions and/or processes are *notably* altered
	Low	Natural functions and/or processes are *slightly* altered
	Very low	Natural functions and/or processes are *negligibly* altered
	Zero	Natural functions and/or processes remain *unaltered*
Duration of impact	Construction period	Up to 2.5 years
	Short term	Up to 5 years after construction
	Medium term	5-15 years after construction
	Long term	More than 15 years after construction

The SIGNIFICANCE of an impact is derived by taking into account the temporal and spatial scales and magnitude. The means of arriving at the different significance ratings is explained in Table 3.

Table 3: Definition of significance ratings.

Significance rating	Level
HIGH	High magnitude with a regional extent and long term duration
	High magnitude with either a regional extent and medium term duration or a local extent and long term duration
	Medium magnitude with a regional extent and long term duration
	High magnitude with a local extent and medium term duration
MEDIUM	High magnitude with a regional extent and construction period or a site specific extent and long term duration
	High magnitude with either a local extent and construction period duration or a site specific extent and medium term duration
	Medium magnitude with any combination of extent and duration except site specific and construction period or regional and long term
	Low magnitude with a regional extent and long term duration
LOW	High magnitude with a site specific extent and construction period

	duration
	Medium magnitude with a site specific extent and construction period duration
	Low magnitude with any combination of extent and duration except site specific and construction period or regional and long term
	Very low magnitude with a regional extent and long term duration
VERY LOW	Low magnitude with a site specific extent and construction period duration
	Very low magnitude with any combination of extent and duration except regional and long term
NEUTRAL	Zero magnitude with any combination of extent and duration

Once the significance of an impact had been determined, the PROBABILITY of this impact occurring as well as the CONFIDENCE in the assessment of the impact were determined using the rating systems outlined in Table 4 and Table 5 respectively. Lastly, the REVERSIBILITY of the impact is estimated using the rating system outlined in Table 6.

Table 4: Definition of probability ratings.

Probability rating	**Criteria**
Definite	Estimated greater than 95 % chance of the impact occurring
Probable	Estimated 5 to 95 % chance of the impact occurring
Unlikely	Estimated less than 5 % chance of the impact occurring

Table 5: Definition of confidence ratings.

Confidence rating	**Criteria**
Certain	Wealth of information on and sound understanding of the environmental factors potentially influencing the impact
Sure	Reasonable amount of useful information on and relatively sound understanding of the environmental factors potentially influencing the impact.
Unsure	Limited useful information on and understanding of the environmental factors potentially influencing this impact

Table 6: Definition of reversibility ratings

Reversibility	**Criteria**
Irreversible	The activity will lead to an impact that is in all practical terms permanent.
Reversible	The impact is reversible within 2 years after the cause or stress is removed.

DESCRIPTION OF PROPOSED CHANGES

The Applicant, Longyuan Mulilo De Aar 2 South (Pty) Ltd wishes to increase the generating size of the wind turbine generators (WTGs) at the proposed De Aar 2 South WEF in order to align to current international WTG models while reducing the number of WTGs on the WEF. The following changes to the WTG parameters are proposed:

- Increasing hub height from 100 m to 120 m;
- Increasing blade length from 60 m to 80 m;
- Increasing WTG generation size to encompass a range of 2.3 MW to 4.0 MW.

The generation capacity of the WEF would be a maximum of 140MW (in accordance with the Department of Energy's cap on maximum megawatts). Proposed changes are summarised in the table below.

Table 7: Proposed changes to the authorised project

Component	Authorised	Proposed amendment
Number of turbines	103	61 Turbines @ 2.3MW per turbine (to 30 Turbines @ 4MW per turbine). The maximum of 61 will be applied for.
Generation capacity per turbine	1.5 - 2.5MW	2.3MW – 4.0MW
Generation capacity of the WEF	155 - 258MW	140 MW
Rotor / blade diameters	120m	(min) 100m (max) 160m (Note: The maximum of 160m is being applied for)
Hub height	100m	(min) 90m (max) 120m (Note: The maximum of 160m is being applied for)
Construction Hardstand Pad	"20" 40m x 50m (adjacent to each turbine) (Note: it is apparent that the "20" is a typographical error in the EA).	40m x 50m (adjacent to each turbine)
Permanent affected area (foundation size)	16 x 16m and 2 m deep	18,4m diameter, that narrows up to 10,6m at the surface (the visible portion) once the foundation is completed. Depth : 3,5m

This assessment will assess the worst-case scenario of 61 turbines of 2.3 MW with the understanding that should the applicant use 4 MW turbines then the number of turbines would be reduced to 30. Using the larger turbines would result in an increase of the turbine tower base from 15 m to 20 m and the construction pad would remain 40 x 50 m.

Refinements to the WEF layout have also been made, primarily repositioning of infrastructure to take various factors into account. A combined infrastructure layout plan of some of the infrastructure is shown in Figure 5. This shows the authorised layout of WTGs in red and the proposed amended layout of WTGs in white. This map is not intened to provide a detailed indication of the layout options, but to demonstrate general differences between the authorised layout and the amended layout. The purpose of including this map here is that it shows that the general area that the WTGs are situated in for the two options is the same, but micrositing has been modified in the amended option. Note that in a number of places red WTGs (authorised) are shown in places where white WTGs (amended layout) do not occur. There is therefore a slightly reduced overall footprint for the amended layout.

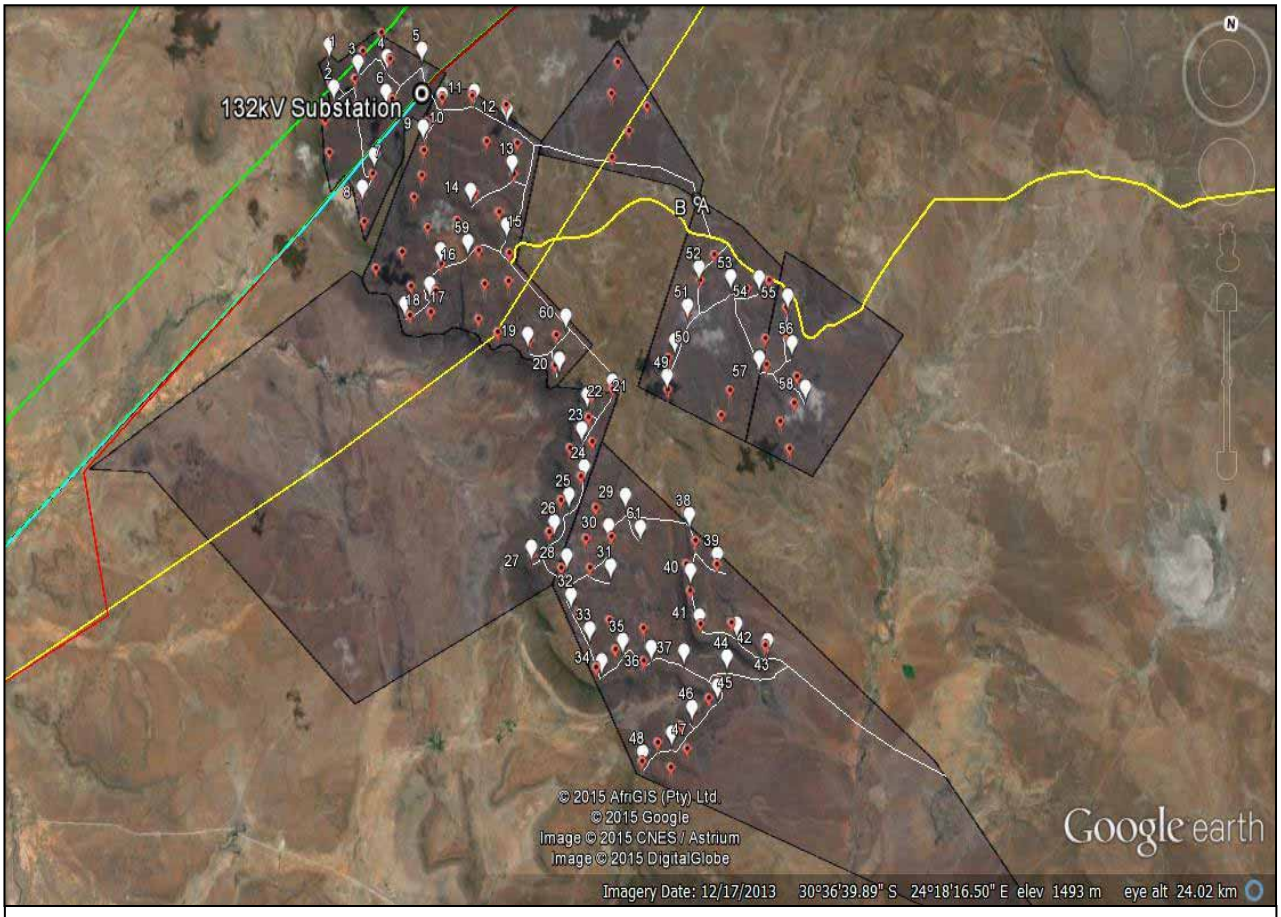


Figure 5: Approved (red) and amended (white) layouts of WTGs.

IDENTIFICATION OF RISKS AND POTENTIAL IMPACTS

Potential impacts on the ecology of the study area include the following:

- Impacts on biodiversity: this includes any impacts on populations of individual species of concern (flora and fauna), including protected species, and on overall species richness. This includes impacts on genetic variability, population dynamics, overall species existence or health and on habitats important for species of concern.
- Impacts on sensitive habitats: this includes impacts on any sensitive or protected habitats, including indigenous forest, fynbos and wetland vegetation that leads to direct or indirect loss of such habitat.
- Impacts on ecosystem function: this includes impacts on any processes or factors that maintain ecosystem health and character, including the following:

    - Disruption to nutrient-flow dynamics;
    - Impedance of movement of material or water;
    - Habitat fragmentation;
    - Changes to abiotic environmental conditions;
    - Changes to disturbance regimes, e.g. Increased or decreased incidence of fire;
    - Changes to successional processes;
    - Effects on pollinators;
    - Increased invasion by alien plants.

    Changes to factors such as these may lead to a reduction in the resilience of plant communities and ecosystems or loss or change in ecosystem function.
- Secondary and cumulative impacts on ecology: this includes an assessment of the impacts of the proposed project taken in combination with the impacts of other known projects for the area or secondary impacts that may arise from changes in the social, economic or ecological environment.
- Impacts on the economic use of vegetation: this includes any impacts that affect the productivity or function of ecosystems in such a way as to reduce the economic value to users, e.g. reduction in grazing capacity, loss of harvestable products. It is a general consideration of the impact of a project on the supply of so-called ecosystem goods and services.

A number of activities that would result in direct impacts to ecosystems from **construction** of the proposed energy facility is as follows:

- Clearing of land for construction.
- Construction of access roads.
- Placement of power lines, cables and water pipelines (if applicable).
- Establishment of borrow and spoil areas.
- Chemical contamination of the soil by construction vehicles and machinery.
- Operation of construction camps.
- Storage of materials required for construction.

A direct impact that would result from **operation** of the proposed energy facility is as follows:

- Collision impacts on birds and bats with turbines.

Note that bird and bat impacts are assessed by separate specialsits and as such are not assessed in this report.

Potential impacts

Major potential impacts identified during the original EIA are as follows:

1. Loss or fragmentation of indigenous natural vegetation;
2. Loss of individuals of threatened plants;
3. Loss of individuals of protected tree species;
4. Loss of individuals of protected plant species;
5. Loss of individuals of threatened or protected animals;
6. Impacts on wetlands and drainage areas;
7. Establishment and spread of declared weeds and alien invader plants.

It was established during the EIA study that no threatened plant species occur in the general area and that there are no threatened or protected animal species that are likely to be negatively affected by the proposed project (due to them being highly mobile). Wetlands and drainage areas have been assessed by another specialist and do not require assessment here. These three impacts do not therefore require further assessment.

It was determined during the EIA study that protected trees were unlikely to occur on site, but the protected tree, *Boscia albitrunca*, has subsequently been found on site, but only on the plateau itself, not within the footprint of the transmission power lines footprint below the plateau to the Hydra Substation. Additionally, no protected plant species were originally thought to occur on site, but there are a number of species protected according to Provincial legislation that were not considered during the EIA study.

In summary, the following potential impacts are required to be assessed here:

Construction Phase impacts:

1. Loss or fragmentation of indigenous natural vegetation;
2. Loss of individuals of protected tree species;
3. Loss of individuals of protected plant species;

Operation Phase impacts:

4. Establishment and spread of declared weeds and alien invader plants.

ASSESSMENT OF IMPACTS

Impacts are assessed for each component of infrastructure for the proposed wind energy facility. There is therefore a separate assessment for the turbines, internal access roads and overhead power lines. These are grouped according to project phases.

Construction Phase impacts

A total of a maximum of 61 turbines have been proposed for the wind energy facility. These are in areas of natural vegetation. The impacts of potential concern are therefore on natural vegetation, impacts due to the potential establishment and spread of alien plants.

Impact 1: Loss or fragmentation of indigenous natural vegetation

The vegetation type on site that will be affected by construction of infrastructure is Northern Upper Karoo and Besemkaree Koppies Shrubland, neither of which is threatened or listed.

Wind turbine generators

The proposed amendment will be for a maximum of 61 WTGs, each of which will occupy only a small local area.

Table 8: Impact summary table for Impact 1 for WTGs (authorised option).

Loss, fragmentation or degradation of natural vegetation	
Infrastructure component	Wind turbine generators
Project alternative	Authorised option
Environmental parameter	Indigenous natural vegetation
Issue/Impact/Environmental Effect/Nature	Loss, degradation or fragmentation of natural vegetation.
Extent	The impact will occur at the site of the proposed turbines. The construction of the arrays potentially affects a small proportion of natural vegetation on site and is scored as ***site specific***.
Intensity/magnitude	At a site specific scale, the vegetation will be lost only in the footprint of the turbine base. Natural functions and/or processes will therefore be slightly altered. The magnitude of the impact is therefore scored as ***low***.
Duration	The impact will occur during construction, but cause effects that will be permanent. It is therefore scored as ***long term***.
Significance rating	On the basis of the impact being of low magnitude at a site specific scale and of long term duration, the impact is scored as having a significance of ***low***. Mitigation measures will not significantly reduce the extent, magnitude or duration of the impact. The significance will, therefore, remain ***low*** after mitigation measures have been implemented.
Probability	It is ***definite*** that the impact will occur.
Confidence	There is a reasonable to high amount of useful information on and relatively sound understanding of the environmental factors potentially influencing the impact. The confidence in the assessment is therefore rated as ***sure***.

Reversibility	The activity will lead to an impact that is in all practical terms permanent. The impact is therefore considered to be ***irreversible***.
Irreplaceable loss of resources	May result in irreplaceable loss of resources, but the value of these resources is limited.
Cumulative effect	Low cumulative impact. Added to existing impacts on natural habitat, the current project will cause additional loss of vegetation, but not to a significant extent.
Degree to which impacts can be avoided, managed or mitigated	There is little opportunity to avoid impacts since there are no parts of the site where there is no natural vegetation, therefore the impact will occur irrespective of mitigation measures. Measures are proposed that will minimize the impact as much as possible.
Mitigation measures	1. Unnecessary impacts on surrounding natural vegetation must be avoided. The construction impacts must be contained to the footprint of the turbines and laydown area. 2. Disturbed areas must be rehabilitated as soon as possible after construction, using site-appropriate indigenous species.

Table 9: Impact summary table for Impact 1 for WTGs (proposed amended option).

Loss, fragmentation or degradation of natural vegetation	
Infrastructure component	Wind turbine generators
Project alternative	Proposed amended option
Environmental parameter	Indigenous natural vegetation
Issue/Impact/Environmental Effect/Nature	Loss, degradation or fragmentation of natural vegetation.
Extent	The impact will occur at the site of the proposed turbines. The construction of the arrays potentially affects a small proportion of natural vegetation on site and is scored as ***site specific***.
Intensity/magnitude	At a site specific scale, the vegetation will be lost only in the footprint of the turbine base. Natural functions and/or processes will therefore be slightly altered. The magnitude of the impact is therefore scored as ***low***.
Duration	The impact will occur during construction, but cause effects that will be permanent. It is therefore scored as ***long term***.
Significance rating	On the basis of the impact being of low magnitude at a site specific scale and of long term duration, the impact is scored as having a significance of ***low***. Mitigation measures will not significantly reduce the extent, magnitude or duration of the impact. The significance will, therefore, remain ***low*** after mitigation measures have been implemented.
Probability	It is ***definite*** that the impact will occur.
Confidence	There is a reasonable to high amount of useful information on and relatively sound understanding of the environmental factors potentially influencing the impact. The confidence in the assessment is therefore rated as

	sure.
Reversibility	The activity will lead to an impact that is in all practical terms permanent. The impact is therefore considered to be ***irreversible***.
Irreplaceable loss of resources	May result in irreplaceable loss of resources, but the value of these resources is limited.
Cumulative effect	Low cumulative impact. Added to existing impacts on natural habitat, the current project will cause additional loss of vegetation, but not to a significant extent.
Degree to which impacts can be avoided, managed or mitigated	There is little opportunity to avoid impacts since there are no parts of the site where there is no natural vegetation, therefore the impact will occur irrespective of mitigation measures. Measures are proposed that will minimize the impact as much as possible.
Mitigation measures	1. Unnecessary impacts on surrounding natural vegetation must be avoided. The construction impacts must be contained to the footprint of the turbines and laydown area. 2. Disturbed areas must be rehabilitated as soon as possible after construction, using site-appropriate indigenous species.

Overhead power lines

The proposed overhead power lines will, connect to an on-site substation and then via a transmission line to the existing Eskom Hydra substation.

Table 10: Impact summary table for Impact 1 for overhead power lines (authorised option).

Loss, fragmentation or degradation of natural vegetation	
Infrastructure component	Overhead power lines
Project alternative	Authorised option
Environmental parameter	Indigenous natural vegetation
Issue/Impact/Environmental Effect/Nature	Loss, degradation or fragmentation of natural vegetation.
Extent	The impact will occur at the site of the proposed power line tower structures and access roads. The construction of the power line infrastructure potentially affects a small proportion of natural vegetation on site and is scored as ***site specific***.
Intensity/magnitude	At a site specific scale, the vegetation will be affected in localised areas. Natural functions and/or processes will therefore be slightly altered. The magnitude of the impact is therefore scored as ***low***.
Duration	The impact will occur during construction. Indications from existing power lines on site are that the base of tower structures becomes re-vegetated. The impact will therefore be ***medium-term***.
Significance rating	On the basis of the impact being of low magnitude at a site specific scale and of medium term duration, the impact is scored as having a significance of ***low***. Mitigation measures will reduce the magnitude to very low and the duration of the impact to short term. The significance will,

	therefore, be reduced to ***very low*** after mitigation measures have been implemented.
Probability	According to the provided layout, it is ***probable*** that the impact will occur
Confidence	There is a reasonable to high amount of useful information on and relatively sound understanding of the environmental factors potentially influencing the impact. The confidence in the assessment is therefore rated as ***sure***.
Reversibility	The activity will lead to an impact that is in all practical terms permanent. The impact is therefore considered to be ***irreversible***.
Irreplaceable loss of resources	May result in irreplaceable loss of resources, but the value of these resources is limited.
Cumulative effect	Low cumulative impact. Added to existing impacts on natural habitat, the current project will cause additional loss of vegetation, but not to a significant extent.
Degree to which impacts can be avoided, managed or mitigated	There is little opportunity to avoid impacts since there are no parts of the site where there is no natural vegetation, therefore the impact will occur irrespective of mitigation measures. Measures are proposed that will minimize the impact as much as possible.
Mitigation measures	1. Unnecessary impacts on surrounding natural vegetation must be avoided. The construction impacts must be contained to the footprint of the tower structures and/or the servitude of the power line. 2. Existing access roads must be used, where possible. 3. Service roads in the servitude must be properly maintained to avoid erosion impacts.

Table 11: Impact summary table for Impact 1 for overhead power lines (proposed amended option).

Loss, fragmentation or degradation of natural vegetation	
Infrastructure component	Overhead power lines
Project alternative	Proposed amended option
Environmental parameter	Indigenous natural vegetation
Issue/Impact/Environmental Effect/Nature	Loss, degradation or fragmentation of natural vegetation.
Extent	The impact will occur at the site of the proposed power line tower structures and access roads. The construction of the power line infrastructure potentially affects a small proportion of natural vegetation on site and is scored as ***site specific***.
Intensity/magnitude	At a site specific scale, the vegetation will be affected in localised areas. Natural functions and/or processes will therefore be slightly altered. The magnitude of the impact is therefore scored as ***low***.
Duration	The impact will occur during construction. Indications from existing power lines on site are that the base of tower structures becomes re-vegetated. The impact will

	therefore be ***medium-term***.
Significance rating	On the basis of the impact being of low magnitude at a site specific scale and of medium term duration, the impact is scored as having a significance of ***low***. Mitigation measures will reduce the magnitude to very low and the duration of the impact to short term. The significance will, therefore, be reduced to ***very low*** after mitigation measures have been implemented.
Probability	According to the provided layout, it is ***probable*** that the impact will occur
Confidence	There is a reasonable to high amount of useful information on and relatively sound understanding of the environmental factors potentially influencing the impact. The confidence in the assessment is therefore rated as ***sure***.
Reversibility	The activity will lead to an impact that is in all practical terms permanent. The impact is therefore considered to be ***irreversible***.
Irreplaceable loss of resources	May result in irreplaceable loss of resources, but the value of these resources is limited.
Cumulative effect	Low cumulative impact. Added to existing impacts on natural habitat, the current project will cause additional loss of vegetation, but not to a significant extent.
Degree to which impacts can be avoided, managed or mitigated	There is little opportunity to avoid impacts since there are no parts of the site where there is no natural vegetation, therefore the impact will occur irrespective of mitigation measures. Measures are proposed that will minimize the impact as much as possible.
Mitigation measures	1. Unnecessary impacts on surrounding natural vegetation must be avoided. The construction impacts must be contained to the footprint of the tower structures and/or the servitude of the power line. 2. Existing access roads must be used, where possible. 3. Service roads in the servitude must be properly maintained to avoid erosion impacts.

Internal access roads

There will be an extensive network of roads on site to connect turbines. It is assumed that these will be relatively significant in width and structure in order to accommodate the cranes and machinery required for erecting the turbines on site. Steep areas are particularly vulnerable to damage from road construction. Internal access roads could affect significant areas of vegetation.

Table 12: Impact summary table for Impact 1 for internal access roads (authorised option).

Loss, fragmentation or degradation of natural vegetation	
Infrastructure component	Internal access roads
Project alternative	Authorised option
Environmental parameter	Indigenous natural vegetation
Issue/Impact/Environmental	Loss, degradation or fragmentation of natural vegetation.

Effect/Nature	
Extent	The impact will occur at the site of the proposed internal access road infrastructure. The construction of the internal access road network potentially affects a large proportion of natural vegetation on site and is scored as ***site specific***.
Intensity/magnitude	At a site specific scale, the vegetation will be extensively affected. Although the hectare footprint of roads may be a relatively small proportion of the toal vegetation on site, the network of roads will significantly fragment natural vegetation on site, creating many small patches and extensive edge effects. Natural functions and/or processes will therefore be notably altered. The magnitude of the impact is therefore scored as ***medium***.
Duration	The impact will occur during construction, but will cause a permanent impact. The impact will therefore be ***long-term***.
Significance rating	On the basis of the impact being of medium magnitude at a site specific scale and of long-term duration, the impact is scored as having a significance of ***medium***. Mitigation measures will not reduce the extent, magnitude or duration of the impact. The significance will, therefore, remain ***medium*** after mitigation measures have been implemented.
Probability	According to the provided layout and the requirements of the project, it is ***definite*** that the impact will occur.
Confidence	There is a reasonable to high amount of useful information on and relatively sound understanding of the environmental factors potentially influencing the impact. The confidence in the assessment is therefore rated as ***sure***.
Reversibility	The activity will lead to an impact that is in all practical terms permanent. The impact is therefore considered to be ***irreversible***.
Irreplaceable loss of resources	May result in irreplaceable loss of resources, but the value of these resources is limited.
Cumulative effect	Low cumulative impact. Added to existing impacts on natural habitat, the current project will cause additional loss of vegetation, but not to a significant extent.
Degree to which impacts can be avoided, managed or mitigated	There is little opportunity to avoid impacts since there are no parts of the site where there is no natural vegetation, therefore the impact will occur irrespective of mitigation measures. Measures are proposed that will minimize the impact as much as possible.
Mitigation measures	1. Unnecessary impacts on surrounding natural vegetation must be avoided. The construction impacts must be contained to the footprint/servitude of the internal access roads. 2. Existing access roads must be used, where possible, as the location for new roads. Disturbances will then be placed where there is an existing, albeit small, disturbance. 3. Steep slopes must be avoided, if possible.

	4. Rehabilitate disturbed areas adjacent to construction as quickly as possible. 5. Rescue any species of value from the footprint of construction. 6. Control alien plants adjacent to infrastructure.

Table 13: Impact summary table for Impact 1 for internal access roads (proposed amended option).

Loss, fragmentation or degradation of natural vegetation	
Infrastructure component	Internal access roads
Project alternative	Proposed amended option
Environmental parameter	Indigenous natural vegetation
Issue/Impact/Environmental Effect/Nature	Loss, degradation or fragmentation of natural vegetation.
Extent	The impact will occur at the site of the proposed internal access road infrastructure. The construction of the internal access road network potentially affects a large proportion of natural vegetation on site and is scored as ***site specific***.
Intensity/magnitude	At a site specific scale, the vegetation will be extensively affected. Although the hectare footprint of roads may be a relatively small proportion of the toal vegetation on site, the network of roads will significantly fragment natural vegetation on site, creating many small patches and extensive edge effects. Natural functions and/or processes will therefore be notably altered. The magnitude of the impact is therefore scored as ***medium***.
Duration	The impact will occur during construction, but will cause a permanent impact. The impact will therefore be ***long-term***.
Significance rating	On the basis of the impact being of medium magnitude at a site specific scale and of long-term duration, the impact is scored as having a significance of ***medium***. Mitigation measures will not reduce the extent, magnitude or duration of the impact. The significance will, therefore, remain ***medium*** after mitigation measures have been implemented.
Probability	According to the provided layout and the requirements of the project, it is ***definite*** that the impact will occur.
Confidence	There is a reasonable to high amount of useful information on and relatively sound understanding of the environmental factors potentially influencing the impact. The confidence in the assessment is therefore rated as ***sure***.
Reversibility	The activity will lead to an impact that is in all practical terms permanent. The impact is therefore considered to be ***irreversible***.
Irreplaceable loss of resources	May result in irreplaceable loss of resources, but the value of these resources is limited.
Cumulative effect	Low cumulative impact. Added to existing impacts on natural habitat, the current project will cause additional loss of vegetation, but not to a significant extent.

Degree to which impacts can be avoided, managed or mitigated	There is little opportunity to avoid impacts since there are no parts of the site where there is no natural vegetation, therefore the impact will occur irrespective of mitigation measures. Measures are proposed that will minimize the impact as much as possible.
Mitigation measures	7. Unnecessary impacts on surrounding natural vegetation must be avoided. The construction impacts must be contained to the footprint/servitude of the internal access roads. 8. Existing access roads must be used, where possible, as the location for new roads. Disturbances will then be placed where there is an existing, albeit small, disturbance. 9. Steep slopes must be avoided, if possible. 10. Rehabilitate disturbed areas adjacent to construction as quickly as possible. 11. Rescue any species of value from the footprint of construction. 12. Control alien plants adjacent to infrastructure.

Impact 2: Loss of individuals of protected tree species

The protected tree, *Boscia albitrunca*, occurs at low densities in some parts of the site on the plateau.

Wind turbine generators

The proposed amendment constitutes a maximum of 61 WTGs, each of which will occupy only a small local area. The probability of striking a protected tree is therefore low, but there is a legal obligation to apply for a permit in the event that any individuals are affected.

Table 14: Impact summary table for Impact 2 for WTGs (authorised option).

Loss of individuals of protected trees	
Infrastructure component	Wind turbine generators
Project alternative	Authorised option
Environmental parameter	Protected trees
Issue/Impact/Environmental Effect/Nature	Loss or damage to individual trees.
Extent	The impact will occur at the site of the proposed turbines. The construction of the turbines potentially affects a small number of trees on site and is scored as ***site specific***.
Intensity/magnitude	At a site specific scale, individual trees may be lost only in the footprint of the turbine base. The magnitude of the impact is therefore scored as ***very low***.
Duration	The impact will occur during construction, but cause effects that will be permanent. It is therefore scored as ***long term***.
Significance rating	On the basis of the impact being of very low magnitude at a site specific scale and of long term duration, the impact is scored as having a significance of ***very low***. Mitigation measures will not significantly reduce the extent, magnitude or duration of the impact. The significance will, therefore, remain ***very low*** after mitigation measures

	have been implemented.
Probability	It is ***probable*** that the impact will occur.
Confidence	There is a reasonable to high amount of useful information on and relatively sound understanding of the environmental factors potentially influencing the impact. The confidence in the assessment is therefore rated as ***sure***.
Reversibility	The activity will lead to an impact that is in all practical terms permanent. The impact is therefore considered to be ***irreversible***.
Irreplaceable loss of resources	May result in irreplaceable loss of resources, but the value of these resources is limited.
Cumulative effect	Low cumulative impact. Added to existing impacts on protected trees, the current project will cause additional loss of trees, but not to a significant degree.
Degree to which impacts can be avoided, managed or mitigated	There is little opportunity to avoid impacts, but measures can be taken to rescue some trees and/or replant trees in other places. Measures are proposed that will minimize the impact as much as possible.
Mitigation measures	1. Undertake a walk-through survey within the footprint of the proposed infrastructure prior to construction in order to identify any individual trees that may be affected. 2. Obtain a permit for the removal of any affected trees.

Table 15: Impact summary table for Impact 2 for WTGs (proposed amended option).

Loss of individuals of protected trees	
Infrastructure component	Wind turbine generators
Project alternative	Proposed amended option
Environmental parameter	Protected trees
Issue/Impact/Environmental Effect/Nature	Loss or damage to individual trees.
Extent	The impact will occur at the site of the proposed turbines. The construction of the turbines potentially affects a small number of trees on site and is scored as ***site specific***.
Intensity/magnitude	At a site specific scale, individual trees may be lost only in the footprint of the turbine base. The magnitude of the impact is therefore scored as ***very low***.
Duration	The impact will occur during construction, but cause effects that will be permanent. It is therefore scored as ***long term***.
Significance rating	On the basis of the impact being of very low magnitude at a site specific scale and of long term duration, the impact is scored as having a significance of ***very low***. Mitigation measures will not significantly reduce the extent, magnitude or duration of the impact. The significance will, therefore, remain ***very low*** after mitigation measures have been implemented.
Probability	It is ***probable*** that the impact will occur.
Confidence	There is a reasonable to high amount of useful information

	on and relatively sound understanding of the environmental factors potentially influencing the impact. The confidence in the assessment is therefore rated as ***sure***.
Reversibility	The activity will lead to an impact that is in all practical terms permanent. The impact is therefore considered to be ***irreversible***.
Irreplaceable loss of resources	May result in irreplaceable loss of resources, but the value of these resources is limited.
Cumulative effect	Low cumulative impact. Added to existing impacts on protected trees, the current project will cause additional loss of trees, but not to a significant degree.
Degree to which impacts can be avoided, managed or mitigated	There is little opportunity to avoid impacts, but measures can be taken to rescue some trees and/or replant trees in other places. Measures are proposed that will minimize the impact as much as possible.
Mitigation measures	1. Undertake a walk-through survey within the footprint of the proposed infrastructure prior to construction in order to identify any individual trees that may be affected. 2. Obtain required permits for the removal of any affected trees.

Overhead power lines

The proposed overhead power lines will, connect on-site substations and then via transmission lines to the existing Eskom Hydra substation. There is a small probability that some protected trees may be within the footprint of this infrastructure.

Table 16: Impact summary table for Impact 2 for overhead power lines (authorised option).

Loss of individuals of protected trees	
Infrastructure component	Overhead power lines
Project alternative	Authorised option
Environmental parameter	Protected trees
Issue/Impact/Environmental Effect/Nature	Loss or damage to individual trees.
Extent	The impact will occur at the site of the proposed power line tower structures. The construction of the towers potentially affects a small number of trees on site and is scored as ***site specific***.
Intensity/magnitude	At a site specific scale, individual trees may be lost only in the footprint of the towere base. The magnitude of the impact is therefore scored as ***very low***.
Duration	The impact will occur during construction, but cause effects that will be permanent. It is therefore scored as ***long term***.
Significance rating	On the basis of the impact being of very low magnitude at a site specific scale and of long term duration, the impact is scored as having a significance of ***very low***. Mitigation measures will not significantly reduce the extent, magnitude or duration of the impact. The significance will, therefore, remain ***very low*** after mitigation measures

	have been implemented.
Probability	It is ***probable*** that the impact will occur.
Confidence	There is a reasonable to high amount of useful information on and relatively sound understanding of the environmental factors potentially influencing the impact. The confidence in the assessment is therefore rated as ***sure***.
Reversibility	The activity will lead to an impact that is in all practical terms permanent. The impact is therefore considered to be ***irreversible***.
Irreplaceable loss of resources	May result in irreplaceable loss of resources, but the value of these resources is limited.
Cumulative effect	Low cumulative impact. Added to existing impacts on protected trees, the current project will cause additional loss of trees, but not to a significant degree.
Degree to which impacts can be avoided, managed or mitigated	There is little opportunity to avoid impacts, but measures can be taken to rescue some trees and/or replant trees in other places. Measures are proposed that will minimize the impact as much as possible.
Mitigation measures	1. Undertake a walk-through survey within the footprint of the proposed infrastructure prior to construction in order to identify any individual trees that may be affected. 2. Obtain a permit for the removal of any affected trees. 3. Consider slight local adjustments to tower positions to avoid any affected individuals.

Table 17: Impact summary table for Impact 1 for overhead power lines (proposed amended option).

Loss of individuals of protected trees	
Infrastructure component	Overhead power lines
Project alternative	Proposed amended option
Environmental parameter	Protected trees
Issue/Impact/Environmental Effect/Nature	Loss or damage to individual trees.
Extent	The impact will occur at the site of the proposed overhead power line tower structures. The construction of the towers potentially affects a small number of trees on site and is scored as ***site specific***.
Intensity/magnitude	At a site specific scale, individual trees may be lost only in the footprint of the tower base. The magnitude of the impact is therefore scored as ***very low***.
Duration	The impact will occur during construction, but cause effects that will be permanent. It is therefore scored as ***long term***.
Significance rating	On the basis of the impact being of very low magnitude at a site specific scale and of long term duration, the impact is scored as having a significance of ***very low***. Mitigation measures will not significantly reduce the extent, magnitude or duration of the impact. The significance will,

	therefore, remain ***very low*** after mitigation measures have been implemented.
Probability	It is ***probable*** that the impact will occur.
Confidence	There is a reasonable to high amount of useful information on and relatively sound understanding of the environmental factors potentially influencing the impact. The confidence in the assessment is therefore rated as ***sure***.
Reversibility	The activity will lead to an impact that is in all practical terms permanent. The impact is therefore considered to be ***irreversible***.
Irreplaceable loss of resources	May result in irreplaceable loss of resources, but the value of these resources is limited.
Cumulative effect	Low cumulative impact. Added to existing impacts on protected trees, the current project will cause additional loss of trees, but not to a significant degree.
Degree to which impacts can be avoided, managed or mitigated	There is little opportunity to avoid impacts, but measures can be taken to rescue some trees and/or replant trees in other places. Measures are proposed that will minimize the impact as much as possible.
Mitigation measures	1. Undertake a walk-through survey within the footprint of the proposed infrastructure prior to construction in order to identify any individual trees that may be affected. 2. Obtain a permit for the removal of any affected trees / plants. 3. Consider slight local adjustments to tower positions to avoid any affected individuals.

Internal access roads

There will be an extensive network of roads on site to connect turbines. It is assumed that these will be relatively significant in width and structure in order to accommodate the cranes and machinery required for erecting the turbines on site. Internal access roads could potentially affect significant numbers of protected trees within specific habitats.

Table 18: Impact summary table for Impact 2 for internal access roads (authorised option).

Loss of individuals of protected trees	
Infrastructure component	Internal access roads
Project alternative	Authorised option
Environmental parameter	Protected trees
Issue/Impact/Environmental Effect/Nature	Loss or damage to individual trees.
Extent	The impact will occur at the site of the proposed internal access roads. The construction of the roads potentially affects a moderate number of trees on site and is scored as ***site specific***.
Intensity/magnitude	At a site specific scale, individual trees may be lost only in the footprint of the roads. The magnitude of the impact is therefore scored as ***low***.
Duration	The impact will occur during construction, but cause effects that will be permanent. It is therefore scored as

	long term.
Significance rating	On the basis of the impact being of very low magnitude at a site specific scale and of long term duration, the impact is scored as having a significance of ***low***. Mitigation measures will not significantly reduce the extent, magnitude or duration of the impact. The significance will, therefore, remain ***low*** after mitigation measures have been implemented.
Probability	It is ***probable*** that the impact will occur.
Confidence	There is a reasonable to high amount of useful information on and relatively sound understanding of the environmental factors potentially influencing the impact. The confidence in the assessment is therefore rated as ***sure***.
Reversibility	The activity will lead to an impact that is in all practical terms permanent. The impact is therefore considered to be ***irreversible***.
Irreplaceable loss of resources	May result in irreplaceable loss of resources, but the value of these resources is limited.
Cumulative effect	Low cumulative impact. Added to existing impacts on protected trees, the current project will cause additional loss of trees, but not to a significant degree.
Degree to which impacts can be avoided, managed or mitigated	There is little opportunity to avoid impacts, but measures can be taken to rescue some trees and/or replant trees in other places. Measures are proposed that will minimize the impact as much as possible.
Mitigation measures	1. Undertake a walk-through survey within the footprint of the proposed infrastructure prior to construction in order to identify any individual trees that may be affected. 2. Obtain a permit for the removal of any affected trees.

Table 19: Impact summary table for Impact 2 for internal access roads (proposed amended option).

Loss of individuals of protected trees	
Infrastructure component	Internal access roads
Project alternative	Proposed amended option
Environmental parameter	Protected trees
Issue/Impact/Environmental Effect/Nature	Loss or damage to individual trees.
Extent	The impact will occur at the site of the proposed internal access roads. The construction of the roads potentially affects a moderate number of trees on site and is scored as ***site specific***.
Intensity/magnitude	At a site specific scale, individual trees may be lost only in the footprint of the roads. The magnitude of the impact is therefore scored as ***low***.
Duration	The impact will occur during construction, but cause effects that will be permanent. It is therefore scored as ***long term***.

Significance rating	On the basis of the impact being of very low magnitude at a site specific scale and of long term duration, the impact is scored as having a significance of ***low***. Mitigation measures will not significantly reduce the extent, magnitude or duration of the impact. The significance will, therefore, remain ***low*** after mitigation measures have been implemented.
Probability	It is ***probable*** that the impact will occur.
Confidence	There is a reasonable to high amount of useful information on and relatively sound understanding of the environmental factors potentially influencing the impact. The confidence in the assessment is therefore rated as ***sure***.
Reversibility	The activity will lead to an impact that is in all practical terms permanent. The impact is therefore considered to be ***irreversible***.
Irreplaceable loss of resources	May result in irreplaceable loss of resources, but the value of these resources is limited.
Cumulative effect	Low cumulative impact. Added to existing impacts on protected trees, the current project will cause additional loss of trees, but not to a significant degree.
Degree to which impacts can be avoided, managed or mitigated	There is little opportunity to avoid impacts, but measures can be taken to rescue some trees and/or replant trees in other places. Measures are proposed that will minimize the impact as much as possible.
Mitigation measures	3. Undertake a walk-through survey within the footprint of the proposed infrastructure prior to construction in order to identify any individual trees that may be affected. 4. Obtain a permit for the removal of any affected trees.

Impact 3: Loss of individuals of protected plant species

There are various plant species protected according to Provincial legislation that may occur at low densities in some parts of the site.

Wind turbine generators

The proposed amendment is for a maximum of 61 WTGs, each of which will occupy only a small local area. The probability of striking a protected plant is therefore low, but there is a legal obligation to apply for a permit in the event that any individuals are affected.

Table 20: Impact summary table for Impact 3 for WTGs (authorised option).

Loss of individuals of protected plants	
Infrastructure component	Wind turbine generators
Project alternative	Authorised option
Environmental parameter	Protected plants
Issue/Impact/Environmental Effect/Nature	Loss of individual plants.
Extent	The impact will occur at the site of the proposed turbines. The construction of the turbines potentially affects a small number of plants on site and is scored as ***site specific***.

Intensity/magnitude	At a site specific scale, individual plants may be lost only in the footprint of the turbine base. The magnitude of the impact is therefore scored as ***very low***.
Duration	The impact will occur during construction, but cause effects that will be permanent. It is therefore scored as ***long term***.
Significance rating	On the basis of the impact being of very low magnitude at a site specific scale and of long term duration, the impact is scored as having a significance of ***very low***. Mitigation measures will not significantly reduce the extent, magnitude or duration of the impact. The significance will, therefore, remain ***very low*** after mitigation measures have been implemented.
Probability	It is ***probable*** that the impact will occur.
Confidence	There is a reasonable to high amount of useful information on and relatively sound understanding of the environmental factors potentially influencing the impact. The confidence in the assessment is therefore rated as ***sure***.
Reversibility	The activity will lead to an impact that is in all practical terms permanent. The impact is therefore considered to be ***irreversible***.
Irreplaceable loss of resources	May result in irreplaceable loss of resources, but the value of these resources is limited.
Cumulative effect	Low cumulative impact. Added to existing impacts on protected plants, the current project will cause additional loss of trees, but not to a significant degree.
Degree to which impacts can be avoided, managed or mitigated	There is little opportunity to avoid impacts, but measures can be taken to rescue some plants and/or replant plants in other places. Measures are proposed that will minimize the impact as much as possible.
Mitigation measures	1. Undertake a walk-through survey within the footprint of the proposed infrastructure prior to construction in order to identify any individual protected plants that may be affected. 2. Obtain required permits for the removal of any affected plants.

Table 21: Impact summary table for Impact 3 for WTGs (proposed amended option).

Loss of individuals of protected plants	
Infrastructure component	Wind turbine generators
Project alternative	Proposed amended option
Environmental parameter	Protected plants
Issue/Impact/Environmental Effect/Nature	Loss of individual plants.
Extent	The impact will occur at the site of the proposed turbines. The construction of the turbines potentially affects a small number of plants on site and is scored as ***site specific***.
Intensity/magnitude	At a site specific scale, individual plants may be lost only in the footprint of the turbine base. The magnitude of the impact is therefore scored as ***very low***.

Duration	The impact will occur during construction, but cause effects that will be permanent. It is therefore scored as ***long term***.
Significance rating	On the basis of the impact being of very low magnitude at a site specific scale and of long term duration, the impact is scored as having a significance of ***very low***. Mitigation measures will not significantly reduce the extent, magnitude or duration of the impact. The significance will, therefore, remain ***very low*** after mitigation measures have been implemented.
Probability	It is ***probable*** that the impact will occur.
Confidence	There is a reasonable to high amount of useful information on and relatively sound understanding of the environmental factors potentially influencing the impact. The confidence in the assessment is therefore rated as ***sure***.
Reversibility	The activity will lead to an impact that is in all practical terms permanent. The impact is therefore considered to be ***irreversible***.
Irreplaceable loss of resources	May result in irreplaceable loss of resources, but the value of these resources is limited.
Cumulative effect	Low cumulative impact. Added to existing impacts on protected plants, the current project will cause additional loss of trees, but not to a significant degree.
Degree to which impacts can be avoided, managed or mitigated	There is little opportunity to avoid impacts, but measures can be taken to rescue some plants and/or replant plants in other places. Measures are proposed that will minimize the impact as much as possible.
Mitigation measures	1. Undertake a walk-through survey within the footprint of the proposed infrastructure prior to construction in order to identify any individual protected plants that may be affected. 2. Obtain required permit/s for the removal of any affected listed / protected plants.

Overhead power lines

The proposed overhead power lines will, connect to an on-site substation and then via a transmission line to the existing Eskom Hydra substation. There is a small probability that some protected plants may be within the footprint of this infrastructure.

Table 22: Impact summary table for Impact 3 for overhead power lines (authorised option).

Loss of individuals of protected plants	
Infrastructure component	Overhead power lines
Project alternative	Authorised option
Environmental parameter	Protected plants
Issue/Impact/Environmental Effect/Nature	Loss or damage to individual plants.
Extent	The impact will occur at the site of the proposed power line tower structures. The construction of the towers potentially affects a small number of plants on site and is scored as ***site specific***.

Intensity/magnitude	At a site specific scale, individual plants may be lost only in the footprint of the tower base. The magnitude of the impact is therefore scored as ***very low***.
Duration	The impact will occur during construction, but cause effects that will be permanent. It is therefore scored as ***long term***.
Significance rating	On the basis of the impact being of very low magnitude at a site specific scale and of long term duration, the impact is scored as having a significance of ***very low***. Mitigation measures will not significantly reduce the extent, magnitude or duration of the impact. The significance will, therefore, remain ***very low*** after mitigation measures have been implemented.
Probability	It is ***probable*** that the impact will occur.
Confidence	There is a reasonable to high amount of useful information on and relatively sound understanding of the environmental factors potentially influencing the impact. The confidence in the assessment is therefore rated as ***sure***.
Reversibility	The activity will lead to an impact that is in all practical terms permanent. The impact is therefore considered to be ***irreversible***.
Irreplaceable loss of resources	May result in irreplaceable loss of resources, but the value of these resources is limited.
Cumulative effect	Low cumulative impact. Added to existing impacts on protected trees and plants, the current project will cause additional loss of trees and plants, but not to a significant degree.
Degree to which impacts can be avoided, managed or mitigated	There is little opportunity to avoid impacts, but measures can be taken to rescue some plants and/or replant plants in other places. Measures are proposed that will minimize the impact as much as possible.
Mitigation measures	1. Undertake a walk-through survey within the footprint of the proposed infrastructure prior to construction in order to identify any individual plants that may be affected. 2. Obtain a permit for the removal of any listed / protected affected plants and trees. 3. Consider slight local adjustments to tower positions to avoid concentrations of any affected individuals of protected plants.

Table 23: Impact summary table for Impact 1 for overhead power lines (proposed amended option).

Loss of individuals of protected plants	
Infrastructure component	Overhead power lines
Project alternative	Proposed amended option
Environmental parameter	Protected plants
Issue/Impact/Environmental Effect/Nature	Loss or damage to individual plants.
Extent	The impact will occur at the site of the proposed power line

	tower structures. The construction of the towers potentially affects a small number of plants on site and is scored as ***site specific***.
Intensity/magnitude	At a site specific scale, individual plants may be lost only in the footprint of the tower base. The magnitude of the impact is therefore scored as ***very low***.
Duration	The impact will occur during construction, but cause effects that will be permanent. It is therefore scored as ***long term***.
Significance rating	On the basis of the impact being of very low magnitude at a site specific scale and of long term duration, the impact is scored as having a significance of ***very low***. Mitigation measures will not significantly reduce the extent, magnitude or duration of the impact. The significance will, therefore, remain ***very low*** after mitigation measures have been implemented.
Probability	It is ***probable*** that the impact will occur.
Confidence	There is a reasonable to high amount of useful information on and relatively sound understanding of the environmental factors potentially influencing the impact. The confidence in the assessment is therefore rated as ***sure***.
Reversibility	The activity will lead to an impact that is in all practical terms permanent. The impact is therefore considered to be ***irreversible***.
Irreplaceable loss of resources	May result in irreplaceable loss of resources, but the value of these resources is limited.
Cumulative effect	Low cumulative impact. Added to existing impacts on protected trees and plants, the current project will cause additional loss of trees and plants, but not to a significant degree.
Degree to which impacts can be avoided, managed or mitigated	There is little opportunity to avoid impacts, but measures can be taken to rescue some plants and/or replant plants in other places. Measures are proposed that will minimize the impact as much as possible.
Mitigation measures	1. Undertake a walk-through survey within the footprint of the proposed infrastructure prior to construction in order to identify any individual plants that may be affected. 2. Obtain a permit for the removal of any affected trees and plants. 3. Consider slight local adjustments to tower positions to avoid concentrations of any affected individuals of protected plants.

Internal access roads

There will be an extensive network of roads on site to connect turbines. It is assumed that these will be relatively significant in width and structure in order to accommodate the cranes and machinery required for erecting the turbines on site. Internal access roads could potentially affect significant numbers of protected plants within specific habitats.

Table 24: Impact summary table for Impact 3 for internal access roads (authorised option).

Loss of individuals of protected plants	
Infrastructure component	Internal access roads
Project alternative	Authorised option
Environmental parameter	Protected plants
Issue/Impact/Environmental Effect/Nature	Loss or damage to individual plants.
Extent	The impact will occur at the site of the proposed power line tower structures. The construction of the towers potentially affects a small number of plants on site and is scored as ***site specific***.
Intensity/magnitude	At a site specific scale, individual plants may be lost only in the footprint of the tower base. The magnitude of the impact is therefore scored as ***very low***.
Duration	The impact will occur during construction, but cause effects that will be permanent. It is therefore scored as ***long term***.
Significance rating	On the basis of the impact being of very low magnitude at a site specific scale and of long term duration, the impact is scored as having a significance of ***very low***. Mitigation measures will not significantly reduce the extent, magnitude or duration of the impact. The significance will, therefore, remain ***very low*** after mitigation measures have been implemented.
Probability	It is ***probable*** that the impact will occur.
Confidence	There is a reasonable to high amount of useful information on and relatively sound understanding of the environmental factors potentially influencing the impact. The confidence in the assessment is therefore rated as ***sure***.
Reversibility	The activity will lead to an impact that is in all practical terms permanent. The impact is therefore considered to be ***irreversible***.
Irreplaceable loss of resources	May result in irreplaceable loss of resources, but the value of these resources is limited.
Cumulative effect	Low cumulative impact. Added to existing impacts on protected trees and plants, the current project will cause additional loss of trees and plants, but not to a significant degree.
Degree to which impacts can be avoided, managed or mitigated	There is little opportunity to avoid impacts, but measures can be taken to rescue some plants and/or replant plants in other places. Measures are proposed that will minimize the impact as much as possible.
Mitigation measures	1. Undertake a walk-through survey within the footprint of the proposed infrastructure prior to construction in order to identify any individual plants that may be affected. 2. Obtain a permit for the removal of any affected trees and plants.

Table 25: Impact summary table for Impact 3 for internal access roads (proposed amended option).

Loss of individuals of protected plants	
Infrastructure component	Internal access roads
Project alternative	Proposed amended option
Environmental parameter	Protected plants
Issue/Impact/Environmental Effect/Nature	Loss or damage to individual plants.
Extent	The impact will occur at the site of the proposed power line tower structures. The construction of the towers potentially affects a small number of plants on site and is scored as ***site specific***.
Intensity/magnitude	At a site specific scale, individual plants may be lost only in the footprint of the tower base. The magnitude of the impact is therefore scored as ***very low***.
Duration	The impact will occur during construction, but cause effects that will be permanent. It is therefore scored as ***long term***.
Significance rating	On the basis of the impact being of very low magnitude at a site specific scale and of long term duration, the impact is scored as having a significance of ***very low***. Mitigation measures will not significantly reduce the extent, magnitude or duration of the impact. The significance will, therefore, remain ***very low*** after mitigation measures have been implemented.
Probability	It is ***probable*** that the impact will occur.
Confidence	There is a reasonable to high amount of useful information on and relatively sound understanding of the environmental factors potentially influencing the impact. The confidence in the assessment is therefore rated as ***sure***.
Reversibility	The activity will lead to an impact that is in all practical terms permanent. The impact is therefore considered to be ***irreversible***.
Irreplaceable loss of resources	May result in irreplaceable loss of resources, but the value of these resources is limited.
Cumulative effect	Low cumulative impact. Added to existing impacts on protected trees and plants, the current project will cause additional loss of trees, but not to a significant degree.
Degree to which impacts can be avoided, managed or mitigated	There is little opportunity to avoid impacts, but measures can be taken to rescue some plants and/or replant plants in other places. Measures are proposed that will minimize the impact as much as possible.
Mitigation measures	1. Undertake a walk-through survey within the footprint of the proposed infrastructure prior to construction in order to identify any individual plants that may be affected. 2. Obtain a permit for the removal of any affected plants.

Operational Phase

There will be little additional disturbance on site following the construction phase, but it is probable that existing disturbance to natural habitats will change conditions in favour of invasive plant species.

Wind turbine generators

The proposed amendment to the layout constitutes a maximum of 61 WTGs, each of which will occupy only a small local area. Each turbine will have a disturbed area around it in which conditions favouring the establishment of alien species will occur.

Table 26: Impact summary table for Impact 4 for WTGs (authorised option).

Establishment and spread of declared weeds and alien invader plants	
Infrastructure component	Wind turbine generators
Project alternative	Authorised option
Environmental parameter	Natural vegetation and species
Issue/Impact/Environmental Effect/Nature	Establishment and spread of declared weeds and alien invader plants
Extent	The impact will occur at the site of the proposed turbines and in surrounding areas, but could potentially spread into the surrounding landscape, depending on the habitat and the alien species that could potentially invade the site. The impact is therefore scored as ***local***.
Intensity/magnitude	At a local scale, natural functions and/or processes will possibly be notably altered. The magnitude of the impact is therefore scored as ***medium***.
Duration	The impact will occur during construction, but cause effects that will last longer than 15 years, if not controlled. It is therefore scored as ***long term***.
Significance rating	On the basis of the impact being of medium magnitude at a local scale and of long term duration, the impact is scored as having a significance of ***medium***. Mitigation measures will reduce the extent to site specific, the magnitude to very low and the duration of the impact to short term. The significance will, therefore, be reduced to ***very low*** after mitigation measures have been implemented.
Probability	On the basis of known patterns of alien invasions, it is ***probable*** that the impact will occur.
Confidence	There is a reasonable to high amount of useful information on and relatively sound understanding of the environmental factors potentially influencing the impact. The confidence in the assessment is therefore rated as ***sure***.
Reversibility	The activity will lead to an impact that could be reversed, if identified and managed. Impacts are possibly reversible within 2 years after the cause or stress is removed. The impact is therefore considered to be ***reversible***.
Irreplaceable loss of resources	May result in irreplaceable loss of resources, but the value of these resources is limited.
Cumulative effect	Low cumulative impact. Added to existing impacts on natural vegetation, the current project will cause additional loss of habitat, but not to a significant degree.

Degree to which impacts can be avoided, managed or mitigated	It is relatively easy to avoid impacts by implementing management measures to detect and control alien invasions.
Mitigation measures	1. Disturbance of indigenous vegetation outside of the footprint of construction must be kept to a minimum. 2. Where disturbance is unavoidable, disturbed areas should be rehabilitated as quickly as possible. 3. Any alien plants within the control zone of the company must be immediately controlled to avoid establishment of a soil seed bank. Control measures must follow established norms and legal limitations in terms of the method to be used and the chemical substances used. 4. An on-going monitoring programme should be implemented to detect and quantify any alien plants that may become established and provide information for the management of aliens. 5. An alien management plan should be compiled for the project.

Table 27: Impact summary table for Impact 4 for WTGs (proposed amended option).

Establishment and spread of declared weeds and alien invader plants	
Infrastructure component	Wind turbine generators
Project alternative	Proposed amended option
Environmental parameter	Natural vegetation and species
Issue/Impact/Environmental Effect/Nature	Establishment and spread of declared weeds and alien invader plants
Extent	The impact will occur at the site of the proposed turbines and in surrounding areas, but could potentially spread into the surrounding landscape, depending on the habitat and the alien species that could potentially invade the site. The impact is therefore scored as ***local***.
Intensity/magnitude	At a local scale, natural functions and/or processes will possibly be notably altered. The magnitude of the impact is therefore scored as ***medium***.
Duration	The impact will occur during construction, but cause effects that will last longer than 15 years, if not controlled. It is therefore scored as ***long term***.
Significance rating	On the basis of the impact being of medium magnitude at a local scale and of long term duration, the impact is scored as having a significance of ***medium***. Mitigation measures will reduce the extent to site specific, the magnitude to very low and the duration of the impact to short term. The significance will, therefore, be reduced to ***very low*** after mitigation measures have been implemented.
Probability	On the basis of known patterns of alien invasions, it is ***probable*** that the impact will occur.
Confidence	There is a reasonable to high amount of useful information on and relatively sound understanding of the environmental factors potentially influencing the impact.

	The confidence in the assessment is therefore rated as ***sure***.
Reversibility	The activity will lead to an impact that could be reversed, if identified and managed. Impacts are possibly reversible within 2 years after the cause or stress is removed. The impact is therefore considered to be ***reversible***.
Irreplaceable loss of resources	May result in irreplaceable loss of resources, but the value of these resources is limited.
Cumulative effect	Low cumulative impact. Added to existing impacts on natural vegetation, the current project will cause additional loss of habitat, but not to a significant degree.
Degree to which impacts can be avoided, managed or mitigated	It is relatively easy to avoid impacts by implementing management measures to detect and control alien invasions.
Mitigation measures	1. Disturbance of indigenous vegetation outside of the footprint of construction must be kept to a minimum. 2. Where disturbance is unavoidable, disturbed areas should be rehabilitated as quickly as possible. 3. Any alien plants within the control zone of the company must be immediately controlled to avoid establishment of a soil seed bank. Control measures must follow established norms and legal limitations in terms of the method to be used and the chemical substances used. 4. An on-going monitoring programme should be implemented to detect and quantify any alien plants that may become established and provide information for the management of aliens. 5. An alien management plan should be compiled for the project.

Overhead power lines

The proposed overhead power lines will, connect an on-site substation and then via a transmission line to the existing Eskom Hydra substation. Each tower structure will have a disturbed area around it in which conditions favouring the establishment of alien species will occur.

Table 28: Impact summary table for Impact 4 for overhead power lines (authorised option).

Establishment and spread of declared weeds and alien invader plants	
Infrastructure component	Overhead power lines
Project alternative	Authorised option
Environmental parameter	Natural vegetation and species
Issue/Impact/Environmental Effect/Nature	Establishment and spread of declared weeds and alien invader plants
Extent	The impact will occur at the site of the proposed towers and in surrounding areas, but could potentially spread into the surrounding landscape, depending on the habitat and the alien species that could potentially invade the site. The impact is therefore scored as ***local***.
Intensity/magnitude	At a local scale, natural functions and/or processes will

	possibly be notably altered. The magnitude of the impact is therefore scored as ***medium***.
Duration	The impact will occur during construction, but cause effects that will last longer than 15 years, if not controlled. It is therefore scored as ***long term***.
Significance rating	On the basis of the impact being of medium magnitude at a local scale and of long term duration, the impact is scored as having a significance of ***medium***. Mitigation measures will reduce the extent to site specific, the magnitude to very low and the duration of the impact to short term. The significance will, therefore, be reduced to ***very low*** after mitigation measures have been implemented.
Probability	On the basis of known patterns of alien invasions, it is ***probable*** that the impact will occur.
Confidence	There is a reasonable to high amount of useful information on and relatively sound understanding of the environmental factors potentially influencing the impact. The confidence in the assessment is therefore rated as ***sure***.
Reversibility	The activity will lead to an impact that could be reversed, if identified and managed. Impacts are possibly reversible within 2 years after the cause or stress is removed. The impact is therefore considered to be ***reversible***.
Irreplaceable loss of resources	May result in irreplaceable loss of resources, but the value of these resources is limited.
Cumulative effect	Low cumulative impact. Added to existing impacts on natural vegetation, the current project will cause additional loss of habitat, but not to a significant degree.
Degree to which impacts can be avoided, managed or mitigated	It is relatively easy to avoid impacts by implementing management measures to detect and control alien invasions.
Mitigation measures	1. Disturbance of indigenous vegetation outside of the footprint of construction must be kept to a minimum. 2. Where disturbance is unavoidable, disturbed areas should be rehabilitated as quickly as possible. 3. Any alien plants within the control zone of the company must be immediately controlled to avoid establishment of a soil seed bank. Control measures must follow established norms and legal limitations in terms of the method to be used and the chemical substances used. 4. An on-going monitoring programme should be implemented to detect and quantify any alien plants that may become established and provide information for the management of aliens. 5. An alien management plan should be compiled for the project.

Table 29: Impact summary table for Impact 4 for overhead power lines (proposed amended option).

Establishment and spread of declared weeds and alien invader plants	
Infrastructure component	Overhead power lines
Project alternative	Proposed amended option
Environmental parameter	Natural vegetation and species
Issue/Impact/Environmental Effect/Nature	Establishment and spread of declared weeds and alien invader plants
Extent	The impact will occur at the site of the proposed towers and in surrounding areas, but could potentially spread into the surrounding landscape, depending on the habitat and the alien species that could potentially invade the site. The impact is therefore scored as ***local***.
Intensity/magnitude	At a local scale, natural functions and/or processes will possibly be notably altered. The magnitude of the impact is therefore scored as ***medium***.
Duration	The impact will occur during construction, but cause effects that will last longer than 15 years, if not controlled. It is therefore scored as ***long term***.
Significance rating	On the basis of the impact being of medium magnitude at a local scale and of long term duration, the impact is scored as having a significance of ***medium***. Mitigation measures will reduce the extent to site specific, the magnitude to very low and the duration of the impact to short term. The significance will, therefore, be reduced to ***very low*** after mitigation measures have been implemented.
Probability	On the basis of known patterns of alien invasions, it is ***probable*** that the impact will occur.
Confidence	There is a reasonable to high amount of useful information on and relatively sound understanding of the environmental factors potentially influencing the impact. The confidence in the assessment is therefore rated as ***sure***.
Reversibility	The activity will lead to an impact that could be reversed, if identified and managed. Impacts are possibly reversible within 2 years after the cause or stress is removed. The impact is therefore considered to be ***reversible***.
Irreplaceable loss of resources	May result in irreplaceable loss of resources, but the value of these resources is limited.
Cumulative effect	Low cumulative impact. Added to existing impacts on natural vegetation, the current project will cause additional loss of habitat, but not to a significant degree.
Degree to which impacts can be avoided, managed or mitigated	It is relatively easy to avoid impacts by implementing management measures to detect and control alien invasions.
Mitigation measures	1. Disturbance of indigenous vegetation outside of the footprint of construction must be kept to a minimum. 2. Where disturbance is unavoidable, disturbed areas should be rehabilitated as quickly as possible. 3. Any alien plants within the control zone of the company must be immediately controlled to avoid establishment of a soil seed bank. Control measures must follow established norms and legal

	limitations in terms of the method to be used and the chemical substances used. 4. An on-going monitoring programme should be implemented to detect and quantify any aliens that may become established and provide information for the management of aliens. 5. An alien management plan should be compiled for the project.

Internal access roads

There will be an extensive network of roads on site to connect turbines. It is assumed that these will be relatively significant in width and structure in order to accommodate the cranes and machinery required for erecting the turbines on site. There will be an extensive disturbed area around the roads in which conditions favouring the establishment of alien species will occur.

Table 30: Impact summary table for Impact 4 for internal access roads (authorised option).

Establishment and spread of declared weeds and alien invader plants	
Infrastructure component	Internal access roads
Project alternative	Authorised option
Environmental parameter	Natural vegetation and species
Issue/Impact/Environmental Effect/Nature	Establishment and spread of declared weeds and alien invader plants
Extent	The impact will occur at the site of the proposed internal access roads and in surrounding areas, but could potentially spread into the surrounding landscape, depending on the habitat and the alien species that could potentially invade the site. The impact is therefore scored as ***local***.
Intensity/magnitude	At a local scale, natural functions and/or processes will possibly be notably altered. The magnitude of the impact is therefore scored as ***medium***.
Duration	The impact will occur during construction, but cause effects that will last longer than 15 years, if not controlled. It is therefore scored as ***long term***.
Significance rating	On the basis of the impact being of medium magnitude at a local scale and of long term duration, the impact is scored as having a significance of ***medium***. Mitigation measures will reduce the extent to site specific, the magnitude to very low and the duration of the impact to short term. The significance will, therefore, be reduced to ***very low*** after mitigation measures have been implemented.
Probability	On the basis of known patterns of alien invasions, it is ***probable*** that the impact will occur.
Confidence	There is a reasonable to high amount of useful information on and relatively sound understanding of the environmental factors potentially influencing the impact. The confidence in the assessment is therefore rated as ***sure***.
Reversibility	The activity will lead to an impact that could be reversed,

	if identified and managed. Impacts are possibly reversible within 2 years after the cause or stress is removed. The impact is therefore considered to be ***reversible***.
Irreplaceable loss of resources	May result in irreplaceable loss of resources, but the value of these resources is limited.
Cumulative effect	Low cumulative impact. Added to existing impacts on natural vegetation, the current project will cause additional loss of habitat, but not to a significant degree.
Degree to which impacts can be avoided, managed or mitigated	It is relatively easy to avoid impacts by implementing management measures to detect and control alien invasions.
Mitigation measures	1. Disturbance of indigenous vegetation outside of the footprint of construction must be kept to a minimum. 2. Where disturbance is unavoidable, disturbed areas should be rehabilitated as quickly as possible. 3. Any alien plants within the control zone of the company must be immediately controlled to avoid establishment of a soil seed bank. Control measures must follow established norms and legal limitations in terms of the method to be used and the chemical substances used. 4. An on-going monitoring programme should be implemented to detect and quantify any alien plants that may become established and provide information for the management of aliens. 5. An alien management plan should be compiled for the project.

Table 31: Impact summary table for Impact 4 for internal access roads (proposed amended option).

Establishment and spread of declared weeds and alien invader plants	
Infrastructure component	Internal access roads
Project alternative	Proposed amended option
Environmental parameter	Natural vegetation and species
Issue/Impact/Environmental Effect/Nature	Establishment and spread of declared weeds and alien invader plants
Extent	The impact will occur at the site of the proposed internal access roads and in surrounding areas, but could potentially spread into the surrounding landscape, depending on the habitat and the alien species that could potentially invade the site. The impact is therefore scored as ***local***.
Intensity/magnitude	At a local scale, natural functions and/or processes will possibly be notably altered. The magnitude of the impact is therefore scored as ***medium***.
Duration	The impact will occur during construction, but cause effects that will last longer than 15 years, if not controlled. It is therefore scored as ***long term***.
Significance rating	On the basis of the impact being of medium magnitude at a local scale and of long term duration, the impact is scored as having a significance of ***medium***. Mitigation

	measures will reduce the extent to site specific, the magnitude to very low and the duration of the impact to short term. The significance will, therefore, be reduced to ***very low*** after mitigation measures have been implemented.
Probability	On the basis of known patterns of alien invasions, it is ***probable*** that the impact will occur.
Confidence	There is a reasonable to high amount of useful information on and relatively sound understanding of the environmental factors potentially influencing the impact. The confidence in the assessment is therefore rated as ***sure***.
Reversibility	The activity will lead to an impact that could be reversed, if identified and managed. Impacts are possibly reversible within 2 years after the cause or stress is removed. The impact is therefore considered to be ***reversible***.
Irreplaceable loss of resources	May result in irreplaceable loss of resources, but the value of these resources is limited.
Cumulative effect	Low cumulative impact. Added to existing impacts on natural vegetation, the current project will cause additional loss of habitat, but not to a significant degree.
Degree to which impacts can be avoided, managed or mitigated	It is relatively easy to avoid impacts by implementing management measures to detect and control alien invasions.
Mitigation measures	1. Disturbance of indigenous vegetation outside of the footprint of construction must be kept to a minimum. 2. Where disturbance is unavoidable, disturbed areas should be rehabilitated as quickly as possible. 3. Any alien plants within the control zone of the company must be immediately controlled to avoid establishment of a soil seed bank. Control measures must follow established norms and legal limitations in terms of the method to be used and the chemical substances used. 4. An on-going monitoring programme should be implemented to detect and quantify any aliens that may become established and provide information for the management of aliens. 5. An alien management plan should be compiled for the project.

Cumulative impacts

Due to the fact that two wind energy facilities are proposed adjacent to one another, the issue of cumulative impacts from both facilities needs to be addressed. There are a total of four impacts that have been assessed in the sections above, as follows:

1. Loss or fragmentation of indigenous natural vegetation,
2. Establishment and spread of declared weeds and alien invader plants;
3. Loss of individuals of protected tree species;

4. Loss of individuals of protected plant species.

The impact on natural vegetation is due primarily to internal access roads. For this infrastructure component the impact was evaluated as being of medium magnitude at a site specific scale and of long-term duration, and the impact was scored as having a significance of ***medium***. If two facilities are taken together then the scale would be elevated to "local", but the remaining measures would stay the same. The significance of the impact for the combined project would therefore remain ***medium***.

Loss of individuals of protected tree species could result from any infrastructure component. For all infrastructure components the impact was evaluated as being of low magnitude at a site specific scale and of long term duration, and the impact was scored as having a significance of ***low***. If the two proposed facilities are taken together then the scale would be elevated to "local", but the remaining measures would stay the same. The significance of the impact for the combined project would therefore remain ***low***.

Loss of individuals of protected plants could result from any infrastructure component. For all infrastructure components the impact was evaluated as being of low magnitude at a site specific scale and of long term duration, and the impact was scored as having a significance of ***low***. If the two proposed facilities are taken together then the scale would be elevated to "local", but the remaining measures would stay the same. The significance of the impact for the combined project would therefore remain ***low***.

Establishment and spread of declared weeds and alien invader plants could result from any infrastructure component. For all infrastructure components the impact was evaluated as being of medium magnitude at a local scale and of long term duration, and the impact was scored as having a significance of ***medium***. If the two proposed facilities are taken together then the scale would be elevated to "local", but the remaining measures would stay the same. The significance of the impact for the combined project would therefore remain ***medium***.

It is therefore concluded that cumulative impacts will not result in impacts having a significance that is greater than for each of the individual proposed wind energy facilities.

DISCUSSION AND CONCLUSIONS

A risk assessment was undertaken which identified four potential negative impacts on the ecological receiving environment. The identified potential impacts are the following:

1. Loss or fragmentation of indigenous natural vegetation;
2. Loss of individuals of protected tree species;
3. Loss of individuals of protected plant species;
4. Establishment and spread of declared weeds and alien invader plants.

The first three impacts would occur during the construction phase of the project and the fourth impact during the operational phase. A summary of the significance of impacts is given in Tables 32 and 33 below for the authorised and proposed amended options respectively. This shows that the potential impact on natural vegetation by the internal access roads is the only impact with a significance of "medium" after mitigation. Other potential impacts are either "low" or can be reduced to "low" or "very low" with mitigation.

Cumulative impacts due to a combination of two wind energy facilities adjacent to one another are not considered to be significant.

Table 32: Summary of significance of impacts for the authorised option

Impact	**Wind turbines**		**Internal access roads**		**Overhead power lines**	
	Without mitigation	With mitigation	Without mitigation	With mitigation	Without mitigation	With mitigation
1. Loss or fragmentation of vegetation	Low	Low	Medium	Medium	Low	Very low
2. Loss of individuals of protected tree species	Very low	Very low	Very low	Very low	Very low	Very low
3. Loss of individuals of protected plant species	Very low	Very low	Very low	Very low	Very low	Very low
4. Spread of alien plants	Medium	Very low	Medium	Very low	Medium	Very low

Table 33: Summary of significance of impacts for the proposed amended option

Impact	**Wind turbines**		**Internal access roads**		**Overhead power lines**	
	Without mitigation	With mitigation	Without mitigation	With mitigation	Without mitigation	With mitigation
1. Loss or fragmentation of vegetation	Low	Low	Medium	Medium	Low	Very low
2. Loss of individuals of protected tree species	Very low	Very low	Very low	Very low	Very low	Very low
3. Loss of individuals of protected plant species	Very low	Very low	Very low	Very low	Very low	Very low
4. Spread of alien plants	Medium	Very low	Medium	Very low	Medium	Very low

The assessed impacts are not shown to be different between the authorised option and the proposed amended option. This is because the categorical nature of the impact assessment methodology does not have the resolution to distinguish between impacts that are marginally different from one another. For example, whether there are 103 turbines, as in the authorised option, or 61, as in the amended option, the extent, magnitude, probability and duration of an impact remain within the same categories. Slight differences would only be possible to distinguish if the impact assessment methodology was calculated using continuous variables.

It is, however, worth noting that the actual footprint area affected by wind turbine generators is lower for the amended option than the authorised option. Based on the permanent hard stand area, the authorised option will result in the destruction of 20.6 ha, whereas the proposed amended option will result in the destruction of 12.2 ha. These areas must be added to the area that will be lost due to internal access roads (in the order of 0.4 ha per kilometre of road for a 4 m wide road for a total of 50 – 60 km of internal roads = approximately 20-24 ha), the substation (2 ha) and the laydown areas (24 ha). The network of internal access roads will be marginally less for the amended option than for the authorised option, because there will be some sections of road that are no longer necessary to construct due to the smaller number of wind turbine generators. The total area affected by the authorised option is therefore in the order of 66.6 ha whereas for the amended option it is in the order of 58.2 ha. This is an approximately 13% reduction in footprint area, which is significant.

When compared to the total area within which the wind energy facility is located (an area approximately 14 x 6 km = 8 400 ha), it can be seen that the overall area affected by either the authorised option or the amended option, including all infrastructure components, is a small percentage of the total area (< 0.8%).

As demonstrated in the paragraph above, the difference in area affected is significantly different for the authorised option and the amended option, with the amended option being lower. The reduction is of benefit to the ecological receiving environment and includes a marginally lower probability of striking populations of any species of concern as well as a reduced loss of overall habitat. Of equal importance is the effect on ecological processes, which are determined on a landscape scale and are not affected so much by the actual footprint of the infrastructure, but more by the way in which the infrastructure creates ecological fragmentation and deleterious edge effects. The effect on ecological processes is therefore deemed to be the approximately the same for both options.

Conclusion

The significance of impacts associated with the proposed amended option is the same as those for the authorised option, according to the impact assessment methodology. However, there is a significant reduction in the actual footprint area associated with the amended option in comparison to the authorised option, which is to the benefit of the ecological receiving environment. The proposed amendments are therefore supported from an ecological point of view.

environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

DETAILS OF SPECIALIST AND DECLARATION OF INTEREST

	(For official use only)
File Reference Number:	12/12/20/ or 12/9/11/L
NEAS Reference Number:	DEA/EIA
Date Received:	

Application for integrated environmental authorisation and waste management licence in terms of the-

(1) National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended and the Environmental Impact Assessment Regulations, 2014; and

(2) National Environmental Management Act: Waste Act, 2008 (Act No. 59 of 2008) and Government Notice 921, 2013

PROJECT TITLE

PROPOSED WIND ENERGY FACILITY SITUATED ON THE EASTERN PLATEAU (SOUTH) NEAR DE AAR, NORTHERN CAPE PROVINCE: APPLICATION FOR AMENDMENT OF ENVIRONMENTAL AUTHORISATION

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E-mail:			

4.2 The specialist appointed in terms of the Regulations_

I, David Hoare , declare that --

General declaration:

I act as the independent specialist in this application;
I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
I declare that there are no circumstances that may compromise my objectivity in performing such work;
I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
I will comply with the Act, Regulations and all other applicable legislation;
I have no, and will not engage in, conflicting interests in the undertaking of the activity;
I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
all the particulars furnished by me in this form are true and correct; and
I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

Signature of the specialist:

David Hoare Consulting cc

Name of company (if applicable):

29 June 2015

Date:

CURRICULUM VITAE

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B.Sc (majors: Botany, Zoology) - Rhodes University, 1991-1993
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M.Sc (Botany) - University of Pretoria, 1995-1997 with distinction
PhD (Botany) – Nelson Mandela Metropolitan University, Port Elizabeth

Main areas of specialisation
- Vegetation ecology, primarily in grasslands, thicket, coastal systems, wetlands.
- Plant biodiversity and threatened species specialist.
- Alien plant identification and control / management plans.
- Remote sensing, analysis and mapping of vegetation.
- Specialist consultant for environmental management projects.

Membership
Professional Natural Scientist, South African Council for Natural Scientific Professions, 16 August 2005 – present. Reg. no. 400221/05 (Ecology, Botany)
Member, International Association of Vegetation Scientists

Employment history
1 February 1998 – 30 November 2004, Researcher, Agricultural Research Council, Range and Forage Institute, Private Bag X05, Lynn East, 0039. Duties: project management, general vegetation ecology, remote sensing image processing.
1 December 2004 – present, Member, David Hoare Consulting cc no. 2001/034446/23. Consultant, specialist consultant contracted to various companies and organisations.
1January 2009 – 30 June 2009, Lecturer, University of Pretoria, Botany Dept.
1January 2013 – 30 June 2013, Lecturer, University of Pretoria, Botany Dept.

Experience as consultant
Ecological consultant since 1995. Author of over 340 specialist ecological consulting reports. Wide experience in ecological studies within grassland, savanna and fynbos, as well as riparian, coastal and wetland vegetation.

Publication record:
Refereed scientific articles (in chronological order):
Journal articles:
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Workshops / symposia attended:

Workshop on remote sensing of rangelands presented by Paul Tueller, University of Nevada Reno, USA, VIIth International Rangeland Congress, 26 July – 1 August 2003, Durban South Africa.

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National Botanical Institute Vegmap Workshop, Kirstenbosch, Cape Town, 30 September-1 October 1999.

Sustainable Land Management – Guidelines for Impact Monitoring, Orientation Workshop: Sharing Impact Monitoring Experience, Zithabiseni, 27-29 September 1999.

WWF Macro Economic Reforms and Sustainable Development in Southern Africa, Environmental Economic Training Workshop, development Bank, Midrand, 13-14 September 1999.

34th Annual Congress of the Grassland Society of South Africa, Warmbaths, 1-4 February 1999

Expert Workshop on National Indicators of Environmental Sustainable Development, Dept. of Environmental Affairs and Tourism, Roodevallei Country Lodge, Roodeplaat Dam, Pretoria, 20-21 October 1998.

South African Association of Botanists Annual Congress, Cape Town, January 1998

Randse Afriakaanse Universiteit postgraduate symposium, 1997.

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Appendix C2:
Avifauna Impact Assessment

a) Addendum to Avifauna Impact Assessment

b) Comment from Chris Van Rooyen (specialist who undertook avifauna pre-construction monitoring programme) on the draft Addendum to the Avifauna Impact Assessment

a) Addendum to Avifauna Impact Assessment

ADDENDUM TO THE AVIFAUNAL IMPACT ASSESSMENT CONDUCTED FOR THE PROPOSED WIND ENERGY FACILTY ON THE EASTERN PLATEAU (SOUTH), NEAR DE AAR, NORTHERN CAPE PROVINCE

APPLICATION FOR AMENDMENT OF ENVIRONMENTAL AUTHORISATION

Specialist report compiled by:

Dr Doug M. Harebottle

For Longyuan Mulilo De Aar 2 South (Pty) Ltd, on behalf of Holland & Associates Environmental Consultants

July 2015

Executive summary

A re-assessment of avifaunal impacts was carried out for a WEF (De Aar 2 South) on the Eastern Plateau, near De Aar in the Northern Cape Province. The facility was granted Environmental Authorisation in March 2013 but based on proposed changes to maximum generation capacity and wind turbine generator (WTGs) technology the applicant (Longyuan Mulilo De Aar 2 South (Pty) Ltd.) applied for an amendment to the EA in June 2015. The amendment includes a reduction in the number of WGTs from 103 to 61, an increase in turbine size (increased hub height and blade length) and there have been some minor changes to some of the locations of the remaining turbines. The overall footprint of the revised proposed WEF has been reduced. An amendment of the EA requires re-assessment of the impacts on the avifauna associated with the proposed changes. This report describes these changes, re-evaluates the impacts (based on the original impact assessment) and discusses any changes to the proposed mitigation to reduce impacts. Data from a completed pre-construction monitoring programme was used extensively in this re-assessment.

The development area falls within the Nama-Karoo biome and forms part of the Platberg-Karoo Conservancy Important Bird Area (IBA). The impact zone of the proposed WEF constitutes a kareekoppie shrubland plateau with rocky outcrops and cliff faces. The surrounding landscape is used primarily for cattle and sheep grazing and comprises karroid scrub vegetation. Overall, the avifauna comprises a rich Nama-Karoo assemblage which reflects the major habitat types within the De Aar region. The initial avifaunal assessment listed 125 species that were recorded on the plateau and in the surrounding landscape (a radius of ± 20 km); the assessment covered both the northern and southern WEF developments. Twenty-three priority species were identified as critical to the impact assessment for both developments. The pre-construction monitoring programme recorded 101 species on the WEF site and identified 24 priority species which included five species not recorded during the initial site visit for the first impact assessment (Grey-winged Francolin, Karoo Korhaan, Rufous-chested Sparrow-hawk, Peregrine Falcon, African Harrier-hawk, , Sclater's Lark). A composite list of 33 priority species was drawn up for the impact re-assessment which included the five additional species above.

The birds which are likely to have the greatest potential relevance relative to the WEF impacts are (a) resident and breeding raptors, foraging on, or moving across the turbine sites, notably, Booted Eagle *Aquila pennatus*, Verreaux's Eagle *Aquila verreauxii,Black-chested Snake-Eagle Circaetus pectoralis*, and Jackal Buzzard *Buteo rufofuscus*; (b) large terrestrial birds foraging on, or moving over, the lowland/plateau interface, including, Karoo Korhaan *Eupodotis vigorsii,* Ludwig's Bustard *Neotis ludwigii*, Kori Bustard *Ardeotis kori,* and Blue Crane *Anthropoides paradiseus* and (c) endemic passerines that utilise the ridge lines (most likely Sclater's Lark *Spizocorys sclateri* and possibly African Rock Pipit *Anthus crenatus*).

The pre-construction monitoring did not consider waterbirds as a significant impact group based on the occurrence of species at wetland sites. However, in light of their sporadic and seasonal movements under favourable conditions it is recommended that they continue to be assessed periodically.

Overall, the construction of the WEF is envisaged to have a *medium*, long-term impact on the avifauna present in the impact zone and possibly in the surrounding areas. The primary proposed avifaunal impacts would arise from (a) disturbance caused by vehicular and people traffic during construction, (b) displacement caused from habitat loss and disturbance during the construction phase and from maintenance activities, and (c) risk of collision with wind turbine blades and powerlines associated with the WEF, and behavioural displacement (alteration of flight paths) during the operational phase.

Effective mitigation measures proposed to reduce impacts on the avifauna, include *inter alia*: (a) carrying out construction for the turbines located closest to the cliff edges before or after the main breeding season for the cliff-nesting raptors (i.e. between December–May) in order to reduce disturbance to breeding pairs, (b) adhering to the 800-m buffer zones around the Booted Eagle and Verreaux Eagles' nest sites for turbine placement, (c) adhering to the 100-m setback distance from the cliff edges for turbine placement, and (d) as an adaptive management approach during the operational phase, marking high-risk turbine blades to make them more visible to birds flying through the area, especially in light of longer blades being proposed.

The proposed increases of 20 m to blade lengths and hub heights, associated with newer WGT technologies, may have some impacts on priority species, particularly Booted Eagle, Verreaux's Eagle and Black-chested Snake-Eagle and to a lesser extent Jackal Buzzard, Ludwig's Bustard and Kori Bustard. However, these impacts will only be properly assessed once the WGTs have been constructed and the WEF is operational (see post-construction monitoring programme below).

A strong recommendation is for a post-construction (operational phase) bird monitoring programme to be carried out as there are limitations to risk-predictive analyses done prior to construction. The monitoring should include species abundance monitoring, flight height assessment of raptors and other large terrestrial species, and intensive carcass searches below the turbines to determine and monitor collision rates for impacted species; adaptive management approaches should be adopted where species-specific mortalities are high. It is also recommended that this programme be incorporated with cumulative impact studies from other renewable energy projects in the area to assess their overall impact on the region's bird populations.

Table of Contents

1. Brief

The purpose of this addendum report is to conduct an additional avifaunal impact assessment based on an application for amendment to the environmental authorisation for a Wind Energy Facility (WEF) on the eastern plateau (South) near De Aar. The original avifaunal assessment was carried out by Harebottle (2012a) based on 103 wind turbine generators (WTGs) within a proposed development area of 9200 ha (92 km^2) on the southern part of the De Aar Plateau. The project was granted environmental authorisation by the Department of Environmental Affairs on 1 March 2013 which included adherence to the proposed avifaunal mitigation measures outlined in Harebottle (2012a).

The proposed amendments by the applicant (Longyuan Mulilo De Aar 2 South Pty Ltd) include:

a. Reducing the number of WTGs from 103 to 61
b. Increasing hub heights from 100 m to 120 m
c. Increasing blade lengths from 60 m to 80 m (i.e. the rotor/ blade diameters would increase from 120m to 160m)
d. Increasing WTG generation size from the approved 1.5 – 2.5MW, to encompass a range from 2.3MW to 4.0MW

The reasons for these amendments are based on:

- the applicant's wishes to increase the generation output of the WTGs in order to align to current international WTG models, and
- to conform to the cap on maximum generation capacity of 140MW per WEF as regulated by the Department of Energy.

2. Terms of reference

Due to these proposed changes, and in accordance with the National Environmental Management Act (NEMA) (No. 107 of 1998), a re-assessment of potential impacts on the associated avifauna is required to be undertaken before Environmental Authorisation can be granted for the revised WEF development.

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

- Address the implications of the proposed amendments in terms of the potential impact(s);
- Conduct a re-assessment of the significance (before and after mitigation) of the identified impact(s) in light of the proposed amendments (as required in terms of the 2014 EIA Regulations), for the construction and operational phases, including consideration of the following:
    - Cumulative impacts;
    - The nature, significance and consequence of the impact;

    - The extent and duration of the impact;
    - The probability of the impact occurring;
    - The degree to which the impact can be reversed;
    - The degree to which the impact may cause irreplaceable loss of resources;
    - The degree to which the impact can be avoided, managed or mitigated;
- Include an impact summary table outlining the findings of the re-assessment in terms of the abovementioned assessment criteria;
- Include a statement as to whether the proposed amendments will result in a change to the significance of the impact assessed in the original EIA for the proposed project (and if so, how the significance would change). The advantages and disadvantages associated with the proposed change.
- Provide a detailed description of measures to ensure avoidance, management and mitigation of impacts associated with the proposed changes.
- Include and address any public comments received during the Public Participation Process (PPP) relating to your area of expertise.
- Include the 12 month pre-construction monitoring report as part of the re-assessment of impacts.

3. Changes to WEF footprint for proposed amended option

Based on the revised layout of the 61 WTGs the following changes were noted (Figure 1):

a. WTGs totally removed from the north-western section of Farm Vedussiekuil
b. There has also been removal of substantial number of WGTs from the edge of the escarpment located on the Farm Matjies Fontain. This area encompassed a sensitive avifaunal zone, namely the known nesting sites for breeding pairs of Verreaux's Eagle and suspected Martial Eagle.
c. Some WGTs have been removed from the south-eastern section of the Farm Vendussiekuil and from the turbine footprint on the Farm Knapdaar.

With the reduction in more than half of WGTs from the layout in the authorised option the overall footprint of the proposed amended option has been reduced. There are no new siting's of WGTs outside of the original footprint of the authorised option. This reduction in the footprint does not equate to an equal percentage of the number of WGTs that have been removed. This is simply due to the fact that where some WGTs have been removed others have been relocated (or shifted) in close proximity to these removals. This means that the overall footprint of the 61 WGTs will only adjust slightly particularly in areas where WGTs have been relocated; where there is complete removal of WGTs from a specific area location (e.g. NE corner of the Farm Vendussiekuil) the footprint reduces considerably.

It is encouraging to note that WGTs that are included in the proposed amended option are now located outside of the originally demarcated sensitive avifaunal buffer zones (Harebottle 2012a).

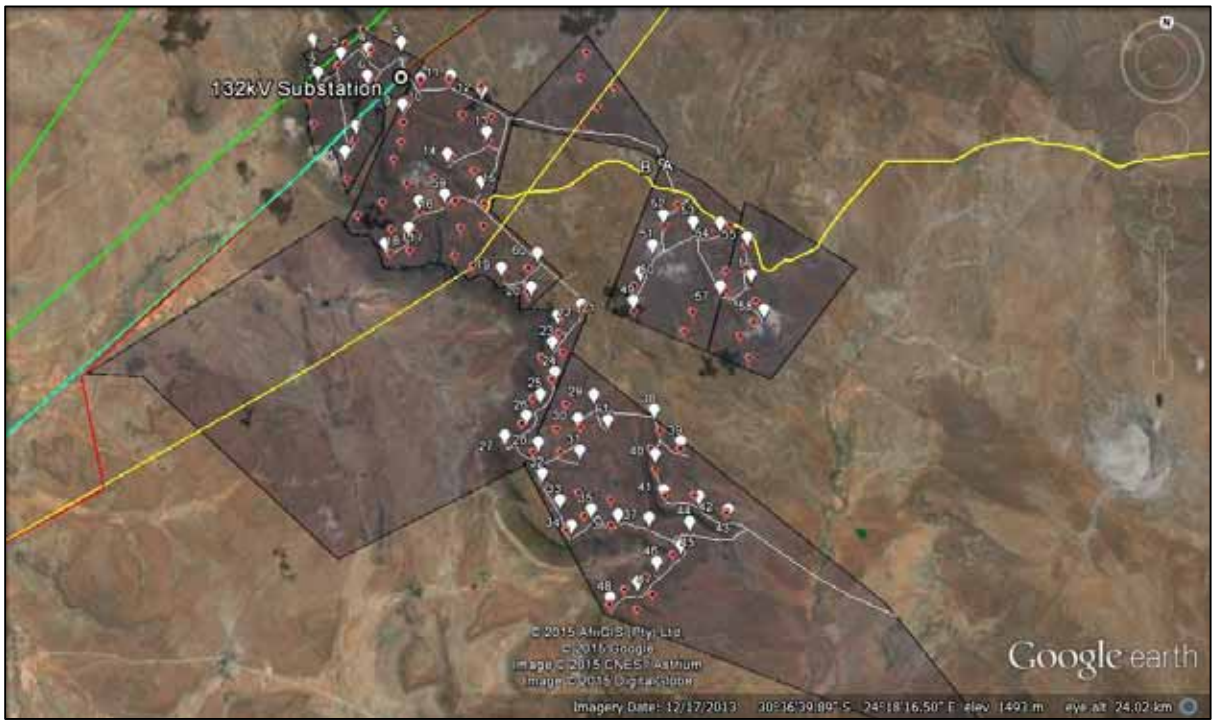

Figure 1. A Google Earth image showing the revised turbine layout for De Aar 2 South WEF on the De Aar plateau. The red placemarks indicate the layout for the authorised option (assessed by Harebottle 2012a); white placemarks indicate the layout for the proposed amended option (assessed in this report). Map supplied by Holland & Associates.

4. Impact assessment methods

This re-assessment was conducted as a desktop study. As the overall footprint of the proposed amended option did not differ significantly from the authorised option no additional site visits were deemed necessary. The following is an outline of the methods used for this report:

- The new WTG layout (proposed amended option) was closely assessed in terms of the avifaunal buffers and setbacks outlined in the authorised option.

- Substantial information was used from the results and outcomes obtained from the completed pre-construction bird monitoring programme for this WEF (van Rooyen *et al.* 2014) to assess displacement and collision risk for the proposed amended option. The pre-construction monitoring was conducted over four seasons covering the following periods: 08 - 15 April 2013 (Autumn), 29 July - 6 August 2013 (Winter), 14 - 22 October 2013 (Spring), and 23 - 30 January 2014 (Summer). Both transect counts and vantage point counts were used to estimate occurrence, abundance and/or flight heights of predominantly priority species.

- Data and outcomes from the initial avifaunal impact report (Harebottle 2012a) were used to make comparisons with van Rooyen *et al.* (2012) in order to get a comprehensive overview of priority species, impacts and to make recommendations in terms of the ToR.

- A full description of the turbine site, associated vegetation types and avi-faunal habitats are given in Harebottle (2012a) and van Rooyen *et al.* (2014). These will not be described in this report but will be referred to where impacts and/or mitigation are relevant.

5. Summary of results from pre-construction monitoring

In order to make any necessary adjustments/changes to the avifaunal impact assessment conducted for the authorised option, a summary of the pertinent findings from the pre-construction monitoring needs to be presented. The following important outputs were derived from van Rooyen *et al.* (2014):

- Overall 101 species were identified over the four monitoring periods for the turbine and control sites. The authors identified 24 priority species. Harebottle (2012a) identified 125 species in and around the WEF site and highlighted 23 priority species. Although there is considerable overlap in priority species, some additional species were recorded and/or identified by either author. A full consolidated list of priority species is presented in Table 1.
- Grey-winged Francolin and Karoo Korhaan were the most regularly encountered priority species within the turbine site. Sclater's Lark and Jackal Buzzard were also recorded frequently.
- Generally abundance of priority species at the turbine site was low (0.58 birds/km).
- The site remains important for Verreaux's Eagle and Booted Eagle and the 800-m buffer around nesting sites and 100 m setback for turbines from cliff edges should be preserved to prevent disturbance.
- Generally, none of the priority species are likely to be displaced.
- There was little flight activity during the vantage point observations at the turbine site (0.66 birds/hour).
- Booted Eagle had the highest collision risk score (133.1) followed by Verreaux's Eagle (26.4). Both species had medium-height flights (i.e. blade height) which occurred mainly around their nest clusters on the western escarpment within the turbine site.
- Jackal Buzzard and Black-chested Snake-Eagle had core flight nodes in the southern and eastern section of the proposed WEF respectively but had fewer medium-height flights than Verreaux's Eagle or Booted Eagle.

- Very little terrestrial bird flight activity was recorded at medium height (6 mins over 240 hrs of observation). Only Ludwig's Bustard and Kori Bustard were recorded. Probably indicative of low-collision risk for terrestrial bird species overall.
- General recommendation that intensive post-construction monitoring (including carcass searches) take place due to limitation of risk predictive analyses and that an adaptive management approach be adopted to manage risks during the operation of the WEF.
- In terms of WGT layout, the authors recommended that no specific turbines needed to be relocated and that the nest buffers and setback zones be retained in order to minimise disturbance and collision risks especially for Verreaux's Eagle and Booted Eagle.

6. Re-assessment of avifaunal impacts

Given the changes to the WEF layout, turbine specifications and the results from the pre-construction monitoring, a re-assessment of the impacts was carried out for the proposed amended option. Impacts that would be assessed follow Harebottle (2012a) and are summarised here:

- Disturbance and displacement of resident or breeding Karoo species from foraging/breeding areas by construction and/or operation of the facility.
- Disturbance and displacement of large terrestrial birds from nesting or foraging areas by construction and/or operation of the facility and/or mortality of these species in collisions with new power lines.
- Disturbance and displacement of resident/migrant raptor species from foraging/breeding areas by construction and/or operation of the facility, and/or mortality of these species in collisions with new power lines, or electrocution when perched on powerlines.
- Disturbance and displacement of resident and breeding waterbirds from nesting and/or foraging areas by construction and/or operation of the facility, and/or mortality of these species in collisions with turbine blades or powerline infrastructure while commuting between resource areas.
- Mortality of aerial foraging species (notably swallows, swifts and martins) with turbine blades or powerlines.

The impact characteristics for the proposed amended option for De Aar Plateau South WEF are outlined in Table 2. These remain largely unchanged from the original avifaunal assessment given in Harebottle (2012a). The only changes that have been made relate to the key receptor species: three species (Greater Flamingo, Blue Crane and Ludwig's Bustard) listed by Harebottle (2012a) have been replaced by five new priority species (Jackal Buzzard,

Peregrine Falcon, Grey-winged Francolin, Karoo Korhaan, Sclater's Lark) that were identified from the pre-construction monitoring (van Rooyen *et al.* 2014).

Table 1. Revised consolidated list of 33 priority species considered important for the proposed amended option for the De Aar Plateau (South) WEF. This list incorporates data from the pre-construction avifaunal monitoring programme (van Rooyen *et al.* 2014). Species listed in bold were observed in the turbine sites either as part of the original EIA (Harebottle 2012) or during the pre-construction monitoring and are of highest priority; other species were recorded in the general surrounding area and include records from the first and second bird atlas projects and/or the EIA site visit (see Harebottle 2012a).

Common name	Scientific name	EIA	Pre-construction monitoring	Conservation status: SA[1] (Global)	Regional endemicity[2]
Heron, Goliath	*Ardea goliath*	X		-	-
Stork, White	*Ciconia ciconia*	X		-	-
Stork, Black	*Ciconia nigra*	X		NT	-
Stork, Abdim's	*Ciconia abdimii*	X		-	-
Flamingo, Greater	*Phoenicopterus ruber*	X		NT	-
Shelduck, South African	*Tadorna cana*	X		-	Endemic
Goose, Spur-winged	*Plectropterus gambensis*	X		-	-
Secretarybird	*Sagittarius serpentarius*	X	X	NT	-
Eagle, Verreaux's	*Aquila verreauxii*	X	X	-	-
Eagle, Tawny	*Aquila rapax*	X	X	VU	-
Eagle, Booted	*Aquila pennatus*	X	X	-	-
Eagle, Martial	*Polemaetus bellicosus*	X		VU (NT)	-
Snake-Eagle, Black-chested	*Circaetus pectoralis*	X	X		
Buzzard, Jackal	*Buteo rufofuscus*	X	X	-	Endemic
Buzzard, Steppe	*Buteo vulpinus*		X	-	-
Goshawk, Southern Pale Chanting	*Melierax canorus*	X	X	-	Near-endemic
Harrier-Hawk, African	*Polyboroides typus*		X	-	-
Sparrow-hawk, Rufous-chested	*Accipiter rufiventris*		X		
Harrier, Black	*Circus maurus*	X		NT (VU)	-
Falcon, Lanner	*Falco biarmicus*	X		NT	-
Falcon, Peregrine	*Falco peregrinus*		X		
Falcon, Amur	*Falco amurensis*	X	X		
Kestrel, Lesser	*Falco naumanni*	X		VU	-
Crane, Blue	*Anthropoides paradiseus*	X	X	VU (VU)	Endemic
Francolin, Grey-winged	*Scleroptila africanus*		X	-	Endemic
Bustard, Kori	*Ardeotis kori*	X	X	VU	-
Bustard, Ludwig's	*Neotis ludwigii*			V (EN)	Near-endemic
Korhaan, Blue	*Eupodotis caerulescens*	X	X	NT	Endemic
Korhaan, Karoo	*Eupodotis vigorsii*		X	-	Endemic
Korhaan, Northern Black	*Eupodotis afra*	X		-	Endemic
Eagle-Owl, Cape Eagle	*Bubo capensis*	X		-	-
Pipit, African Rock	*Anthus crenatus*	X		-	-
Lark, Sclater's	*Spizocorys sclateri*		X	NT (NT)	Endemic

[1] Barnes 2000;

[2] Hockey *et al.* 2005

Table 2. Impact characteristics for the proposed De Aar Plateau South WEF

Summary	Construction	Operation
Project aspect/activity	• Loss of habitat/habitat destruction through site clearance, road construction/upgrade, sub-stations and establishment of the camp and assembly areas. • Disturbance associated with noise and movement from construction activities	• Displacement and/or disturbance from foraging/nesting by noise and/or movement of turbine blades • Collision mortalities with turbine blades and/or powerlines, or electrocution on new power infrastructure.
Impact type	Direct	Direct
Receptors affected	All birds on site; key species – Booted Eagle, Verreaux's Eagle, Martial Eagle, Jackal Buzzard, Peregrine Falcon, Grey-winged Francolin, Karoo Korhaan, Sclater's Lark	All birds on site; key species – Booted Eagle, Verreaux's Eagle, Martial Eagle, Jackal Buzzard, Peregrine Falcon, Grey-winged Francolin, Karoo Korhaan, Sclater's Lark

These potential impacts are described below. Impacts were assessed using methodology provided by Aurecon (2011) and recommendations from Holland and Associates (*in litt.*).

6.1 Construction impacts

(A) Habitat loss

Nature: Construction activities would result in a negative direct impact on the avifauna of the WEF site
Impact magnitude: Low
Extent: The extent of this impact is **local** as it is limited to the site **Duration**: The duration would be **short-medium term** as the affected areas will most likely remain degraded for up to 5 years after completion of the construction phase. **Intensity**: The footprint of the development has been reduced from the authorised option but still covers a wide area. Due to its placement on a ridge-top, there will be some loss of habitat for specialised, montane grassland species. The magnitude of the change will be **low-medium**.
Probability – There is a **definite** likelihood that areas of habitat will be lost
IMPACT SIGNIFICANCE (PRE-MITIGATION): LOW
Degree of confidence: Certain
Reversibility: Irreversible
Can impacts be avoided/mitigated/managed: Yes.
Mitigation: - Avoiding construction in areas classified as a sensitive vegetation type particularly where remnant patches are present (reference will need to be made to the botanical impact

assessment for details of sensitivity). - Rehabilitation of areas that have been altered/cleared could assist in managing habitat loss.
Cumulative impacts: Associated habitat loss from the neighbouring northern section of the De Aar plateau development may lead to additional loss in habitat during the construction phase. However, the impacts may not be severe especially since the overall development footprint of the southern section (this report) has been reduced.

(B) Disturbance and displacement

Nature: Construction activities would result in a negative direct impact on the avifauna of the WEF site
Impact magnitude: Medium
Extent: The extent of this impact is **local**. **Duration**: The duration would be **short-medium term** as this effect will last as long as the construction of the turbines but will not extend beyond the construction phase. **Intensity**: The general avian community will be impacted to some degree although some species may habituate over time. Sensitive and/or threatened species (e.g. Grey-winged Francolin, Sclater's Lark and Karoo Korhaan) could be displaced temporarily from favoured sites, especially if explosives are used for the turbine foundations. Hence, the magnitude of the change will be **medium**.
Probability – There is a **definite** likelihood that birds will be disturbed and/or displaced.
IMPACT SIGNIFICANCE (PRE-MITIGATION): MEDIUM-HIGH
Degree of confidence: Certain
Reversibility: Reversible, to some extent.
Can impacts be avoided/mitigated/managed: Yes, to some degree.
Mitigation: - Reducing and maintaining noise disturbance to a minimum particularly with regards to blasting. Blasting should be avoided (where possible) during the breeding seasons of the general avifaunal community and in particular for the priority species and notably the cliff-breeding raptor species (refer to Table 1 in Harebottle 2012). Blasting should be kept to a minimum and, where possible, synchronized with neighbouring blasts. - Limiting (or avoiding where possible) construction of turbines closest to the cliff-edges from July – November; this will minimize impacts on the breeding productivity of Booted Eagle and Verreaux's Eagle. It is important that all turbines located along the cliff line be included and not only those that are situated closest to the nest sites as the birds use the cliff line for foraging and finding thermals on a daily basis. - Excluding development or disturbance from sensitive areas.
Cumulative impacts: Associated construction activities from the neighbouring northern section of the De Aar plateau WEF development, especially if carried out in parallel with the southern section, may lead to increased cumulative disturbance and displacement impacts on local bird populations. Whether impacts will be severe is unknown and monitoring during construction would help quantify these impacts.

6.2 Operational impacts

(A) Disturbance and displacement

Nature: Operational activities would result in a **negative direct** impact on the avifauna of the WEF through displacing birds caused by disturbance.
Impact magnitude: Medium-High
Extent: The extent of this impact would be regional if Verreaux's Eagles, Booted Eagles, Martial Eagles or Jackal Buzzards are displaced, or local should only other priority species be affected. **Duration**: The duration would be **long-term** as the ecology of the area will remain affected for as

long as the facility is operational. **Intensity**: Some priority species may be displaced for the duration of the project, so the magnitude of the impact will be **medium-high**.
Probability: There is a **definite** likelihood that some priority species will be disturbed and/or displaced.
IMPACT SIGNIFICANCE (PRE-MITIGATION): MEDIUM
Degree of confidence: Sure
Reversibility: Reversible, to some extent.
Can impacts be avoided/mitigated/managed: Yes, to some degree.
Mitigation: - Minimizing the disturbance associated with the operation of the facility, by scheduling, as far as possible , maintenance activities to avoid and/or reduce disturbance in sensitive areas at sensitive times (e.g. breeding season for cliff-nesting raptors , June – November). Where unscheduled maintenance needs to take place, disturbance by maintenance staff will need to be kept to a minimum. The 800-m 'no-go' buffer zones around key nesting areas should largely eliminate the risk of disturbance (C. van Rooyen in litt.). However, should staff be concerned that maintenance to turbines located in sensitive areas may impact on any of the avifauna (notably the cliff –nesting raptors) they should consult with the Environmental Site Officer (ESO) and/or a relevant avifaunal specialist prior to carrying out any maintenance activities.
Cumulative impacts: No major cumulative impacts are envisaged. The construction of the neighbouring norther section of the De Aar plateau WEF development may lead to increased displacement overall but this will need to be quantified during and post-construction of the WEF. There are six proposed Solar Energy Facility developments close to De Aar (Harebottle 2012a) and the Maanhaarberg WEF, located 25 km SW of De Aar, which may cause may cause some behavioural changes to species foraging activity (particularly if construction of all the developments occurs simultaneously) but this may be negligible due to the distance of these projects from the plateau projects and the availability of similar habitat in the surrounding area.

(B) Mortality (Collisions)

Nature: Operational activities would result in a negative direct impact on the avifauna of the WEF site through bird deaths from collision with turbine blades and/or overhead powerlines associated with the WEF.
Impact magnitude: Low-Medium
Extent: The extent of this impact would be **regional** if Verreaux's Eagles, Booted Eagles, Martial Eagles or Jackal Buzzards are killed, or **local** should other priority species be affected, or non-priority aerial foragers (i.e. swifts and swallows) that occupy the area. **Duration**: The duration would be **long-term** as the ecology of the area will remain affected for as long as the facility is operational. **Intensity**: Numbers of individuals of threatened or sensitive species may be killed in collision or electrocution incidents so the magnitude of the change will be **medium-high**.
Probability: There is a **probable** likelihood that birds will be killed.
IMPACT SIGNIFICANCE (PRE-MITIGATION): MEDIUM
Degree of confidence: Unsure
Reversibility: Irreversible
Cam impacts be avoided/mitigated/managed: Yes, to some degree.
Mitigation: - Minimising the length of any new internal power lines installed, and ensuring that all priority lines are marked with bird flight diverters (Jenkins *et al.* 2011) along their entire length. It is recommended that prioritisation of lines take place prior to construction and then refined during the operational phase (C. van Rooyen in litt.); hence (a) prior to the electrification of

the wind farm, an on-site "walk-through" should be conducted by an avifaunal specialist to identify the sections of power line between the turbines which require marking with Bird Flight Diverters as an anti-collision measure, and (b) during the operational phase, regular surveys of the intra-turbine power lines should be conducted as part of the post-construction monitoring programme to assess if there are collision mortalities, and any additional spans identified as high risk should be marked with Bird Flight Diverters. It is imperative that all new power line infrastructure is adequately insulated and bird friendly when configured (Lehman *et al.* 2007). - In addition, the 132kV grid connection should also be inspected at least once a quarter to establish if there is any significant collision mortality. - The project should consider marking the turbine blades as way to reduce collisions, especially in light of longer blades being considered for the WGTs. Although there is no conclusive evidence, some studies have proposed that painting one blade of each turbine black may enhance conspicuousness to oncoming birds (McIsaac 2001, Hodod 2002). It is recommended that this should be considered as part of an adaptive management approach once a specific turbine has been identified as a mortality risk in the operational phase (C. van Rooyen in litt.). Other blade-marking options should also be considered, where applicable. - Ensuring that lighting on the turbines is kept to a minimum, and is coloured (red or green) and intermittent, rather than permanent and white, to reduce confusion effects for birds flying at night. - Using low-risk turbine designs and configurations, which discourage birds from perching on turbine towers or blades (Jenkins 2011). - Monitoring collision incidence and where appropriate being prepared to shut-down problem turbines at particular times or under particular conditions (Jenkins 2011).
Cumulative impacts: The construction of the neighbouring northern section of the De Aar Plateau WEF development may lead to increased collision rates once WGTs are operational but this will need to be quantified during and after the actual construction of the WEFs. Birds displaced from the plateau WEF developments may also face collision risks around the Maanhaarberg WEF. This could lead to further displacement and behavioural changes to species foraging activity patterns and/or reduction in energy-efficient travel. Although collision mortalities will need to be effectively monitored at all WEFs to gauge cumulative impacts, such impacts it should nevertheless be considered at a broader landscape level where multiple renewable projects are being planned or constructed in relatively close proximity to each other.

7. Potential impact of longer turbine blades and increased hub heights

An important component of the proposed changes to the WGTs at the WEF site is making use of turbines that have longer blades (80 m) and higher hub heights (120 m); both the initial impact assessment and pre-construction monitoring programme conducted their studies based on the original WGT specifications: blade lengths of 60 m and hub heights of 100 m.

One of the changes the new WGTs would impose to avifauna would be altering the highest point the blade reaches. The 60 m blades would reach a height of 160 m above ground at their highest arc; the 80 m blades would increase this to 200 m, an overall increase of 40 m. The lowest point of the blades (40 m) would remain the same due to the corresponding increase of the hub height by 20 m.

During the pre-construction bird monitoring programme, van Rooyen *et al.* (2014) used a medium flight height class of 35–125 m to determine species with a high-risk of collision with turbine blades. They found that Booted Eagles and to a lesser extent Verreaux's Eagles and Jackal Buzzards used these heights more frequently than other species and other height classes. Based on the new WGT specifications, this medium flight height may need to be re-adjusted to accommodate the new blade lengths and hub heights, as a portion of the new blade height may now be excluded from this height category; this may have an impact on how the different species use the different flight heights based on the new specifications.

Using the flight height data in van Rooyen *et al.* (2014), a re-calculation of the collision risk-index (rating) was carried out in lieu of the new 40 m increase in blade length and 20 m increase in hub height was (C. van Rooyen in litt.); both medium and high altitude flight classes were included in the revised risk index calculation. The results showed that there was a significant increase in the risk rating for Black-chested Snake-Eagle and Verreaux's Eagle; this was due to increased flight time as a result of the inclusion of high altitude flights. The risk rating for Booted Eagle remained practically the same, and Jackal Buzzard decreased slightly (C. van Rooyen in litt.)

Based on the above, the increased dimensions of the WGTs could be significant for soaring raptors (especially Verreaux's Eagle and Black-chested Snake Eagle) and/or large, slow-flying birds like bustards and korhaans. Van Rooyen (in litt.) highlighted that the majority of scientific studies based on increased hub heights and rotor swept area show that these do not automatically translate into an increase in collision risk (e.g. Howell 1997, Barclay *et al.* 2007, Krijgsveld *et al.* 2009, Smallwood 2013): only two studies have found a correlation between turbine hub height and mortality (De Lucas *et al.* 2008; Loss *et al.* 2013). It seems that the interplay of other factors such as topography, turbine location, morphology and a species inherent ability to avoid turbines play more of a significant role in the magnitude of collision risk. In addition, there is no evidence, at least from European studies (e.g. Raab 2009), that show bustards to be at risk given a larger rotor swept area but studies are limited and more observational data is required. Consequently the risk factors associated with increased hub heights for raptors, bustards and korhaans needs to be interpreted in light of the above scientific literature but at the same time cannot be ignored and needs to be carefully monitored. As it is difficult to accurately predict impacts prior to construction, it is strongly recommended that observations during the post-construction monitoring programme (see *'Conclusions and recommendations'* below) gauge the impact of the new blade heights on flight patterns of priority species, particularly for Booted Eagle, Verreaux's Eagle, Black-chested Snake-Eagle and Jackal Buzzard, and to a lesser extent Karoo Korhaan and Kori Bustard. High risk turbines could then be identified and appropriate action taken to remove or reduce the risk.

8. Revision of sensitive avifaunal areas

Harebottle (2012a) identified three avifaunal sensitive areas; these were identified as 'no-go' (exclusion) zones and turbines located within these buffer zones were strongly recommended to be re-located outside of these zones. These areas included:

- A 1-km buffer around all Verreaux's Eagle nest sites. The buffer area was subsequently reduced to 800-m after consultation with the client and raptor experts.
- A 1.5-km buffer around a disused Martial Eagle nest site. This buffer was revised to 1 km after consultation with the client and raptor experts.
- A 1.5-km buffer of the Vendussiekuil farm dam to reduce disturbance and collision risks for Greater Flamingo and possibly Blue Cranes and ducks that may utilise the wetlands in the area.

The pre-construction monitoring provided important additional data on which to base a revision of the avifaunal exclusion zones. The results from the monitoring highlighted the following (Van Rooyen *et al.* 2014):

- At least two breeding pairs of Verreaux's Eagle with up to four nest sites (for both pairs) clustered on the western escarpment; Harebottle (2012a) listed only one nest site but this was based on information provided by one of the landowners.
- Three Booted Eagle nest sites located on the western escarpment, with at least one active nest in spring; Harebottle (2012a) did not record any Booted Eagle nest sites but his site visit took place in mid-summer (December) and thus would have missed any breeding activity.
- No Martial Eagle nest was located on the western escarpment. A nest was found on a high-voltage pylon but was later discovered to have not been used for a number of years and was thus marked as an abandoned nest site.
- A pair of Jackal Buzzards was confirmed breeding in winter. Harebottle (2012a) did not record any breeding activity but his site visit took place in mid-summer (December) and thus would have missed any breeding activity.
- Observations at the Vendussiekuil farm dam provided no evidence of any priority species (notably flamingos) using the waterbody.

Based on the results from pre-construction monitoring, a revised list of avifaunal sensitive zones was adopted for the proposed amended option. These include:

- Buffer zones of 800 m around the Verreaux's Eagle nest sites
- Buffer zones of 800 m around the Booted Eagle nest sites
- Within a 100 m of the plateau edge (cliff face) – this to prevent raptors, using the cliffs for uplifts, from colliding with turbines that would have been located closer to the edge of the plateau.

The Vendussiekuil farm dam has been withdrawn as an exclusion zone.

As recommended by Jenkins *et al.* (2011), turbine layouts were adaptively assessed based on the results after each season of pre-construction monitoring, and summarised in the final pre-construction monitoring report (van Rooyen *et al.* 2014).

9. Mitigation significance

Based on the proposed mitigation measures described in the above tables, and the results and recommendations from van Rooyen *et al.* (2014), a re-assessment of the significance of the impacts pre- and post-construction was done. The results are presented in Table 3.

Habitat loss impacts before mitigation has changed from *low-medium* to *low*. This is due to the reduction in the number of WTGs which will reduce the area (habitats) that will be impacted during the construction phase. The result from this is the likely increase in the amount of available habitat for the general karoo avifaunal community, given that the avifauna habituate to the turbines once the WEF is established.

The impact significance for disturbance and displacement prior to construction changed from *high* to *medium-high*. With the proposed number of turbines being reduced there will be considerably less construction activities which may reduce the overall impact on the general avifauna. However, the post-mitigation remains unchanged (*medium*) especially in light of the priority species and the raptor community; the latter have nest sites that are situated in fairly close proximity to some of the turbine sites on the edge of the western section of the plateau.

Pre- and post-mitigation significance for disturbance and displacement impacts during operation of the WEF changed from *high* to *medium* and *medium* to *low-medium* respectively. This drop in significance for both impacts is based on the fewer operational activities (e.g. turbine maintenance) that will be associated with an overall smaller footprint, and should mitigation measures proposed above be adhered to then post-construction impacts are likely to be further reduced.

In terms of mortality (collision risks) pre-mitigation significance has been changed from *medium-high* to *medium*. The reduction in the overall footprint of the WEF and number of WGTs are the primary reasons for this. However, it should be noted that this is still a relatively high significance as priority and collision-prone species (e.g. Booted Eagle, Verreaux's Eagle, Jackal Buzzard, Martial Eagle, Karoo Korhaan, Grey-winged Francolin) would still remain largely at risk, given the uncertainty of how these species will react to operational turbines in the landscape.

Table 3. Comparison of the overall significance of impacts between the original avifaunal impact assessment (authorised option, Harebottle 2012a) and this re-assessment for De Aar 2 South (proposed amended option). Where significance has changed this is indicated in *italics*.

Phase/Impact	Pre-mitigation Significance		Post-mitigation Significance	
	Harebottle (2012) (Authorised Option)	This report (Proposed amended Option)	Harebottle (2012) (Authorised Option)	This report (Proposed amended Option)
Construction				
Habitat loss	Low-Medium	*Low*	Low	Low
Disturbance/ Displacement	High	*Medium-High*	Medium	Medium
Operational				
Disturbance/ Displacement	High	*Medium*	Medium	*Low-Medium*
Mortality	Medium-High	*Medium*	Medium	*Medium*

Post-mitigation significance has remained unchanged (*medium*) from the first assessment (Harebottle 2002a). The reasons for this are largely that although the reduction of WGTs should further reduce the frequency of birds colliding with turbine blades and/or any overhead powerlines the risks associated with priority and/or collision-risk species remains uncertain and therefore a more cautionary approach should be followed. Quantitative post-construction monitoring will reveal the real extent of the operational impacts and so these significances, although they provide an optimistic outlook, should be viewed with some caution.

10. Conclusions and recommendations

Harebottle (2012a) described the De Aar plateau as having a moderate to high degree of sensitivity with respect to avifauna. For this proposed amended option for the De Aar 2 South WEF, this description remains unchanged. Although there are no known regionally or nationally critical populations of impact susceptible species within or close to the development area, there are four red-listed endemic species that occur on site (Table 1). In addition, there are six priority species which are considered either endemic or near-endemic and are therefore of some conservation importance (Table 1). The area also falls within the Platberg-Karoo Conservancy Important Bird Area (IBA, SA037) which supports 13 threatened species and 11 range-restricted or biome-restricted species (Barnes 1998).

Overall, construction and operation of the WEF is predicted to have an impact on the avifauna present on site. The predicted disturbances will vary between the two phases. How detrimental the impacts will have on bird populations in the short or long-term is variable and difficult to predict. However, the proposed reduction in the number of turbines and the subsequent reduction in the overall footprint of the WEF (proposed amended option), should assist the avifaunal community by reducing the overall significance of the impacts. This is reflected in the impact significance assessment (Table 3) for this re-assessment.

The breeding sites for Verreaux's Eagle and Booted Eagle remain the focal sites in terms of avifaunal significance. Although the Vendussiekuil dam did not reveal any significance for wetland related species (e.g. flamingos, cranes and ducks)(van Rooyen *et al.* 2014) it is recommended that it and the other dams in the surrounding area continue to be assessed post-construction even on an *ad hoc* basis and especially when they are inundated and/or during flood events. Movements of waterbirds can often be spontaneous, erratic, unpredictable, often seasonal (particularly in karroid environments) and which is usually related to the availability of inundated wetlands (Dennis & Tarboton 1993, Harebottle 2012b). Consequently, their movements need to be continually assessed especially when conditions become favourable for this to occur.

Based on the initial avifaunal assessment (Harebottle 2012a), and extensive data collected from the pre-construction monitoring (van Rooyen *et al.* 2014), the residual impacts remain at least of *medium* significance. This is based mainly on construction and operational impacts on cliff-nesting raptors in the area (primarily Verreaux's Eagle and Booted Eagle), and other priority species including Grey-winged Francolin, Ludwig's Bustard and Sclater's Lark.

In terms of the proposed locations and layout of the WGTs in the site no further refinement is necessary at this stage. Van Rooyen *et al.* (2014) provided recommendations in terms of buffer zones around cliff-nesting raptors and setback distances from cliff edges, and these have been incorporated into the proposed turbine layout. These recommendations were based mainly on the flight height, durations and high collision risk scores for the cliff-nesting raptors (Booted Eagle and Verreaux's Eagle). Terrestrial species generally showed minimal flight activity at medium height (i.e. blade height) and had low collision risk scores; it is therefore likely that collision mortalities for species such as Ludwig's Bustard and Kori Bustard would be negligible, but this will need to be further assessed post-construction.

For cumulative impacts, this proposed amended option cannot be assessed in isolation as they may pose limited threats to avifaunal populations. It needs to be reviewed in combination with the development of other renewable energy facilities in the region. Cumulatively, these are likely to form significant barriers to birds either in the form of displacement from foraging areas or reducing energy-efficient travel between resource areas. No definite cumulative impacts can be provided at this stage of project development. Masden *et al.* (2010) and Jenkins (2011) concur that a more strategic approach to assessing wind energy development in South Africa is required than is currently being applied. It

would be necessary for the Department of Environmental Affairs (DEA), or a similar body, to undertake this strategic assessment as it cannot be assessed in a project specific application.

This re-assessment has highlighted the significant role that intensive pre-construction monitoring plays in providing additional data (particularly flight duration and flight height of priority species) to aid mitigation measures for the avifaunal community on site. When utilising these data for this re-assessment, they did change some of the pre- and post-mitigation impact significance for this proposed development.

A future recommendation is the need for a post-construction monitoring programme to be implemented as soon as the WEF becomes operational. Van Rooyen *et al.* (2014) highlighted this as a critical recommendation adding that the monitoring must include regular searches for bird carcasses within the turbine network to gauge collision risk rates for susceptible species. Monitoring during the operational phase of the WEF falls in line with best practice guidelines regarding avifaunal assessments at WEFs in South Africa (Jenkins *et al.* 2011) and WEF managers are obliged to comply with this requirement as part of the environmental management plans (EMP). As part of this, on-going impacts can be assessed and mitigation measures refined (e.g. shutting specific turbines down) for the WEF, particularly where there may be increased mortality for specific species particularly priority species (van Rooyen *et al.* 2014).

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JENKINS, A.R., VAN ROOYEN, C.S., SMALLIE, J.J., ANDERSON, M.D. & SMIT, H.A. 2011. Best practice guidelines for monitoring and impact mitigation at wind energy development sites in southern Africa. Endangered Wildlife Trust/BirdLife South Africa, Johannesburg.

KRIJGSVELD, K.L., AKERSHOEK, K., SCHENK, F., DIJK, F. & DIRKSEN, S. 2009. Collision risk of birds with modern large wind turbines. Ardea 97(3): 357–366.

LEHMAN, R.N., KENNEDY P.L. & SAVIDGE J.A. 2007. The state of the art in raptor electrocution research: a global perspective. Biological Conservation 136: 159–174.

LOSS, S.R., WILL, T. & MARRA, P.P. 2013. Estimates of bird collision mortality at wind facilities in the contiguous United States. Biological Conservation 168: 201–209.

McISAAC, H.P. 2001. Raptor acuity and wind turbine blade conspicuity. Pp. 59-87. National Avian-Wind Power Planning Meeting IV, Proceedings. Prepared by Resolve, Inc., Washington DC.

RAAB, R., JULIUS, E., SPAKOVSZKY, P. & NAGY, S. 2009. Guidelines for best practice on mitigating impacts of infrastructure development and afforestation on the Great Bustard. Prepared for the Memorandum of Understanding on the conservation and management of the Middle-European population of the Great Bustard under the Convention on Migratory species (CMS). Birdlife International. European Division.

SMALLWOOD, K.S. 2013. Comparing bird and bat fatality rate estimates among North American Wind-Energy projects. Wildlife Society Bulletin 37(1):19–33; 2013; DOI: 10.1002/wsb.260.

VAN ROOYEN C., FRONEMAN, A. & LAUBSER, N. 2014. Avifaunal pre-construction monitoring at the proposed Mulilo De Aar 2 South Wind Energy Facility. Unpublished report. Submitted to Longyuan Mulilo De Aar 2 South (Pty) Ltd.

environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

DETAILS OF SPECIALIST AND DECLARATION OF INTEREST

	(For official use only)
File Reference Number:	12/12/20/ or 12/9/11/L
NEAS Reference Number:	DEA/EIA
Date Received:	

Application for integrated environmental authorisation and waste management licence in terms of the-

(1) National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended and the Environmental Impact Assessment Regulations, 2014; and

(2) National Environmental Management Act: Waste Act, 2008 (Act No. 59 of 2008) and Government Notice 921, 2013

PROJECT TITLE

PROPOSED WIND ENERGY FACILITY SITUATED ON THE EASTERN PLATEAU (SOUTH) NEAR DE AAR, NORTHERN CAPE PROVINCE: APPLICATION FOR AMENDMENT OF ENVIRONMENTAL AUTHORISATION

Specialist:	Dr Doug Harebottle		
Contact person:	Dr Doug Harebottle		
Postal address:	14 Seaton Street, Plumstead		
Postal code:	7800	Cell:	0827363087
Telephone:	0217068406	Fax:	N/A
E-mail:	dm.harebottle@gmail.com		
Professional affiliation(s) (if any)	SACNASP (Pr.Sci.Nat) Member of the South African Wetland Society		

Project Consultant:			
Contact person:			
Postal address:			
Postal code:		Cell:	
Telephone:		Fax:	
E-mail:			

4.2 The specialist appointed in terms of the Regulations_

I, DOUGLAS HAREBOTTLE , declare that --

General declaration:

I act as the independent specialist in this application;
I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
I declare that there are no circumstances that may compromise my objectivity in performing such work;
I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
I will comply with the Act, Regulations and all other applicable legislation;
I have no, and will not engage in, conflicting interests in the undertaking of the activity;
I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
all the particulars furnished by me in this form are true and correct; and
I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

Signature of the specialist:

Name of company (if applicable):

28/6/2015

Date:

CURRICULUM VITAE

DOUGLAS MICHAEL HAREBOTTLE

Last updated: 2015-04-28

GENERAL

Home address	:	14 Seaton Street, Plumstead 7800, South Africa
Telephone number	:	+27 (0) 21 7068406
Postal address	:	As for home address
Work address	:	Dept of Biodiversity and Conservation Biology University of the Western Cape Robert Sobukwe Road Bellville South Africa 7535
Mobile number	:	+27 (0) 82 7363087
Fax number	:	+ 27(0) 86 2737485
E-mail	:	dm.harebottle@gmail.com

PERSONAL DATA

Title	:	Dr
Surname	:	Harebottle
First names	:	Douglas Michael
SA Identity number	:	690528 5043 083
Date of birth	:	28 May 1969
Sex	:	Male
Marital status	:	Married, with two children (19yrs & 16yrs)
Driver's licence	:	Yes, Code 08 (Light commercial vehicle)
Nationality	:	South African
Home language	:	English
Other languages	:	Afrikaans
Health	:	Excellent
LinkedIn profile	:	http://www.linkedin.com/profile/view?id=212487725

EDUCATIONAL QUALIFICATIONS

Last school attended	:	St Benedicts College Bedfordview, Johannesburg (1982 - 1986)
Highest standard passed	:	Matriculated (Grade 12) with a D aggregate

HIGHER EDUCATION

University attended	:	University of KwaZulu-Natal (Pietermaritzburg) South Africa (1987 - 1994)
Degrees obtained and major subjects	:	B.Sc. (1987 - 1989) Zoology III, Entomology II B.Sc. (Hons) - Zoology (1990) M.Sc. - Zoology (1994)
Distinctions obtained	:	Biometry I(a) (1989) Honours Degree awarded *cum laude* Masters Degree awarded *cum laude*
Awards and prizes	:	Received an award from the Zoological Society of southern Africa for being the top Honours student in the Zoology Department at the University of KwaZulu-Natal.
Special courses undertaken	:	Honours thesis: "***Status, distribution, infra-specific variation and foraging behaviour of the Spotted Thrush Turdus fischeri natalicus in southern Africa"*** (Awarded 100% pass) Masters thesis: ***"Conservation biology of the Spotted Thrush Zoothera guttata guttata in southern Africa"*** *(*Awarded *cum laude*)

HIGHER EDUCATION (contd)

University attended : University of Cape Town
South Africa, (2002-2012)

Degrees obtained
and major subjects : Ph.D - Zoology (Part-time)

Special courses undertaken : Doctoral thesis

"Assessing the conservation value of wetlands and waterbirds with a focus on the winter rainfall region of South Africa".

During my employ at the Animal Demography Unit, I registered for a part-time PhD (Zoology) which I completed in 2012. My research focussed on developing methodology to rate the conservation value of wetlands for waterbirds. The outcome from this was developing a new scoring system (Waterbird Conservation Value score) based on the Ramsar 1% thresholds and considering all species at a wetland. The study showed that this system has value for wetlands for which species fall short of the Ramsar threshold but which have important populations that are of conservation value. The system is being tested in the Mediterranean and further application within the Ramsar and BirdLife International's Important Bird Area network is being explored.

FURTHER EDUCATION

Course undertaken : Introduction to Geospatial Technology using QGIS (23 February – 16 March 2015)

MOOC (Massive Open Online Course) offered by the Canvas Network (https://learn.canvas.net) and overseen (graded) by Del Mar College, USA. Modules completed included the following:

- Introduction to GIS
- Spatial Data Models
- Coordinate Reference Systems
- Displaying and Creating Data
- Remote Sensing
- Spatial Analysis Techniques

Course undertaken : Going Places with Spatial Analysis
(3 March – 14 April 2015)

MOOC (Massive Open Online Course) offered by Udemy and presented and overseen by staff and experts from ESRI (https://esri.udemy.com/home/my-courses/#/learning) .

Practical exercises using case studies were done using ArcGIS Online (http://analyze.maps.arcgis.com/home/index.html)

Sections completed included the following:

- Introduction to spatial analysis
- Understanding and comparing places
- Determining how places are related
- Finding the best locations and paths
- Detecting and quantifying patterns
- Making predictions

RESEARCH ROLES/INTERESTS

A. Currently part of a research team investigating the relationships between ancient and modern Sacred Ibis populations. Research team is led by Prof. David Lambert (Griffiths University, Australia) together with Prof. Salima Ikram (American University in Cairo).

Title of the project: “Ancient Ibis Mummies from Egypt: DNA Evolution”

Project started in 2010. Three year funding grant.

Principal role: Coordinate collection of blood from modern Sacred Ibis populations from different regions in Africa.

B. I was part of a research team, headed by Dr Res Altwegg, that looked at the demography and population ecology of Hadeda Ibis in the greater Cape Town area, focusing on understanding the reasons for the species being a successful range expander.

Projected started in 2008 and finished in 2011 but data collection ongoing.

Principal role: Coordinate and assist with catching and (ringing) banding young birds and contribute to ecological aspects of the project and eventual paper.

C. Co-coordinator of a waterbird ringing programme in the south-western Cape Province, with a focus in the Cape Town metropolitan area.

Project started in 2002, and is ongoing.

Primary objective: To determine dispersal, survival and site fidelity of various colonial waterbirds with a focus on African Sacred Ibis.

D. Part of a research team looking at post-fire impacts on bird and plant communities. Researchers come from the Percy Fitzpatrick Institute of African ornithology and the Animal Demography Unik both based at the University of Cape Town.

Projected started March 2015.

POST-GRADUATE STUDENT INVOLVEMENT

- Co-supervisor for Ms Erica Essig (M.Sc., University of Cape Town).

  Thesis title: “Assessing the influence of water depth, water quality and macro-invertebrates on shorebird abundance at an artificial wetland system in Cape Town, South Africa”.

- Co-supervisor for Mr Osama Alkalei (M.Sc., University of the Western Cape).

  Thesis title: “Fixed-point photography of mountain fynbos: post-fire assessment as a tool for management of a protected area”.

- Co-supervisor for Mrs Tracy Meintjes (M.Tech., Nelson Mandela Metropolitan University).

  Proposed thesis title: “Estimating waterbird populations using citizen science” (Proposed title)

- Co-supervisor for Ms Nicky Durant (B.Tech., Cape Peninsula University of Technology).

  Thesis title: “The effect of water quality on the bird species of the Liesbeek urban river system"

PUBLICATIONS

Peer reviewed/Research papers

Harebottle, DM., Taylor, PA & Berruti, A. 1997. The subspecies status of the Spotted Ground Thrush Zoothera guttata guttata (Aves: Turdidae) in South Africa - a multivariate analysis. Durban Musuem Novitates 22: 32-36

Swanepoel D, Underhill LG, Wheeler M, **Harebottle DM** and Williams AJ. 2006. Waterbirds at Theewaterskloof Dam, Western Cape, South Africa. Ostrich 77: 170–174.

Harebottle, DM, Jackson, C & Oschadleus, HD 2005. Wader ringing in coastal Kenya - results and overview from the first AFRING waterbird ringing course. Wader Study Group Bulletin 106: 55-57.

Underhill LG, Crawford RJM, **Harebottle DM** and Tjørve KMC 2007. The development of the heronry on Robben Island, Western Cape, South Africa, 1980–2005. In: S Kirkman (ed). Final report of the BCLME (Benguela Current Large Marine Ecosystem) project on top predators as biological indicators of ecosystem change in the BCLME. Chapter 27. pp. 217-221

Harebottle DM, Williams AJ, Weiss, Y and Tong GB 2008. Waterbirds at Paarl Waste Water Treatment Works, South Africa, 1994-2004: Seasonality, trends and conservation importance. Ostrich 79(2): 147-163.

Harebottle DM and Anderson MD 2011. Flamingos on the runway! Bulletin African Bird Club 18: 83-85

Duckworth GD, Altwegg R & **Harebottle DM** 2012. Demography and population ecology of the Hadeda Ibis (*Bostrychia hagedash*) at its expanding range edge in South Africa. Journal of Ornithology 153: 421-430.

Whittington-Jones C, West S and **Harebottle DM** 2013. Distribution of African Grass-Owl *Tyto capensis* in Southern Africa: survey priorities for Gauteng province. Bulletin of African Bird Club 20 (2):177–185.

Whittington-Jones C. and **Harebottle DM**. 2013. Distribution of African Grass-Owl *Tyto capensis* in Southern Africa: Survey priorities for Mpumalanga. Gabar 24(2): 83–94.

Harebottle DM and Vanderwalt B. 2014. Hybridisation between White-faced and Fulvous Ducks in the wild: further evidence from South Africa. Ornithological Observations 5: 17-21.

Jansen DYM, Abadi F, **Harebottle DM** and Altwegg R 2014 . Does seasonality drive spatial patterns in demography? Variation in survival in African Reed Warblers *Acrocephalus baeticatus* across southern Africa does not reflect global patterns. Ecology and Evolution. Article first published online: 23 Feb 2014 (Wiley).

Harebottle DM & Oschadleus HD 2014. Roadside densities and variation in nest size and structure of sociable weaver colonies near Prieska, Northern Cape, South Africa. Ornithological Observations 5:304-309.

Animal Demography Unit research reports

Harrison JA, **Harebottle DM** 1999. Survey of the avifauna of the Ghaamsberg, Northern Cape. ADU Research Report 35.

Harrison JA, Navarro RA, **Harebottle DM** 2001. Bird monitoring at Blouvlei, Century City, January 2000 - January 2001. ADU Research Report 43. 16pp.

Harebottle, DM 2001. Report on waterbird responses to aircraft disturbance at Kleinriviersvlei, Western Cape Province. ADU Research Report No. 45. Avian Demography Unit, University of Cape Town.

Harrison JA, Navarro RA, **Harebottle DM** 2002. Bird monitoring at Blouvlei, Century City, March 2001 - February 2002. ADU Research Report 47. 17pp.

Harebottle, DM, D'Arcy, P., Hancock, P., Hearn, RD, Wheeler, M. & Brewster, C. 2006. Report on a waterbird ringing study at Lake Ngami, Botswana, 3–18 December 2005. ADU Research Report No. 70. Avian Demography Unit, University of Cape Town.

Harebottle DM, Harrison JA, Navarro RA 2004. Conservation of Birds in Gauteng: an Analysis. Parts 1 & 2. ADU Research Report 60a & b: 245pp.

Williams AJ, Harrison JA, **Harebottle DM** 2005. Specialist study on birds for the Strandfontein section of the proposed N21 (R300) Cape Town Ring Road Toll Project, and its alternative routes. ADU Research Report 67.

Bruinzeel LW, Navarro RA, **Harebottle DM**, Underhill LG 2006. Distribution of wild birds as potential avian influenza vectors in KwaZulu-Natal. ADU Research Report.

De Villiers MS, Dyer BM, Calf KM, **Harebottle DM**, Oschadleus HD, Mecenero S, Ward VL 2003. The Institute of Ecology (Friederich-Schiller University, Jena) and Avian Demography Unit Collaborative Research Project, 22 September-9th October 2003. ADU Research Report 53: 15pp. Report to Western Cape Nature Conservation Board and the Robben Island Museum

Other reports

Harebottle DM 2005. Coordination of African Waterbird Ringing Schemes. Progress report to African-Eurasian Migratory Waterbird Agreement (AEWA).

Harebottle DM 2007. Coordination of African Waterbird Ringing Schemes. Progress report to European Commission on behalf of African-Eurasian Migratory Waterbird Agreement (AEWA).

Wilson JGM**, Harebottle DM,** Roxburgh L & Nkhulungo E. 2006. Avian influenza and waterbird monitoring at Lake Chilwa, Malawi, 9-16 February 2006. Unpublished report to United Nations Food & Agricultural Organisation and Wetlands International.

Wilson JGM**, Harebottle DM** & Nkhulungo E. 2007. Avian influenza surveillance at Lake Chilwa, Malawi, 14-21 December 2006. Unpublished report to United Nations Food & Agricultural Organisation and Wetlands International.

Wilson JGM**,** Iverson S, **Harebottle DM**, Elridge W & Nkhulungo E 2007. Duck trapping, satellite telemetry and avian influenza surveillance at Lake Chilwa, Malawi, 27 January - 15 February 2006. Unpublished report to United Nations Food & Agricultural Organisation and Wetlands International.

Harebottle DM 2015. An assessment of waterbirds at various wetlands in the Western Cape. In: Malan, H,. Day, JA, Ramjukadh, C-L, and Olivier, N. Trajectories of change in wetlands of the Fynbos Biome from the late 1980s to 2014. Water Research Commission Report, January 2015. App. 2.

Conference papers/abstracts/round-table discussions

Harebottle DM 2000. Coordinated Waterbird Counts in South Africa – overview, results 1992–2000 and recommendations. 10th Pan-African Ornithological Congress - Programme and book of abstracts. Kampala, Uganda, 3–8 September 2000. p. 33.

Harebottle DM 2001. Using the Nest Record Card (NERCS) Scheme to monitor crane nests. In: Proceedings of the 12th South African Crane Working Group Workshop, 22-23 November 2000. pp. 74-76.

Harebottle DM 2001. A preliminary investigation into the effects of migration mortalities on the Spotted Ground Thrush (*Zoothera guttata*) in South Africa. In: The avian calendar: exploring biological hurdles in the annual cycle (Programme and abstracts). Third conference of the European Ornithologists' Union, 21–25 August 2001, Haren/Groningen, The Netherlands. pp. 125–126

Harebottle, DM. & Underhill, LG. 2001. Abundance and richness of Palearctic waders in South Africa (1992–2001) – a preliminary review using data from the coordinated waterbird counts (CWAC). In: Wader Study Group annual meeting (Programme and abstracts), Kollumerpopmp, The Netherlands, 31 August–2 September 2001. p. 30.

Harebottle DM 2003. A preliminary investigation into the effects of artificial breaching on waterbirds at the Bot River Estuary, Western Cape, 1993-2003. In: Wet and Wildlife - Current trends in Zoology and Limnology in southern Africa. Joint conference of SASQs and ZSSA, University of Cape Town, 30 June – 4 July 2003. pp. 117–118.

Harebottle DM & Oschadleus HD. 2004. Waterbird ringing in Africa – past trends and future scope. In: Birds crossing borders – linking people and habitats. 11th Pan-African Ornithological Congress - Programme and abstracts. Djerba, Tunisia, 20–25 November 2004. p. 44.

Harebottle DM, Williams AJ and Weiss Y. 2004. Ten years of waterbird counts at Paarl Bird Sanctuary, Western Cape, South Africa: 1994–2004. In: Birds crossing borders – linking people and habitats. 11th Pan-African Ornithological Congress - Programme and abstracts. Djerba, Tunisia, 20–25 November 2004. p. 44-45. (Poster)

Harebottle DM 2001. A preliminary investigation into the effects of migration mortalities on the Spotted Ground Thrush (*Zoothera guttata*) populations in South Africa. . In: Birds crossing borders – linking people and habitats. 11th Pan-African Ornithological Congress - Programme and abstracts. Djerba, Tunisia, 20–25 November 2004. p. 44. (Poster)

Harebottle, DM, Navarro, RA, Underhill, LG. & Waltner, M. 2006. Trends in numbers of migrant waders (Charadrii) at Langebaan Lagoon, South Africa, 1975-2003. In: Boere, GC, Gailbrath CA & Stroud, DA (eds). Waterbirds around the world: a global overview of the conservation, management and research of of the world's waterbird flyways. The Stationery Office, Edinburgh, UK. pp. 376-378.

Harebottle, DM. & Underhill, LG. 2006. The Arctic connection: monitoring coastal waders in South Africa - a case study. In: Boere, GC, Gailbrath CA & Stroud, DA (eds). Waterbirds around the world: a global overview of the conservation, management and research of of the world's waterbird flyways. The Stationery Office, Edinburgh, UK. pp. 138-139.

Harebottle DM, Williams AJ, Weiss Y & Tong G. 2006. Ten years of waterbird counts on an urban wetland: Paarl Sewage Works, South Africa: 1994–2004.In: Program and general congress information, 25th International Ornithological Congress, Hamburg, Germany, 13–19 August 2006. p. 53. (Poster).

Harebottle DM & Oschadleus HD**.** 2006. AFRING and the future of waterbird ringing in Africa. In: Programme and abstracts, 12 Pan-African Ornithological Congress, Goudini, South Africa, 7–12 September. p. 45 (Round table discussion)

Altegg R & **Harebottle DM.** 2008. Breeding success and juvenile survival of urban Hadeda Ibis (*Bostrychia hagedash*). In: Programme and abstracts, 12th Pan-African Ornithological Congress, Goudini, South Africa, 7–12 September. p. 32.

Harebottle DM, Underhill LG and Barnard, P 2009. The second Southern African Bird Atlas Project (SABAP2): changes and conservation outcomes. p. 95. (Poster)

Harebottle DM. 2008. AFRING: current assessment and the way forward. In: Programme and abstracts, 12 Pan-African Ornithological Congress, Goudini, South Africa, 7–12 September. p. 23 (Round table discussion)

Harebottle DM, Underhill LG and Brooks M 2009. The second Southern African Bird Atlas Project: protocols and conservation outcomes. In: 50 years of zoological research: reflection and insights. Zoological Society of southern Africa – 50th anniversary conference, Natalia, Illovo Beach, Kwazulu-Natal. p. 40.

Harebottle DM, Underhill LG and Brooks M 2012. The second Southern African Bird Atlas Project: four years on. In: Frontiers in South African Ornithology. Symposium organized by BirdLife South Africa and Fitzpatrick Institute of African Ornithology, Port Elizabeth, 15-16 March 2012. p.4.

Harebottle DM, Underhill LG and Brooks M 2012**.** MyBirdPatch: a new project to monitor changes in local bird populations. In: Frontiers in South African Ornithology. Symposium organized by BirdLife South Africa and Fitzpatrick Institute of African Ornithology, Port Elizabeth, 15-16 March 2012. pp. 14-15.

Harebottle DM, Underhill LG and Brooks M 2012. The second Southern African Bird Atlas Project: progress and outcomes, 2007–2012.In: Programme and abstracts. 13th Pan-African Ornithological Congress, Arusha, Tanzania. 14-21 October 2012. p. 32.

Harebottle DM, Underhill LG and Williams AJ M 2012. A proposed new method to assess wetland avifaunal importance: flyway and regional approaches. In: Abstracts. 13th Pan-African Ornithological Congress, Arusha, Tanzania. 14-21 October 2012. p. 32.

Chapters in books

Harebottle DM 2000. Spotted Ground Thrush. In: Barnes KN (ed.) The Eskom Red Data Book of Birds of South Africa, Lesotho and Swaziland. Johannesburg: BirdLife South Africa. pp. 51-53.

Harebottle DM. & Harrison JA. 2003. Spur-winged Goose *Plectropterus gambensis*. In: Big Birds on Farms: Mazda CAR Report 1993-2001. Young DJ, Harrison JA, Navarro RA, Anderson MD & Colahan BD (eds), pp. 95-99.

Popular publications (59)

Most recent five publications

Harebottle DM 2005. Powerlines and waterbirds at Edith Stephens Wetland Park. Primary Science Programme News. 2nd Term. p. 4.

Harebottle DM 2005. Powerlines and waterbirds: a win-win situation for Edith Stephens Wetland Park. Promerops 262: 11.

Harrison JA, **Harebottle DM**, Wheeler MJ 2006. Birds in Reserves Project: Instructions. ADU Guide No. 1. 36pp.

Harebottle, DM. & Gibbs, D 2006. At what age do African Sacred Ibis breed? Promerops 265: 13.

Harebottle, DM 2011. CWAC – making a difference for waterbirds and wetlands. The Kite 91: 2.

Harebottle DM 2012. CWACing waterbirds in IBAs. IBA Newsletter. Spring 2012. BirdLife South Africa. pg. 5

Unpublished EIA reports (15)

Most recent five reports

Harebottle, DM 2012. Construction of a wind energy facility on the Eastern Plateau, near De Aar, Northern Cape. Avifaunal Impact Assessment. Unpublished report to Aurecon (Pty) Ltd.

Harebottle DM 2012. Construction of three photovoltaic energy facilities near De Aar, Northern Cape. Avifaunal Impact Assessment. Unpublished report to Aurecon (Pty) Ltd.

Harebottle DM and van der Westhuizen AC 2012. Construction of wind and solar energy facilities near Springbok, Northern Cape. Avifaunal Impact Assessment. Unpublished report to Aurecon (Pty) Ltd.

Harebottle DM 2014. Avifaunal impact assessment of the proposed Boundary Solar Energy Facility (farm Kareeboom 1716), near Kimberley, Free State province. Unpublished report to Savannah Environmental (Pty) Ltd.

Harebottle DM 2014. Avifaunal impact assessment of the proposed Blackwood Solar Energy Facility (portion 1 of farm Padamsfontein 1593), near Kimberley, Free State province. Unpublished report to Savannah Environmental (Pty) Ltd.

Harebottle DM 2014. Avifaunal impact assessment of the proposed Bosjesmansberg Solar Energy Facility (portion 1of farm Bosjesmansberg 67), east of Copperton, Northern Cape province. Unpublished report to Savannah Environmental (Pty) Ltd.

Conferences/Congresses/Symposiums attended

Pan-African Ornithological Congress (PAOC)

2000 – Uganda (1 oral presentation + abstract)

2004 – Tunisia (1 oral presentation + abstract)

2008 – South Africa (1 poster presentation + abstract, Chair of Scientific Programme Committee)

2012 – Tanzania (2 oral presentations + abstracts, Chair of Symposium)

International Ornithological Congress (IOC)

2006 – Germany (2 poster presentations + abstracts)

Global Flyways Conference (Waterbirds Around the World)

2004 – Edinburgh (2 poster presentations + abstracts)

Wader Study Group

2001 – Annual Meeting, The Netherlands (1 oral presentation + abstract)

European Ornithologists' Union (Third Conference)

2001 – Groningen, The Netherlands (2 poster presentations + abstracts)

Zoological Society of South Africa (ZSSA)

2003 – Cape Town (poster presentation + abstract)

2010 – KwaZulu-Natal (oral presentation + abstract)

Frontiers of South African Ornithology conference

2012 – Port Elizabeth (2 oral presentations + abstracts)

Book reviews

The Atlas of Birds: Mapping Avian Diversity, Behaviour and Habitats. Ostrich 83: 175

Other reviews

I was asked by the Centre for Environmental Rights, working on behalf of BirdLife South Africa, to provide an independent and objective assessment of an existing environmental impact assessment report and environmental management report submitted for a coal mining application in Mpumalanga, South Africa. Report submitted 29 July 2013.

The title of the report was "**AN ASSESSMENT OF THE ENVIRONMENTAL IMPACT ASSESSMENT AND ENVIRONMENTAL MANAGEMENT REPORT FOR THE PROPOSED COAL MINING OPERATION FOR WILLIAM PATRICK BOWER (PTY) LTD ON THE FARMS GROENVLEI 353JT AND LAKENVLEI 355JT"**

Courses/workshops attended

Aug 1995 – River Ecology Course

Attended a three day course in the Kruger National Park (Olifants River) covering all aspects of river ecology, including vegetation assessments and fish sampling. Course was coordinated and run by Dr Andrew Deacon.

July 2007 – Project Management

2-day course presented by the Staff Learning Centre, University of Cape Town

Sept 2010 – Introduction to R (statistical software package)

1-day introductory course presented By Dr Res Altwegg at South African National Biodiversity Institute

Sept 2010 – Statistical Modelling Workshop for Biologists

4-day workshop presented by lecturers from Centre for Research into Ecological and Environmental Modelling (St Andrews University, Scotland) and hosted by University of Cape Town.

July 2012 – Statistical Modelling Workshop for Biologists

4-day workshop presented by lecturers from Centre for Research into Ecological and Environmental Modelling (St Andrews University, Scotland) and hosted by University of Cape Town.

Attended as a follow-up to the 2010 course.

March 2013 – Climate Information Platform and e-learning workshop

1-day workshop hosted by the Climate Systems Analysis Group (CSAG), Department of Environmental and Geographical Sciences, University of Cape Town.

Covered an introduction to CSAGs climate information tools (Climate Information Platform – CIP) and e-learning materials which incorporated three concepts of climate science (uncertainty, climate data and principles of modeling and downscaling).

April 2014 – Data publishing tool for bird and bat monitoring and assessments

Attended a two day workshop at SANBI to discuss the development and implementation of an on-line data tool for bird and bat monitoring data, primarily from renewable energy impact assessments and/or monitoring.

Radio/TV interviews

1) Interviewed by Tim Neary (702/CapeTalk) on 1 July 2012 as part of his environmental slot on Sunday mornings (06:00- 07:00). Topic was the five year anniversary of the second Southern African Bird Atlas Project (SABAP2).
2) Video interview by Aletta Gardner from Eye Witness News on 23 April 2013 about the return of Greater Flamingos to the Black River in Cape Town. Here is the link to the video clip - http://ewn.co.za/Media/2013/04/29/130429flamingos

Professional associations

- I am a paid up member of the South African Wetland Society.
- Registered as a Professional Natural Scientist with the South African Council for Natural Scientific Professions (SACNASP)

NGO affiliations/memberships

- I am a paid up member of the Wildlife and Environment Society of South Africa (WESSA)
- I am a member of BirdLife South Africa (BLSA)
- I am a member of the Friends of the Liesbeek River (NPO).

CURRENT POSITION

Name of firm/organisation	:	Department of Biodiversity and Conservation Biology, University of the Western Cape & South African National Biodiversity Institute, Kirstenbosch
Post held	:	Post-doctoral Research Fellow (1 October 2014 – present)
Major job functions	:	(a) To develop a research strategy for the development and creation of a Centre of Excellence (CoE) in Biodiversity Information Management (BIM), with a strong focus on developing post-graduate curricula and research topics within the framework of BIM and the University of the Western Cape. The strategy aims to bring together skills and content areas from disciplines such as Education, Information Technology, Biodiversity, Spatial Ecology, Conservation Planning, Information Management, Geographic Sciences and Computer Systems and to develop a strong post-graduate hub as a stepping stone to the CoE. (b) Demonstrate the value of 'Primary Data' through a showcase example of using bird data. (c) Part-time lecturing: "Introduction to Systematic Conservation Planning" and "Basic Marxan Principles" (Third-year BCB students).

PREVIOUS EXPERIENCE

(A)

Name of firm/organisation	:	Animal Demography Unit
Address of firm/ organisation	:	Department of Biological Sciences University of Cape Town Private Bag Rondebosch South Africa 7701
Type of firm/organisation	:	Animal Research Unit within University
Post held	:	Project Manager - Second Southern African Bird Atlas Project (SABAP2) (monitoring changes in bird distributions in South Africa using bird atlasing methodology) - MyBirdPatch (monitoring bird populations at fine spatial scales) (1 December 2006 – 30 September 2013)
Major job functions	:	Overall management of the projects involving (a) planning, coordination and implementation of project activities especially those related to database and electronic media, (b) providing feedback to volunteers, (c) managing and leading a small team of staff, (d) arranging steering committee meetings and taking minutes and (d) overall financial management of the project.
Post held	:	African Waterbird Ringing Coordinator for AFRING (African Waterbird Ringing Scheme) (1 January 2004 – 30 November 2006)
Major job functions	:	This was a African-Eurasian Waterbird Agreement (AEWA) project set up to coordinate waterbird ringing schemes and waterbird ringing initiatives in Africa. A large focus of my duties was planning, coordinating and facilitating waterbird ringing training courses in different regions within Africa to build local and regional capacity in order to strengthen bird ringing initiatives on a continental scale. During my appointment I coordinated and ran three training courses (Kenya 2004, Botswana 2005, Ghana 2006 and Zambia 2008).

Other tasks included collating historical waterbird ringing data, creating a central database system to store and curate African ringing data and to coordinate and hold annual stakeholder meetings in order to guide the policy and tasks of AFRING.

Post held : Project Coordinator
(1 March 1999 – 31 December 2003)

Main job functions : I was responsible for coordinating and managing three national bird programmes:

1. CWAC (Coordinated Waterbird Counts)
2. BIRP (Birds In Reserves Project)
3. NERCS (Nest Record Card Scheme)

CWAC was my major focus and the *modus operandi* of the programme was to coordinate the counting of waterbirds at wetlands in South Africa using volunteers and professional ornithologists. I also managed and curated the national waterbird counts database.

CWAC falls within Wetlands International's African Waterbird Census (AfWC) programme which is part of its International Waterbird Census (IWC), initiative. It also forms part of South Africa's commitment to the Ramsar Convention, the Bonn Convention (CMS) and African Eurasian Waterbird Agreement (AEWA).

BIRP is a programme that monitors birds within Protected Areas, the main objective being to see which species are adequately protected and to assist conservation agencies in setting conservation and management policies for those species that are not suitably protected. My main job functions for this programme were to maintain regular data processing and vetting, and perform all necessary PR with sponsors and participants.

NERCS is a nest monitoring programme that aims to determine the breeding success of birds breeding in South Africa using data collected from specially designed Nest Record Cards. My duties here encompassed coordinating and maintaining data capture of new cards and performing all necessary PR with sponsors and participants.

(B)

Name of firm/organisation	:	Mpumalanga Dept of Environmental Affairs & Tourism. Directorate: Environmental Education
Post held	:	Principal Environmental Officer (1 August 1997 – 30 April 1998)
Main job functions	:	To promote appropriate environmental education programmes and activities amongst teachers and other community leaders. To use my skills and knowledge to promote and increase environmental awareness among schools and the community, e.g. with my academic background and interest in birds I developed a bird programme for the environmental centre focusing on bird morphology, adaptations for flight, bird ringing, bird behaviour and conservation. I would take children on walks teaching them to identify birds and learn more about their importance in the environment. The planning, co-ordination and management of environmental projects which were in accordance with the principles of the Directorate of Environmental Education. Projects initiated in this regard included (1) negotiations with local government to re-establish a vulture restaurant in the nearby Gustav Klingbiel Nature Reserve, (2) the establishment of a bird club for the escarpment region of Mpumalanga, (3) the implementation of an Enviro-Focus programme for Lydenburg and (4) the launch of a national river bio-monitoring programme at schools in the centre's management area. The control and management of all hi-tech office equipment, including the fax machine, photocopier, computer, printer and telephones. The facilitation and co-ordination of a guardian group, entailing overseeing and managing two junior staff members. This included training, capacity building and evaluation on a regular basis.

(C)

Name of firm/organisation	:	Olifants River Forum
Type of firm/organisation	:	Volunteer-based, non-government conservation organisation
Post held	:	Scientific & Communications Officer 1 September 1995 - 29 November 1996 Based in Lydenburg, South Africa
Main job functions	:	My duties included inter alia:

Providing specialist advice as well as service with respect to all aspects which in the opinion of the Forum fell within my area of expertise;

Acting as a representative of the Forum when duly authorised thereto in fields of interest to the Forum;

Fund-raising activities aimed at increasing the funds of the Forum to allow greater scope of research, management and activities to be undertaken and maintained;

Maintaining records and supplying reports on a quarterly basis.

Management and maintenance of all equipment, supplies and property entrusted to me or placed in my care with due diligence;

To investigate the possibilities and potential of a wide range of scientific research projects which were in keeping with the aims of the Forum and the formulation of project recommendations and budgets for presentation to the Forum for approval;

The management and control, in accordance with the instructions of the appointed auditors of the Forum, of the activities and budgets of any approved projects;

Assisting the regional chairpersons in the administration of their duties, including the attendance of regional meetings and acting as a liaison officer between the regional committees and the central management committee of the Forum.

Special courses undertaken	:	Attended a three day River Ecology Course in the Kruger National Park.

(D)

Name of firm/organisation	:	Durban Natural Science Museum
Post held	:	Assistant to museum Ornithologist Temporary vacation position (27 November 1989 - 31 January 1990)
Main job functions	:	Assisted Dr Aldo Berruti with his study into Spotted Thrush speciation and which I later incorporated into my Honours thesis The work involved gathering mensural data from museum specimens and applying multivariate methods to test for differences between individuals implying any subgroupings Multivariate analyses were done using BIOSTAT II, a computer generated statistical software package, and a scatterplot derived to determine the validity of any subgroupings. Conclusions, based on these results, were then derived for explaining any differences between Spotted Thrush collected at different geographical locations.
Other positions/experience	:	Employed by the Department of Agriculture as a Resource Conservation Inspector for the Redbilled Quelea Control Programme from 15 October to 25 October 1993. However, due to time and travel constraints imposed by this position I voluntary resigned in order to complete my Masters degree. Assisted with tutoring zoology and biology undergraduate students at University. Work mainly involved aiding students during their practicals and on field excursions. Assistant – Rennies Wetland Project (September 1998 – January 1999) I was employed by the Rennies Wetland Project to work as an assistant to Mr Anton Linström, Wetland Ecologist at the Mpumalanga Parks Board. My duties here included capacity building regarding wetland description and functioning,

plus the formulation of a three to four month project to enhance wetland conservation in Mpumalanga. The project I identified was the nomination of Verloren Valei Nature Reserve, near Dullstroom, as the first Ramsar site in Mpumalanga. This involved collecting, synthesizing and summarizing all the data necessary for the application.

From 1996 I have acted in a part-time/ad hoc capacity as a freelance avifaunal consultant conducting bird surveys as part of biodiversity assessments for private landowners and specialist avifaunal assessments as part of Environmental Impact Assessments (EIAs). For the latter, I have conducted assessments for commercial and estate developments, but with a major emphasis in the mining and renewable energy sectors. I have been contracted by various environmental consultancies to carry out the EIA projects. Most of my renewable energy (wind and solar farms) projects have been carried out in the Western and Northern Cape provinces. I have been involved with the EIA work since 2000. For a full list of reports please refer to “Unpublished EIA reports” in Appendix 2 (“List of publications”)

ADDITIONAL INFORMATION

Other skills : Qualified bird ringer (bander). Registered with SAFRING since 1998. SAFRING ringers no. 751. Over 5 000 birds ringed.

I have experience with passerine mist-netting and catching juvenile waterbirds (ibises, egrets, herons, spoonbills) and seabirds (African Black Oystercatcher, Swift Tern, Kelp Gull, Hartlaub’s Gull, Great White Pelican) at breeding colonies. I assisted with banding of rehabilitated African Penguins after the *Treasure* oil spill. In addition I have experience with using colour rings (plain and engraved) and extracting blood.

Hobbies : Reading, Hiking, Tennis, Birding & avid amateur bird photographer

Leadership roles :

Committee Member – Witwatersrand Bird Club
Conservation Chairperson
(September 1993 - August 1995.)

Primary duties included the development and conservation of existing and proposed bird sanctuaries in Gauteng. Encouraging and promoting conservation issues amongst members, especially through involvement with conservation projects, was another important task. Secondary duties included leading outings and organising activities within the club.

Gauteng representative for CWAC (Co-ordinated Waterbird Counts)

My duties here encompassed identifying important wetlands and organising bi-annual waterbird counts at these wetlands. This role was carried out as part of my portfolio on the Witwatersrand Bird Club committee.

Chairman : Escarpment Bird Club, Lydenburg
9 October 1997 – 15 February 1999
(Satellite club of the Lowveld Bird Club)

My main duties here include co-ordinating the activities and role of the Escarpment Bird Club as a new bird club in the escarpment region of Mpumalanga. Other duties include organising and leading bird outings, as planned by the club, plus organising special bird ringing sessions for club members.

: **Secretary: Greater Lydenburg Environmental Forum**
20 November 1997 – 30 April 1998

My main responsibility while serving on the Executive and Management Committee of the Forum was to provide the committee and Forum role players with accurate and detailed information regarding any aspect of the Forum, including notification of meetings, minute taking at meetings, writing letters on behalf of the chairman and discussion with local government regarding local environmental issues.

: **Regional Coordinator – Southern Africa African Waterbird Census (AfWC) (1 January 2000 – present)**

My responsibilities are to:

Promote and facilitate growth of AfWC and wetland conservation initiatives in the seven participating southern African countries (Namibia, Botswana, Zimbabwe, Mozambique, Malawi, Zambia, Swaziland, Lesotho and South Africa).

Keep contact with each national coordinator in order to keep up to date with the waterbird monitoring programmes in each country.

Provide the national coordinators with a medium through which they can discuss or communicate any news or problems concerning AfWC.

Coordinate reports and data submission to Wetlands International.

: **Committee member – Cape Bird Club Conservation Committee (March 2005 – present)**

My main responsibilities here include maintaining links between the Animal Demography Unit and the Cape Bird Club, and initiating and supporting conservation related activities within the club.

: **Chair of the scientific committee for the 12th Pan-African Ornithological Congress, 7-12 September 2008, Goudini, South Africa.**

As chair, and in conjunction with my committee, I was responsible for coordinating the scientific programme for the congress. This involved identifying plenary speakers, symposia and round-table discussions, allocating speakers and coordinating submission of abstracts for the congress programme.

: **African representative for the Duck Specialist Group (Jan. 2011 – present)**

The Duck Specialist Group is one of the many specialist groups within the framework of Wetlands International.

Responsibilities here include maintaining contact with specialists in Africa to promote research on ducks and geese and share information on improving duck monitoring within Africa.

: **Member of Bird and Wind Energy Specialist Group (2011-2013)**

Represented the Animal Demography Unit on this specialist group but also wore my specialist hat and participated in discussions around potential bird impacts of these developments and the role and communications of the consultants and the relevant developers.

COMPUTER LITERACY

: Have extensive experience with:

Windows 7 and 8
Microsoft Office 2010
Microsoft Explorer & Outlook
Mozilla Thunderbird & Firefox
Google Chrome
Adobe Photoshop
Adobe Lightroom
ArcView ver 3.2, ArcGIS online
Quantam GIS
Program R (working knowledge)
Google Earth Pro
HTML and basic PHP
MySQL queries

REFERENCES

1. Prof. Les G. Underhill

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   Previous employer and PhD supervisor who can comment on my work performance, personality and academic abilities.

2. Dr Phoebe Barnard

   Climate Change & BioAdaptation Division
   Birds & Environmental Change Programme
   South African National Biodiversity Institute
   Kirstenbosch Research Centre
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   Previous work colleague who can comment on my personality and work performance.

3. Dr Dieter Oschadleus

   SAFRING Coordinator
   Department of Biological Sciences
   University of Cape Town
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   South Africa

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   E-mail: dieter.oschadleus@uct.ac.za

   Past ADU colleage and ringer who can comment on my work performance, ringing experience and character.

b) Comment from Chris Van Rooyen (specialist who undertook avifauna pre-construction monitoring programme) on the draft Addendum to the Avifauna Impact Assessment

AFRIMAGE Photography (Pty) Ltd Trading as:

Chris van Rooyen Consulting

VAT#: 4580238113

21 July 2015

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Robindale
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2194

Tel: +27 (0)82 4549570
email: vanrooyen.chris@gmail.com

To:

HOLLAND & ASSOCIATES ENVIRONMENTAL CONSULTANTS

Attention: Nicole Holland

Dear Nicole

COMMENTS ON THE ADDENDUM TO THE AVIFAUNAL IMPACT ASSESSMENT CONDUCTED FOR THE PROPOSED WIND ENERGY FACILTY ON THE EASTERN PLATEAU (SOUTH), NEAR DE AAR, NORTHERN CAPE PROVINCE (DEA REF NO.:12/12/20/2463/AM3)

We refer to your email dated 16 July 2015. We have reviewed the addendum to the specialist avifauna assessment and we support the recommendations of the updated avifaunal study, subject to the comments below.

6. Re-assessment of avifaunal impacts

- *Table 1:* Martial Eagle is incorrectly listed as having been observed during the pre-construction monitoring.
- *6.1 Construction Impacts. (B) Disturbance and displacement: Limiting (or avoiding where possible) construction between February and July to minimize impacts on breeding productivity, particularly for the cliff-nesting raptors (Booted Eagle, Verreaux's Eagle).* We would suggest that this period be changed to July – November, to coincide with the peak breeding season for both species (Hockey et.al 2005).
- *6.2 Operational Impacts: (A) Disturbance and displacement: Minimizing the disturbance associated with the operation of the facility, by scheduling maintenance activities to avoid and/or reduce disturbance in sensitive areas at sensitive times (e.g. breeding season).* This may not always be possible due to unscheduled maintenance events, but the 800m no-go buffer zones around key nesting areas should largely eliminate the risk of disturbance anyway.
- *6.2 Operational Impacts: (B) Mortality (Collisions): Minimising the length of any new powerlines installed, and ensuring that all new lines are marked with bird flight diverters (Jenkins et al. 2011) along their entire length.* It may be unnecessary to mark all the new lines. Prior to the electrification of the wind farm, an on-site "walk-through" should be conducted by an avifaunal specialist to identify the sections of power line between the turbines which require marking with Bird Flight Diverters as an anti-collision measure. During the operational phase, regular surveys of the intra-turbine power lines should be conducted as part of the post-construction monitoring programme to assess if there are collision mortalities, and any additional spans identified as high risk should be marked with Bird Flight

Diverters. In addition to that, the 132kV grid connection should also be inspected at least once a quarter to establish if there is any significant collision mortality.

- *6.2 Operational Impacts: (B) Mortality (Collisions): An experimental approach should be adopted whereby a single blade is painted black on one blade of one each of a number of pairs of potentially high risk turbines. Other blade-marking options should also be considered, where applicable.* We would suggest that this be considered as part of an adaptive management approach once a specific turbine has been identified as a mortality risk in the operational phase.

7. Potential impact of longer turbine blades and increased hub heights

We agree that the new turbine dimensions will necessitate a re-calculation of the potential risk of collisions due to the 40m increase in height. We have done this re-calculation and, as a pre-cautionary measure, included all medium altitude **and** high altitude flights that were recorded during the pre-construction monitoring i.e. all flights >35m. See Figure 1 (previous risk index) and Figure 2 (revised risk index) for comparative purposes.

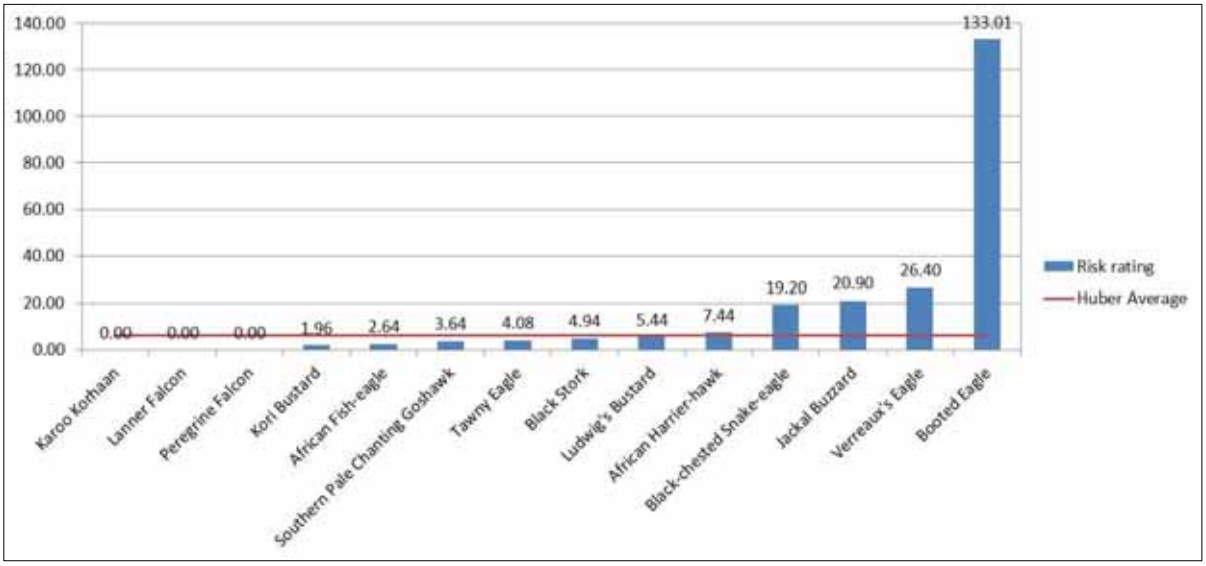

Figure 1: The original site specific collision risk rating for priority species based on previous lay-out of 103 turbines. Only medium altitude flights were included for purposes of this risk index.

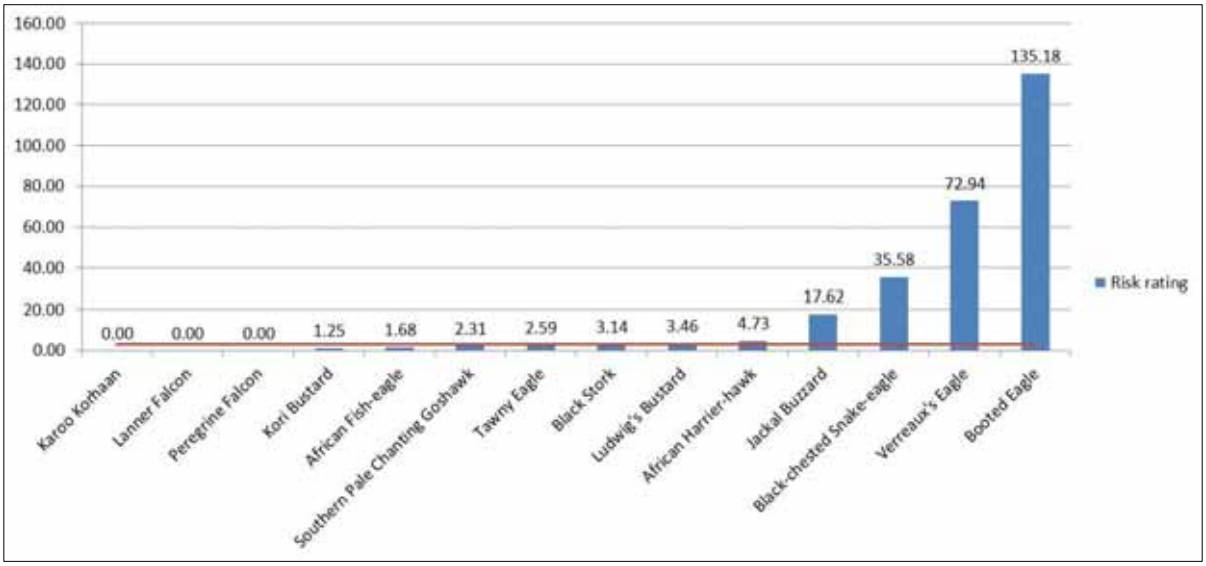

Figure 2: The revised site specific collision risk rating for priority species based on amended lay-out of 61 turbines. Both medium and high altitude flights were included for purposes of this risk index to accommodate the 40m increase in turbine height.

A re-calculation of the risk index taking into account the increased rotor height and reduced number of turbines have resulted in a significant increase in the risk rating for Black-chested Snake-Eagle and Verreaux's Eagle, due to increased flight time as a result of the inclusion of high altitude flights. The risk rating for Booted Eagle remained practically the same, and Jackal Buzzard decreased slightly. However, the majority of published scientific studies indicate that an increase in turbine hub height and rotor swept area do not automatically translate into a larger collision risk. Turbine dimensions seem to play an insignificant role in the magnitude of the collision risk in general, relative to other factors such as topography, turbine location, morphology 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, Barriuos & Rodriguez 2004; Barclay et al. 2007, Krijgsveld et al. 2009, Smallwood 2013; Everaert 2014). Two studies found a correlation between turbine hub height and mortality (De Lucas et al. 2008; Loss et al. 2013).

See below a summary of published findings on the topic:

- Howell et al. 1997 states on p.9: "The evidence to date from the Altamont Pass does not support the hypothesis that the larger rotor swept area (RSA) of the KVS – 33 turbines contributes proportionally to avian mortality, i.e. larger area results in more mortalities. On the contrary, the ratio of K-56 turbines to KVS-33 turbines rather than RSA was approximately 3.4:1 which as consistent with the 4.1:1 mortality ratio. It appears that the mortality occurred on a per-turbine basis, i.e. that each turbine simply presented an obstacle."
- Barrios & Rodriguez 2004 states on p. 80: "Most deaths and risk situations occurred in two rows at PESUR with little space between consecutive turbines. This windwall configuration (Orloff & Flannery 1992) might force birds that cross at the blade level to take a risk greater than in less closely spaced settings. However, little or no risk was recorded for five turbine rows at PESUR having exactly the same windwall spatial arrangement of turbines. Therefore, we conclude that physical structures had little effect on bird mortality unless in combination with other factors."
- Barclay et al. 2007 states on p. 384: "Our analysis of the data available from North America indicates that this has had different consequences for the fatality rates of birds and bats at wind energy facilities. It might be expected that as rotor swept area increased, more animals would be killed per turbine, but our analyses indicates 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."

We are not disputing or ignoring the findings of Loss et al. and De Lucas et al. 2008, but they do seem to be contrary to the majority of studies on the topic. Indications are that bustards are not prone to wind turbine collisions – a Spanish database of over 7000 recorded turbine collisions contains no Great Bustards Otis tarda (A. Camiña 2012). The same lack of mortality was also reported from Austria (Raab et al. 2009). Bustards are not mentioned once in a comprehensive review by the Birdlife International of the literature on wind turbine/avian interactions spanning 10 years between 2003 and 2013 (Gove et al. 2013).

In conclusion therefore, although the risk ratings for Black-chested Snake-Eagle and Verreaux's Eagle increased significantly, it must be interpreted within the context of the literature quoted above. The following statement is made in the addendum report: *Based on the above, the 40 m increase in overall blade height above ground for the newer WGTs could be significant for soaring raptors or large, slow-flying birds like korhaans and bustards.* This statement should also be interpreted within the context of the literature quoted above.

Sincerely

Chris van Rooyen

Albert Froneman

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Appendix C3:
Addendum to specialist bat sensitivity assessment

Addendum to the Specialist Bat (Chiroptera) Sensitivity Assessment

- For the proposed Wind Energy Facility situated on the Eastern Plateau (South) near De Aar in the Northern Cape

Compiled and Reviewed by: Monika Moir and Werner Marais

17 July 2015

PREPARED FOR:

Longyuan Mulilo De Aar 2 South (Pty) Ltd

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Appointment of Specialist (Animalia Zoological & Ecological Consultation CC)

Specialist Company:	Animalia Zoological & Ecological Consultation CC
Project overseen and reviewed by:	Werner Marias & Monika Moir
Appointed by:	Longyuan Mulilo De Aar 2 South (Pty) Ltd
For:	Addendum to the specialist bat impact assessment from the original EIA, taking cognizance of the findings of the preconstruction bat monitoring

Independence:

Animalia Zoological & Ecological Consultation CC has no connection with the developer. Animalia Zoological & Ecological Consultation CC is not a subsidiary, legally or financially of the developer; remuneration for services by the developer in relation to this proposal is not linked to approval by decision-making authorities responsible for permitting this proposal and the consultancy has no interest in secondary or downstream developments as a result of the authorization of this project.

Applicable Legislation:

Legislation dealing with biodiversity applies to bats and includes the following:

NATIONAL ENVIRONMENTAL MANAGEMENT: BIODIVERSITY ACT, 2004 (ACT 10 OF 2004; especially sections 2, 56 & 97)

The act calls for the management and conservation of all biological diversity within South Africa. Bats constitute an important component of South African biodiversity and therefore all species receive attention additional to those listed as Threatened or Protected**.**

1. Site and Project Overview

The original bat EIA impact assessment, for the De Aar 2 South Wind Energy Facility (WEF) located on the eastern plateau of De Aar in the Northern Cape Province, as well as the subsequent 12 month preconstruction bat monitoring was conducted by Animalia. The 12 month pre-construction bat monitoring study was carried out over April 2013 to April 2014. Therefore the results and findings of the preconstruction bat monitoring, as well as additional experience gained on the topic, have improved insight into the project site, as the original bat EIA impact assessment was conducted in early 2012 at the advent of wind energy related bat assessments in South Africa. This resulted in some limited differences between the impact assessment ratings of the authorised option in the original bat EIA impact assessment and this addendum.

The proposed site was approximately 12,832ha and was located over 8 portions of 4 farms. The original and currently authorised WEF consisted of 103 1.5-2.5 MW turbines.

Longyuan Mulilo De Aar 2 South (Pty) Ltd proposes to amend the project description of the authorised WEF as outlined in the table below (table provided by Holland & Associates Environmental Consultant)

Table 1: Proposed amendments to De Aar 2 South Wind Energy Facility

Component	Approved	Proposed amendment
Number of turbines	103	61 Turbines @ 2.3MW per turbine (to 30 Turbines @ 4MW per turbine). The maximum of 61 will be applied for.
Generation capacity per turbine	1.5 - 2.5MW	2.3MW – 4.0MW
Generation capacity of the WEF	155 - 258MW	140 MW
Rotor / blade diameters	120m	(min) 100m (max) 160m (Note the maximum of 160 is being applied for)
Hub height	100m	(min) 90m (max) 120m (Note the maximum of 120 is being applied for)
Construction Hardstand Pad	40m x 50m (adjacent to each turbine)	40m x 50m (adjacent to each turbine)
Permanent affected area (foundation size)	16 x 16m and 2 m deep	18,4m diameter, that narrows up to 10,6m at the surface (the visible portion) once the foundation is completed. Depth : 3,5m

Figures 1 – 2 below display the site boundary and the passive bat monitoring system locations across the site that were used in the pre-construction bat monitoring study. **Figures 3 – 4** display the authorised 103 turbine layout and the proposed amended 61 turbine layout.

Figure 1: Site boundary of De Aar 2 South Wind Energy Facility

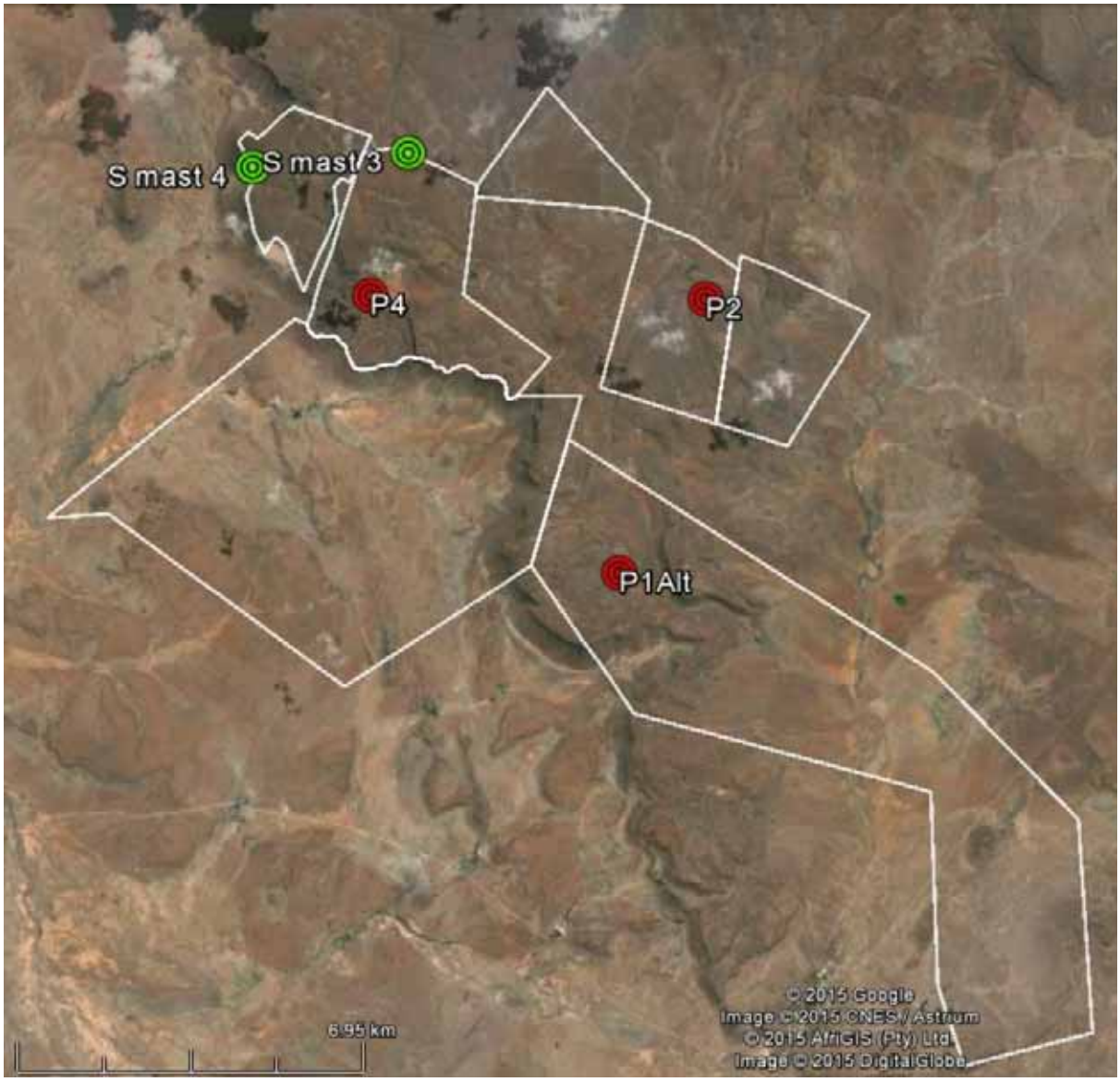


Figure 2: Positions of passive bat monitoring stations used in the pre-construction bat sensitivity monitoring (green locations were 10m monitoring stations; red locations were meteorological masts used for monitoring at height).

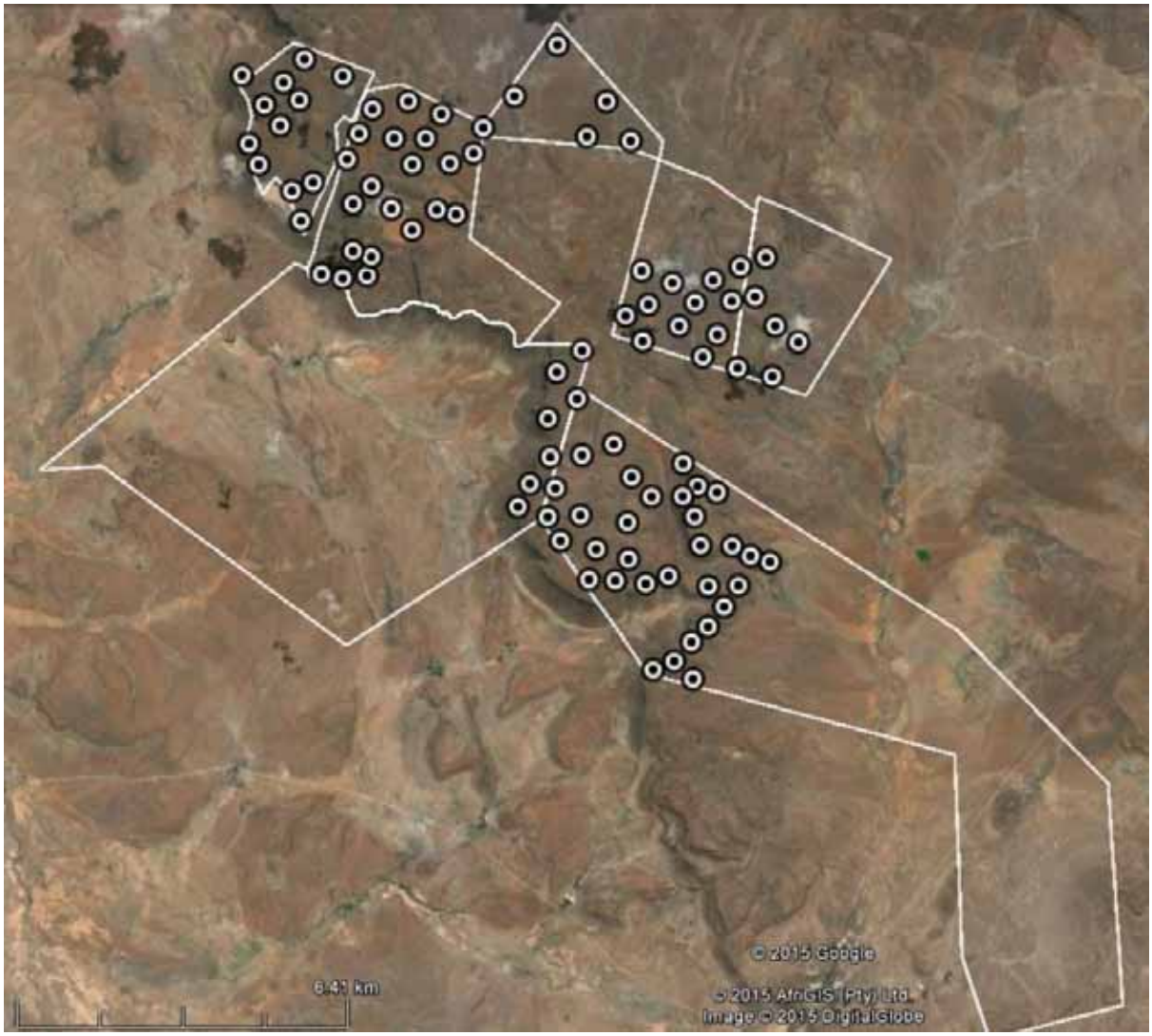


Figure 3: Authorized turbine layout of 103 x 1.5-2.5 MW turbines

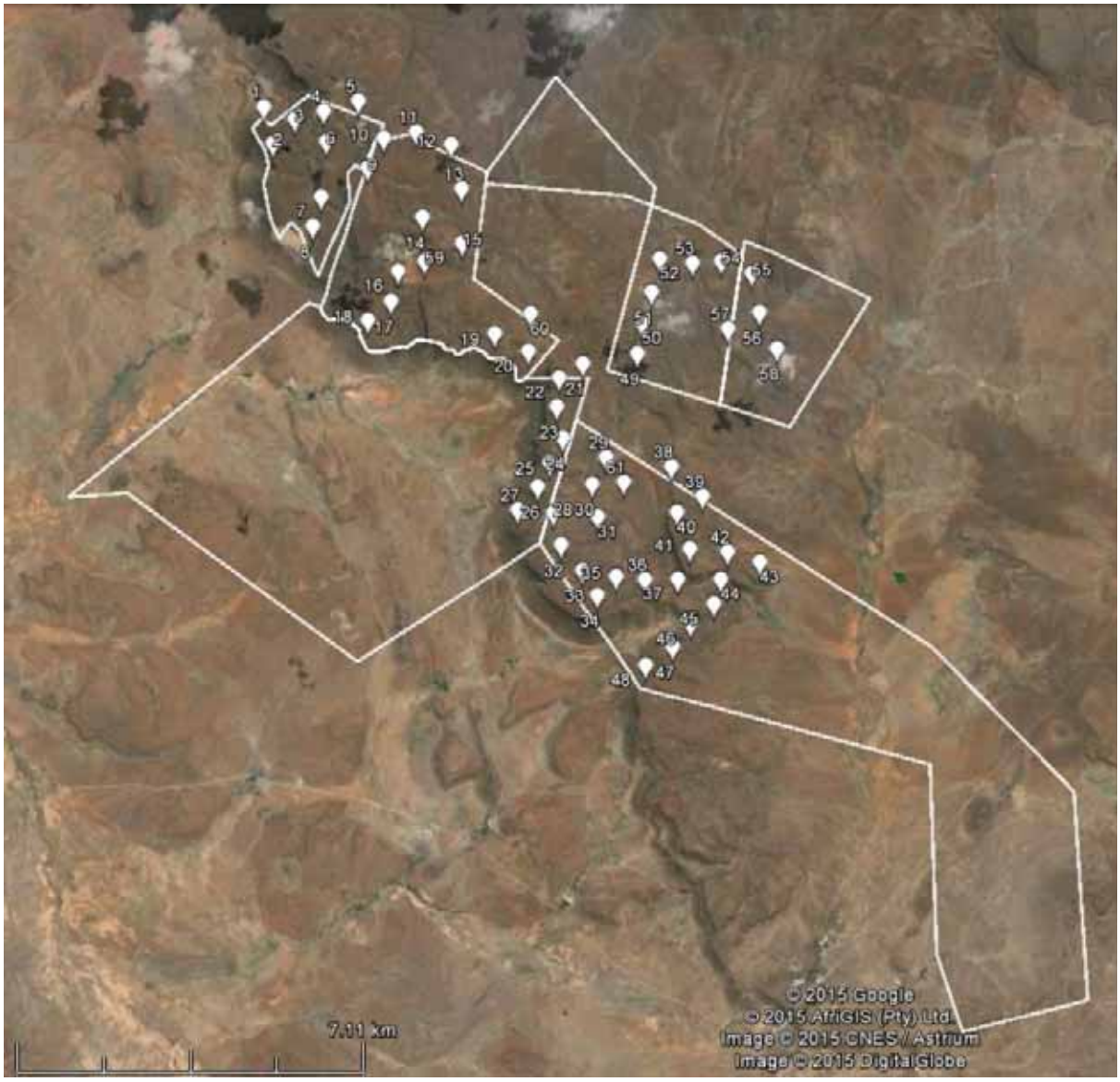


Figure 4: Proposed amended turbine layout of 61 x 2.3 MW turbines

2. Bat sensitivity map

The bat sensitivity map highlights the sensitive areas of the site, based on features identified to be important for foraging and roosting of the bat species that are confirmed and most probable to occur on site. The sensitivity map is based on species ecology, habitat preferences and results of the passive monitoring conducted during the pre-construction study. The bat sensitivity map is the first line of impact mitigation by means of improving turbine placement with regards to bat preferred habitats on site. **Table 2 and 3** below describes features used to compile the map and relevant sensitivity descriptions. **Figures 5 – 7** display the sensitivity map with the authorized and proposed amended layouts.

Table 2: Bat sensitivity map description

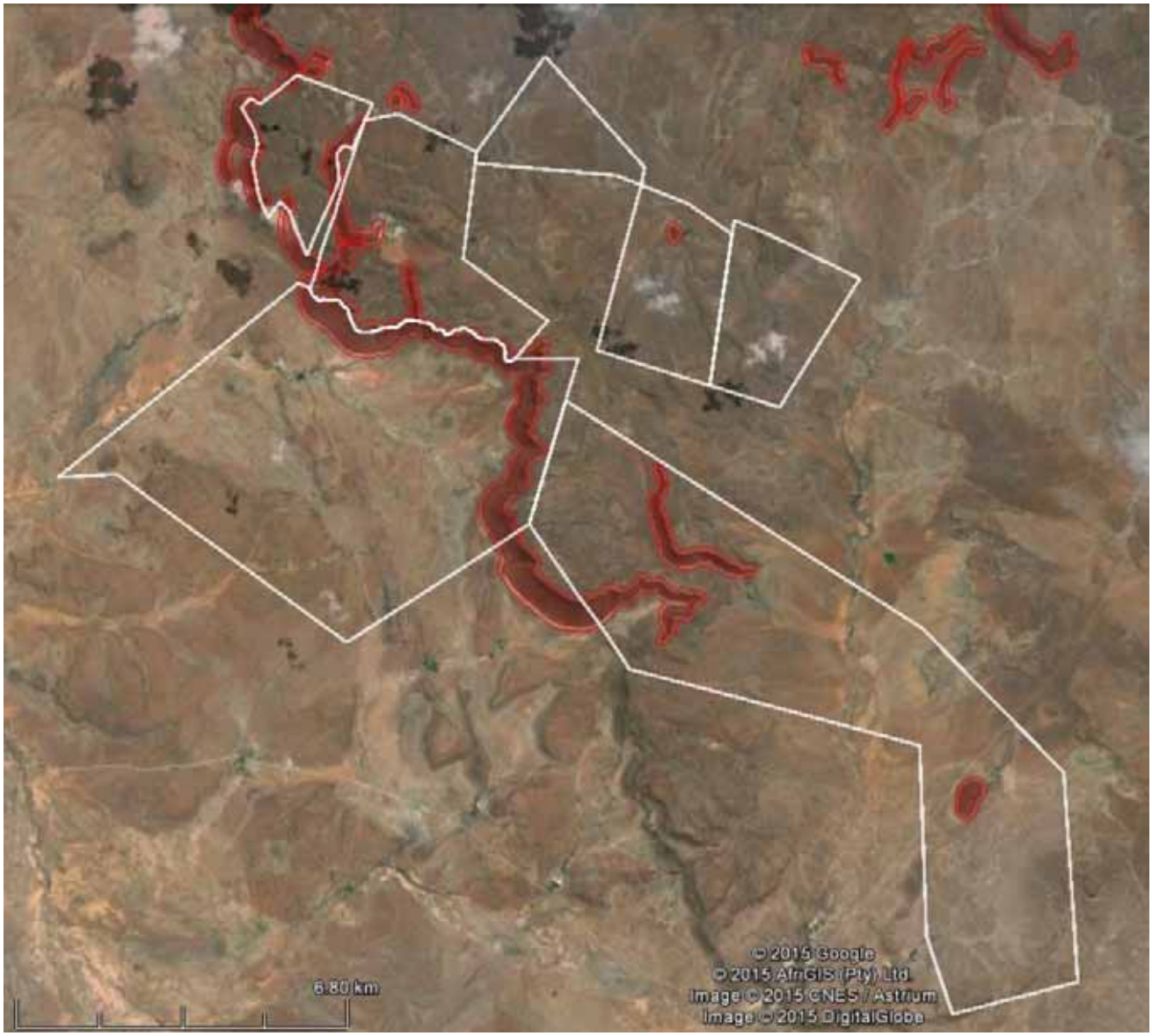
High sensitivity buffer	100m radial buffer
Moderate sensitivity buffer	None
Features used to develop the sensitivity map	The topography on site. Hill slopes on the edge of the plateau offer roosting space for bats
	The presence of rock faces, areas of exfoliating rock and clumps of larger woody plants. These features provide natural roosting spaces and tend to attract insect prey.

Table 3: Description of sensitivity utilized in the sensitivity map

Sensitivity	**Description**
High Bat Sensitive areas and buffers	Areas of foraging habitat or roosting sites considered to have significant roles for bat ecology. Turbines within or close to these areas must acquire priority for application of mitigation measures.

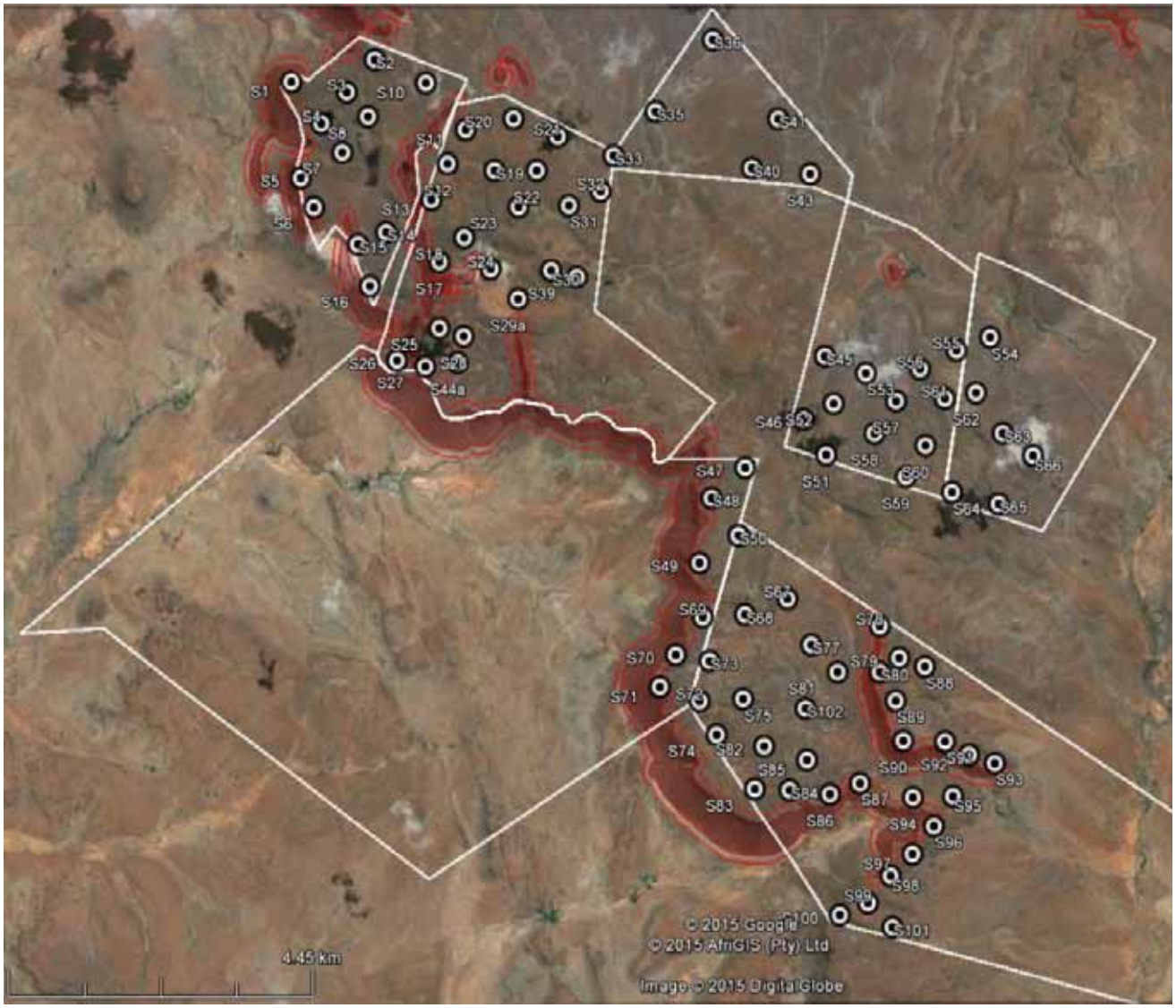
Table 4: Turbines located within bat sensitive areas

Turbine Layout	**Turbines within high sensitivity areas and buffers**
Authorized 103 turbine layout	5, 27, 70, 78 and 91
Proposed amended 61 turbine layout	2, 26, 27, 38, 41 and 42



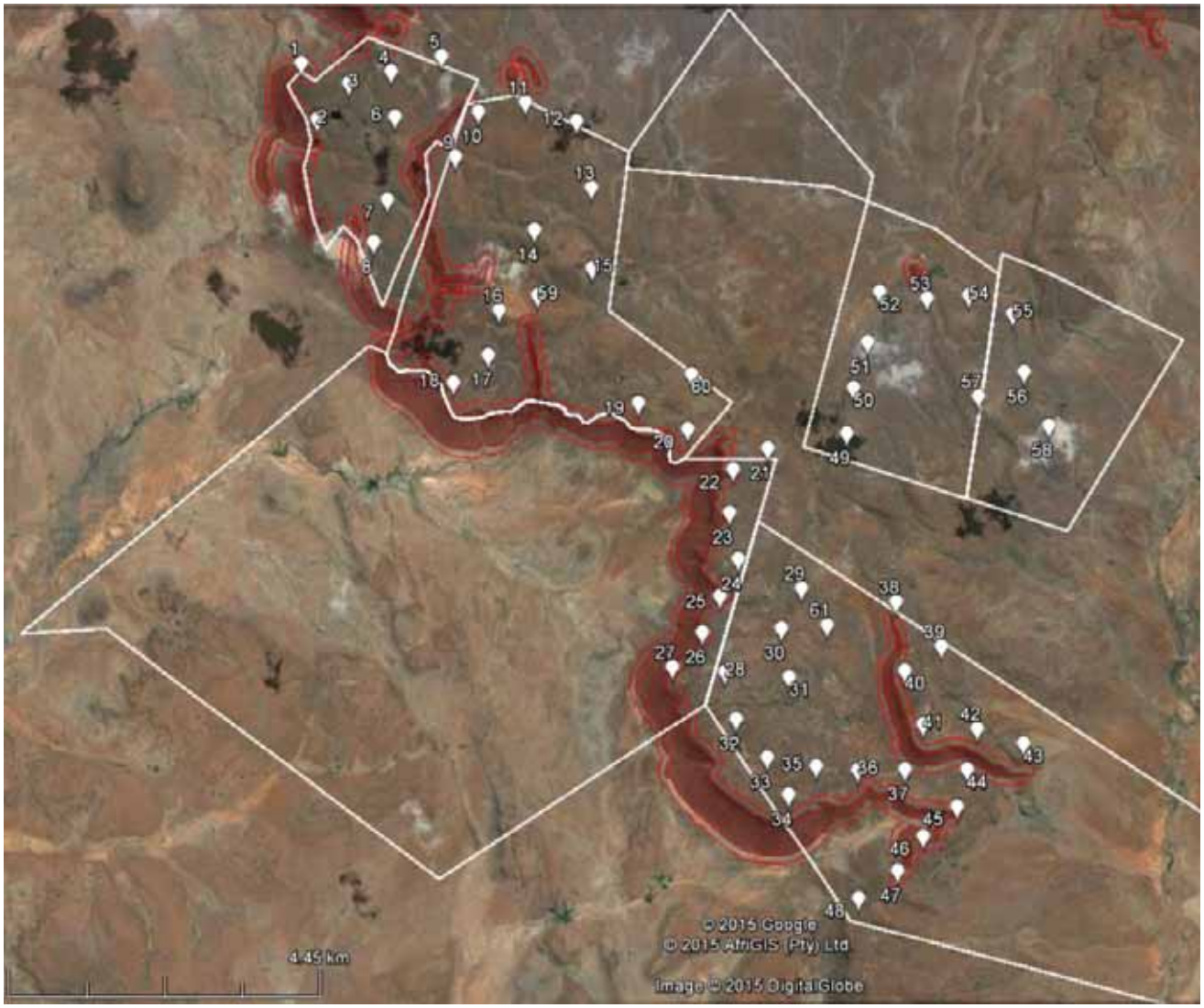
Bat sensitivity area Bat sensitivity buffer

Figure 5: Sensitivity map of the proposed De Aar 2 South wind energy facility.



Bat sensitivity area Bat sensitivity buffer

Figure 6: Sensitivity map of the proposed De Aar 2 South wind energy facility with the authorised 103 turbine layout.



Bat sensitivity area Bat sensitivity buffer

Figure 7: Sensitivity map of the proposed De Aar 2 South wind energy facility with the proposed amended 61 turbine layout.

3. PROPOSED MITIGATION MEASURES AND DETAILS

The correct placement of wind farms and of individual turbines according to the bat sensitivity map can significantly lessen the impacts on bat fauna in an area, and should be considered as the preferred option for mitigation. The turbine layout for the De Aar 2 South Wind Farm was assessed in the Bat Sensitivity Map section above.

Where mitigation by location is not possible, other options that may be utilized if required include curtailment, blade feathering, blade lock, acoustic deterrents or light lures. The following terminology applies:

Curtailment:

Curtailment is the act of limiting the supply of electricity to the grid during conditions when it would normally be supplied. This is usually accomplished by locking or feathering the turbine blades.

Cut-in speed:

Cut-in speed is defined as the wind speed at which the generator is connected to the grid and producing electricity. For some turbines, their blades will spin at full or partial RPMs below cut-in speed when no electricity is being produced.

Feathering or Feathered:

Adjusting the angle/pitch of the rotor blade parallel to the wind, or turning the whole unit out of the wind, to slow or stop blade rotation. Normally operating turbine blades are angled almost perpendicular to the wind at all times.

Free-wheeling:

Free-wheeling occurs when the blades are allowed to rotate below the cut-in speed or even when fully feathered and parallel to the wind. In contrast, blades can be “locked” and cannot rotate, which is a mandatory situation when turbines are being accessed by operations personnel.

Increasing cut-in speed:

The turbine’s computer system (referred to as the Supervisory Control and Data Acquisitions or SCADA system) is programmed to a cut-in speed higher than the manufacturer’s set speed, and turbines are programmed to stay locked or feathered at 90° until the increased cut-in speed is reached over some average number of minutes (usually 5 – 10 min), thus triggering the turbine blades to pitch back “into the wind” and begin to spin normally and producing power.

Blade locking or full feathering below the manufacturers cut in speed, that locks or significantly reduces the speed the blades turn, is more desirable for the conservation of bats than allowing free rotation with no feathering below the manufacturers cut in speed.

Acoustic deterrents are a developing technology and will need investigation as a possible option for mitigation if during operation mitigation is found to be required

Light lures refer to the concept where strong lights are placed on the periphery (or only a few sides) of the wind farm to lure insects and therefore bats away from the turbines. The long term effects on bat populations and local ecology of this method is unknown.

Habitat modification, with the aim of augmenting bat habitat around the wind farm in an effort to lure bats away from turbines, is not recommended. This method can be adversely intrusive on other fauna and flora and the ecology of the areas being modified. Additionally it is unknown whether such a method may actually increase the bat numbers of the broader area, causing them to move into the wind farm site due to resource pressure.

Power modes for turbines are the various operational modes linked to cut in and cut out and tip speeds for turbines that the turbines are designed to be able to operate at without overstraining the turbines. Different modes are used to reduce the noise output of the turbines (which also reduces the energy output) and the greater the reduction in noise the slightly slower the tip speeds are. Thus using lower noise modes will reduce the tip speed of the turbines

Currently the most effective method of mitigation, after correct turbine placement, is alteration of blade speeds and cut-in speeds under environmental conditions favorable to bats.

A basic "5 levels of mitigation" (by blade manipulation or curtailment), from light to aggressive mitigation is presented below:

1. No curtailment (free-wheeling is unhindered below manufacturers cut in speed so all momentum is retained, thus normal operation).

2. 90 Degree feathering of blades below manufacturers cut-in speed so it is exactly parallel to the wind direction as to minimize free-wheeling blade rotation as much as possible without locking the blades.

3. 90 Degree feathering of blades below manufacturers cut in speed, with reduced power mode settings between manufacturer’s cut-in speed and mitigation cut-in conditions.

4. 90 Degree feathering of blades below mitigation cut in conditions.

5. 90 Degree feathering throughout the entire night.

The preliminary recommendation is that curtailment mitigation initiates at **Level 2** for the periods, times and weather conditions outlined in **Table 5** below. These mitigations must be applied to the turbines identified within bat sensitive areas (**Table 4**). If such mitigation is undertaken, then depending on the results of the post construction mortality monitoring the mitigation can be either relaxed or intensified (moving down or up in the levels) up to a maximum intensity of Level 4. This is an adaptive mitigation management approach that will require changes in the mitigation plan to be implemented immediately and in real time during the post construction monitoring.

The table below is based on the passive data collected during the pre-construction monitoring and provides baseline data to be utilized during the operational monitoring assessment. Both the temperature and wind speed parameters indicated in the table must be experienced simultaneously to create favorable conditions for bat activity. This is due to the fact that they have synergistic or otherwise contradictory influences on bat activity and are never considered in isolation. In general bat activity is negatively correlated to wind speed and positively correlated to temperature. Due to climatic data lacking during critical mitigation periods, no weather bat activity parameters could be calculated for selected periods and areas in Table 5. In this instance, turbines must be mitigated during the period listed as high the bat activity time frame. The times and weather conditions at which 80% of bat activity were recorded are as follows:

Table 5: Times and weather conditions at which 80% of bat activity were recorded at **De Aar 2 South WEF**

	Applied to turbines identified in Table 4
Peak activity time frame 1	1 October – 31 December
	Time of sunset to 03:00
Environmental conditions of peak activity	Wind speed 0 – 5.0m/s (measured at 10m) Temperatures above 15˚C (measured at 10m)
Peak activity time frame 2	Whole month of January
	Time of sunset to 03:00
Environmental conditions of peak activity	Wind speed 0 – 5.0m/s (measured at 50m) Temperatures above 17˚C (measured at 10m)
Peak activity time frame 3	Whole month of February
	Time of sunset to 03:00
Environmental conditions of peak activity	Could not be determined

4. ASSESSMENT OF IMPACTS

The assessment of impacts below will be displayed for both the authorised 103 turbine layout and the proposed amended 61 turbine layout.
The original bat EIA impact assessment as well as the subsequent 12 month preconstruction bat monitoring was conducted by Animalia. However, the results and findings of the preconstruction bat monitoring have improved insight into the project site. This resulted in some limited differences between the impact assessment ratings of the authorised option in the original bat EIA impact assessment and this addendum.

4.1 Construction phase

Nature of impact: Destruction of bat roosts due to earthworks and blasting
During construction, the earthworks and especially blasting can damage bat roosts in rock crevices. Blasting close to a rock crevice roost can cause mortality to the inhabitants of the roost.

	Authorized Option		**Proposed amended Option**	
	Without mitigation	**With mitigation**	**Without mitigation**	**With mitigation**
Type	Negative	Negative	Negative	Negative
Extent	Site specific	Site specific	Site specific	Site specific
Magnitude	Medium - High	Low	Medium	Low
Duration	Long term	Long term	Long term	Long term
Probability	Probable	Unlikely	Probable	Unlikely
Confidence	Sure	Sure	Sure	Sure
Reversibility	Irreversible	Irreversible	Irreversible	Irreversible
Significance	Low (-)	Very Low (-)	Low (-)	Very Low (-)

Mitigation: Adhere to the sensitivity map during turbine placement. No blasting is allowed to occur within bat sensitive areas outlined in the sensitivity map. Blasting should be minimized and used only when absolutely necessary.

Nature of impact: Artificial lighting
During construction strong artificial lights used in the work environment during night time will attract insects and thereby also bats. However only certain species of bats will readily forage around strong lights, whereas others avoid such lights even if there is insect prey available.
This can draw insect prey away from other natural areas and thereby artificially favour certain species, affecting bat diversity in the area.

	Authorized Option		Proposed amended Option	
	Without mitigation	**With mitigation**	**Without mitigation**	**With mitigation**
Type	Negative	Negative	Negative	Negative
Extent	Site specific	Site specific	Site specific	Site specific
Magnitude	Medium - Low	Very low	Low	Very low
Duration	Construction period	Construction period	Construction period	Construction period
Probability	Probable	Probable	Probable	Probable
Confidence	Certain	Certain	Certain	Certain
Reversibility	Reversible	Reversible	Reversible	Reversible
Significance	Low (-)	Very low (-)	Very low (-)	Very low (-)
Mitigation: Consciously switch off all lights at a construction area when not required anymore, do not let it burn throughout the night. If suitable for the purpose, utilize lighting temperatures (colours/wavelengths) that attract less insects.				

Nature of impact: Foraging habitat loss

Some foraging habitat will be permanently lost by construction of turbines and access roads. Temporary foraging habitat loss will occur during construction due to storage areas and movement of heavy vehicles.

	Authorized Option		Proposed amended Option	
	Without mitigation	**With mitigation**	**Without mitigation**	**With mitigation**
Type	Negative	Negative	Negative	Negative
Extent	Site specific	Site specific	Site specific	Site specific
Magnitude	Medium	Low	Low	Very low
Duration	Long term	Long term	Long term	Long term
Probability	Definite	Definite	Definite	Definite
Confidence	Certain	Sure	Certain	Sure
Reversibility	Irreversible	Irreversible	Irreversible	Irreversible
Significance	Low (-)	Very low (-)	Low (-)	Very low (-)
Mitigation: Adhere to the bat sensitivity map. Keep to designated areas when storing building materials, resources, turbine components and/or construction vehicles and keep to designated roads with all construction vehicles. Damaged areas should be rehabilitated by an experienced vegetation succession specialist after construction.				

4.2 Operational phase

Nature of impact: Bat mortalities due to direct blade impact or barotrauma during foraging activities (not migration)				
	Authorized Option		**Proposed amended Option**	
	Without mitigation	**With mitigation**	**Without mitigation**	**With mitigation**
Type	Negative	Negative	Negative	Negative
Extent	Local	Local	Local	Local
Magnitude	High	Low	High	Low
Duration	Long term	Long term	Long term	Long term
Probability	Probable	Probable	Probable	Unlikely
Confidence	Certain	Unsure	Certain	Unsure
Reversibility	Irreversible	Irreversible	Irreversible	Irreversible
Significance	High (-)	Medium (-)	High (-)	Low (-)
Mitigation: Adhere to the sensitivity maps, avoid turbine placement in areas of High bat sensitivity and their buffers. Also adhere to mitigation recommendations outlined in this addendum.				

Nature of impact: Bat mortalities due to direct blade impact or barotrauma during foraging – cumulative impact (resident and migrating bats affected)

Mortalities of bats due to wind turbines during foraging and migration can have significant ecological consequences as the bat species at risk are insectivorous and thereby contribute significantly to the control of flying insects at night. On a project specific level insect numbers in a certain habitat can increase if significant numbers of bats are killed off. But if such an impact is present on multiple projects in close vicinity of each other, insect numbers can increase regionally and possibly cause outbreaks of colonies of certain insect species.

Additionally if migrating bats are killed off it can have detrimental effects on the cave ecology of the caves that a specific colony utilizes. This is due to the fact that bat guano is the primary form of energy input into a cave ecology system given that no sunshine that allows photosynthesis exists in cave ecosystems.

	Authorized layout		**Proposed amended layout**	
	Without mitigation	**With mitigation**	**Without mitigation**	**With mitigation**
Type	Negative	Negative	Negative	Negative
Extent	Regional	Regional	Regional	Regional
Magnitude	High	Low	High	Low
Duration	Long term	Long term	Long term	Long term
Probability	Probable	Unlikely	Probable	Unlikely
Confidence	Certain	Sure	Certain	Sure
Reversibility	Irreversible	Irreversible	Irreversible	Irreversible
Significance	High (-)	Very low (-)	Medium (-)	Very low (-)

Mitigation: Adhere to the bat sensitivity map for turbine placement. Also adhere to recommended mitigation measures for this project. It is essential that project specific mitigations be applied and adhered to.

5. Conclusion

Mitigation during the operational phase must be applied to turbines located in bat sensitive areas and buffers as laid out in Table 4. The mitigation parameters to be applied are laid out in Table 5. A preliminary recommendation would be that curtailment mitigation initiates at **Level 2** for the months, times and weather conditions. If such mitigation is undertaken, then depending on the effectiveness and results of the post construction mortality monitoring the mitigation can be either relaxed or intensified (moving down or up in the levels) up to a maximum intensity of Level 4. This is an adaptive mitigation management approach that will require changes in the mitigation plan to be implemented immediately and in real time during the post construction monitoring. It is recommended that operational mortality monitoring commences on site immediately after the first turbine is turning, whether it is freewheeling during construction or productive and connected to the electricity grid.

With regards to amended turbine specifications, a change to rotor diameter and hub height can increase the risk of impact on bats due to the fact that an increased turbine size increases the airspace in which bat mortality may occur. With regards to utilizing turbines with a higher blade-ground clearance, a negative correlation was found between bat activity and height from the ground (higher microphones detected less bat activity than lower microphones). Thus the risk of impacts on species of concern will decrease with a higher blade ground clearance. However, for the De Aar 2 South Wind Energy Facility, the lowest height of the blades above the ground has remained approximately the same with the authorised and proposed amended turbine specifications. Thus the ground clearance impact remains the same.

The increased airspace due to larger rotor diameter would increase the negative impacts on high flying bat species. However, the heavily reduced turbine layout from 103 turbines to 61 turbines is a positive amendment and simultaneously decreases the negative impacts on bats. Ultimately, the reduced 61 turbine layout is favoured over the authorised layout.

Signed off by:

Monika Moir

Zoologist and Ecologist

MSc (Biodiversity & Conservation, UJ)

Pr.Sci.Nat. – SACNASP

(Zoological Science)

DISCLAIMER

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environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

DETAILS OF SPECIALIST AND DECLARATION OF INTEREST

	(For official use only)
File Reference Number:	12/12/20/ or 12/9/11/L
NEAS Reference Number:	DEA/EIA
Date Received:	

Application for integrated environmental authorisation and waste management licence in terms of the-

(1) National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended and the Environmental Impact Assessment Regulations, 2014; and

(2) National Environmental Management Act: Waste Act, 2008 (Act No. 59 of 2008) and Government Notice 921, 2013

PROJECT TITLE

PROPOSED WIND ENERGY FACILITY SITUATED ON THE EASTERN PLATEAU (SOUTH) NEAR DE AAR, NORTHERN CAPE PROVINCE: APPLICATION FOR AMENDMENT OF ENVIRONMENTAL AUTHORISATION

Specialist:	Animalia Zoological and Ecological Consultants		
Contact person:	Monika Mair		
Postal address:	3 Zircon Str, Helderkruin, Roodepoort		
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Telephone:	060 994 0195	Fax:	
E-mail:	monika@animalia-consult.co.za		
Professional affiliation(s) (if any)	SACNASP		

Project Consultant:			
Contact person:			
Postal address:			
Postal code:		Cell:	
Telephone:		Fax:	
E-mail:			

4.2 The specialist appointed in terms of the Regulations_

I, Monika Mair , declare that –

General declaration:

I act as the independent specialist in this application;
I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
I declare that there are no circumstances that may compromise my objectivity in performing such work;
I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
I will comply with the Act, Regulations and all other applicable legislation;
I have no, and will not engage in, conflicting interests in the undertaking of the activity;
I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
all the particulars furnished by me in this form are true and correct; and
I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

Signature of the specialist:

Animalia Zoological and Ecological Consultants

Name of company (if applicable):

17 July 2015

Date:

P.O. Box 6892
Weltevredenpark
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Werner C. Marais

Summary of qualifications

Late 2009 *University of Johannesburg*
Started PhD (Biodiversity and Conservation) – Still in progress

2008 *University of Johannesburg*
MSc (Biodiversity and Conservation)

2006 *University of Johannesburg*
Hons (Biodiversity and Conservation)

2005 *University of Johannesburg*
BSc (Zoology and Botany)

Education

PhD (Biodiversity and Conservation)

- In-depth study of the subterranean and epiphereal ecosystems of caves and their surrounding environments in the Gauteng province, and more specifically the Carletonville Dolomite Grassland vegetation unit.
- Special reference is paid to cave dwelling bats and their specific conservation needs inside as well as outside caves, where foraging takes place.
- A thorough understanding of grassland ecology as well as mammalian biology/behavior is essential for the study.
- The impacts of urbanisation on cave bat colonies are an essential focus of the research.
- Strong ecological focus.

MSc (Biodiversity and Conservation)

- The potential of using insectivorous bats (Microchiroptera) as a means of insect pest control in agricultural areas – Passed with distinction
- Involved a large scale in-depth survey of the bat diversity in the Tzaneen and Waterpoort areas, Limpopo.
- Understanding and observing the biology and behavior of local bat species.

- Designing and experimenting with artificial bat roosts.

Hons Biodiversity and Conservation

- Research project: Preliminary study of the terrestrial Arthropoda associated with caves of the Cradle of Humankind World Heritage Site – Passed with distinction
- Introduction to Environmental Management
- Herpetology
- Terrestrial and conservation ecology
- Resource management (incl. forestry, fire ecology, animal behavior)
- Practical fieldwork methodology (4X4, boat training and mapping)
- Mammology
- Population genetics and biosystematics
- Philosophy and research methodology: Zoology Nature conservation
- Parasitology
- Molecular evolution

BSc Zoology and Botany

- One-year course in animal diversity and identification
- Six month course in basic and marine ecology
- Limnology and terrestrial ecology
- Coastal diversity excursion (Marine ecology)
- Introduction to SASS Freshwater pollution monitoring methodology
- Applied freshwater ecotoxicology
- Waterborne diseases
- Integrated animal physiology and processes
- General parasitology
- Cytology
- Six-month course in the identification and diversity of South African flora
- Ethno and economical plants
- Biotechnology
- Plant physiology
- Plant pathology
- Cellular and molecular biology
- Introduction to organic and physical chemistry
- General chemistry
- Mineralogy and earth dynamics

Additional:

- ***Experienced report writing skills, sufficient computer skills.***
- ***Proficient in GIS, bioacoustics analysis.***
- ***Snake Identification and Handling Course – Presented by MHB Enviro Developments.***
- ***Multiple training courses in bat related topics - Gauteng and Northern Regions Bat Interest Group (GNoRBIG; 2005-2009).***
- ***Soil Classification and Wetland Delineation Course – Presented by Terrasoil.***
- ***Fall Arrest Level 2 qualification (for working at heights).***
- ***Advanced driving course in 4x4 off-road driving.***

Affiliations to professional bodies and societies

- Pr.Sci.Nat.– SACNASP (Zoological Science; registration number 400169/10)
- Steering committee member of the SABAA (South African Bat Assessment Association).
- Bat Conservation International (BCI)
- Serving on the research committee of the Gauteng and Northern Regions Bat Interest Group (GNoRBIG).
- Serving on the steering committee of the Zoological Society of the University of Johannesburg.

Experience

i. 2008 – Current Founder of Animalia Zoological & Ecological Consultation CC. Animalia has completed more than **280 specialist reports and numerous large scale projects** under the supervision and lead of Werner Marais:

ii. 2008 University of Johannesburg Gauteng

- Sensitivity and biodiversity surveys of five caves in the Cradle of Humankind World Heritage Site (COHWHS) and Pretoria areas.
- Preliminary survey to investigate the correlation between insectivorous bats and prey insects in the Krugersdorp Game Reserve.

iii. 2007, 2008 Limpopo

1. *Bertie van Zyl (Pty) Ltd.(ZZ2 Tomato Farms)*

2. University of Johannesburg Gauteng

Two year project to research the biological pest control method of utilizing insectivorous bats in agriculture. Required to conduct an in-depth study of bat (Microchiroptera) behavior and ecologically important factors.

iv. 2006 University of Johannesburg Gauteng

Six month survey of cave dwelling arthropods in the Cradle of Humankind World Heritage Site.

Additional:

Invited by the EWT (Endangered Wildlife Trust) to deliver a presentation on current ecological issues regarding bats and wind energy.

Invited to present on current ecological issues regarding bats and wind energy for ESSA (Exploration Society of Southern Africa).

Contributing editor for the: "South African Good Practice Guidelines for Surveying Bats at Wind Energy Facility Developments – Pre-construction; 3rd Edition February 2014"

As a co-author, recieved the Dow Greeff price for best annual scientific publication: "Die karst-ekologie van die Bakwenagrot (Gauteng)" published in the Suid-Afrikaanse Tydskrif vir Natuurwetenskap en Tegnologie, Vol. 31(1), 2012.

Public and educational presentations related to bats, and presented a part of a Bat Training Course at Nylsvley Nature Reserve.

Presented the following papers at conferences:

- ***The potential of using insectivorous bats (Microchiroptera) as a means of insect pest control in agricultural areas. The Zoological Society of Southern Africa's 50th Anniversary Conference. July 2009.***
- ***Inseketende vlermuise (Microchiroptera) en vlermuishuise in landbougebiede. Suid Afrikaanse Akademie vir Wetenskap en Kuns se 100 jaar Eufees kongres. October 2009.***

Interviewed for two popular magazine articles on ecological aspects of biological pest control utilising bats; published in two consecutive issues of Farmers Weekly.

Languages

Afrikaans / English – Full professional proficiency in both.

References

Dr Francois Durand – Karst ecologist and paleontologist. Pr.Sci.Nat. (Zoology and Earth Sciences).

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Thank You

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EDUCATION

University of Johannesburg, Auckland Park, SA
MSc Biodiversity and Conservation (Full dissertation) **2012-2014**

Title: Habitat use, temporal distribution and preferred weather conditions of *Tadarida aegyptiaca* and *Neoromicia capensis*, and its application to wind farm development in South Africa.

University of Johannesburg, Auckland Park, SA
BSc Honours in General Zoology (Cum laude) **2011**

Areas of Concentration: Nature Conservation, Mammology, Population Genetics, Ecophysiology, Terrestrial Ecology, Indices for the health of aquatic ecosystems, Fish as a Test Organism, Aquatic Parasitology, Philosophy and Research Methodology

Honours' Thesis title: Environmental Conditions Affecting Hibernating Natal Long-fingered Bats (*Miniopterus natalensis*) in Bakwena Cave, Irene

University of Johannesburg, Auckland Park, SA
BSC Zoology and Human Physiology (Cum laude) **2008-2010**

Afrikaanse Hoerskool Germiston, Germiston, SA
Matriculated with 6 distinctions **2007**

SHORT COURSES

Acoustic techniques and AnalookW workshop **2013**
Intructors: Chris Corben and Kim Livengood

NQF US229995 and US229998 Fall Arrest and Basic Rescue (Work at height) **2014**
Gravity Training CC

The Management of Bats Injured by Wind Turbines **2014**

Instructor: E.J. Richardson (Richardson and Peplow Environmental)
Bats and Wind Energy Annual Meeting/Workshop **2014**

NQF US229994 and US229998 Fall Protection Planner **2014**
Gravity Training CC

AWARDS

- Top Zoology Honours Achiever

(Awarded by Department of Zoology, UJ) **2011**

- Human Physiology Top Achiever for modules HPH2A, 2B, 3A, 3B

(Awarded by Department of Zoology, UJ) **2009-2010**

- Zoology Top Achiever for modules ZOO1A, 1B, 2A, 3A, 3B

(Awarded by Department of Zoology, UJ) **2008 - 2010**

- Mathematics Top Achiever for module 1C

(Awarded by Department of Mathematics, UJ) **2008**

- UJ First Year Top Achiever **2008**
- Ekhurleni West Top Achiever for Matric Accountancy **2007**
- Afrikaanse Hoërskool Germiston Dux Scholar **2007**

REPORTS OF ACADEMIC RESEARCH AND CONFERENCE PROCEEDINGS

- Environmental Conditions Affecting Hibernating Natal Long-fingered Bats (*Miniopterus natalensis*) in Bakwena Cave, Irene - Presented at the Department of Zoology Colloquium and Akademie vir Wetenskap Conference, 2011

EMPLOYMENT HISTORY

- **Senior Environmental Specialist Consultant** **2011 to present**
  Animalia Zoological and Ecological Consultation
  Contact person: Werner Marais
  Contact number: +2778 190 3316
  Email: werner@animalia-consult.co.za

- **Environmental Characterisation for Eskom power line maintenance** **June – Aug 2012**
  Envirolution Consulting (Pty) Ltd
  Contact person: Gesan Govender
  Contact number: +27834198905
  Email: gesan@envirolution.co.za

- **Practical demonstrator** **Jan – Nov 2011**
  University of Johannesburg
  Department of Zoology
  Contact number: +27 (0)11 559 2441

- **Product promoter** **June 2010 – Dec 2011**
  Splurgenetwork
  Contact person: Jolene Holder
  Contact number: +27741421655

- **Private mathematics tutor** **May 2010 – Nov 2010**
  My Academics SA
  Contact person: Travis Beyer
  Contact number: +2782 378 3651

- **The Lion Park (Lanseria) Volunteer** **Sep – Nov 2010**
  Contact number: +27 (0)11 691 9905

- **Temporary receptionist, office worker and data capturer** **2005 – 2009**
  Iveco SA
  Waterfall Park, Howick Close, Bekker Street, Midrand
  Contact person: Ilka Grund
  Contact number: +2772 954 1924

- **Volunteer Game Counter** **Oct 2006**
  Jabutas Cheetah Reserve
  Rhenosterkloof, Polokwane

PROFICIENCY IN THE FOLLOWING COMPUTER PROGRAMS

- Microsoft Office Excel
- Microsoft Office Powerpoint
- Microsoft Office Word
- Microsoft Office Outlook
- IBM SPSS Statistics
- MapSource
- DNRGarmin
- Google Earth
- GPS Utility
- GPS Babel
- BatSound
- Analook

PROFICIENCY IN THE FOLLOWING LANGUAGES

- English – native language
- Afrikaans – speak and read/write

MEMBERSHIPS

- University of Johannesburg Golden Key Society **2009 to present**
- University of Johannesburg Alumni Society **2010 to present**
- Zoological Society of Southern Africa **2012 - 2013**

Appendix C4:
Addendum to Freshwater Impact Assessment

Addendum to

Freshwater Assessment for the Proposed Longyuan Mulilo De Aar 2 South Wind Energy Facility, Northern Cape

July 2015

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1. INTRODUCTION AND BACKGROUND

Mulilo Renewable Energy (Pty) Ltd applied for Environmental Authorisation from the Department of Environmental Affairs in 2011 to establish a Wind Energy Facility (WEF) and associated infrastructure on the eastern plateau (south) of De Aar (Longyuan Mulilo De Aar 2 South WEF hereafter referred to as De Aar 2 South WEF). The proposed development site is approximately 12,832ha in extent and consists of 8 portions of 4 farms. The original proposed WEF comprised approximately 103 turbines, each with a generation capacity of 1.5 - 2.5MW. The potential generation capacity of the WEF has subsequently been limited to 140MW in accordance with the Department of Energy's cap on maximum megawatts, although 258MW was authorised.

Subsequent to the freshwater assessment for the environmental impact assessment for the project, the project description for the proposed wind energy facility has been refined and improved upon (Figure 1). This freshwater addendum report provides an assessment of the amended project description.

2. SUMMARY OF RECOMMENDATIONS FROM FRESHWATER ASSESSMENT REPORT

The main aquatic features within the study area are the Brak and Hondeblaf Rivers, seasonal tributaries within the Orange River System (Lower Orange WMA). The Brak River (Quaternary catchment D62B) flows in a north westerly direction along the southern boundary of the study area with a number of its tributaries crossing the site as they flow in a southerly direction. The Brak River joins the Orange River east of Prieska. The Hondeblaf River (Quaternary catchment D31B) originates on the plateau and flows in a north to north easterly direction towards Philipstown before joining the Orange River near Vanderkloof.

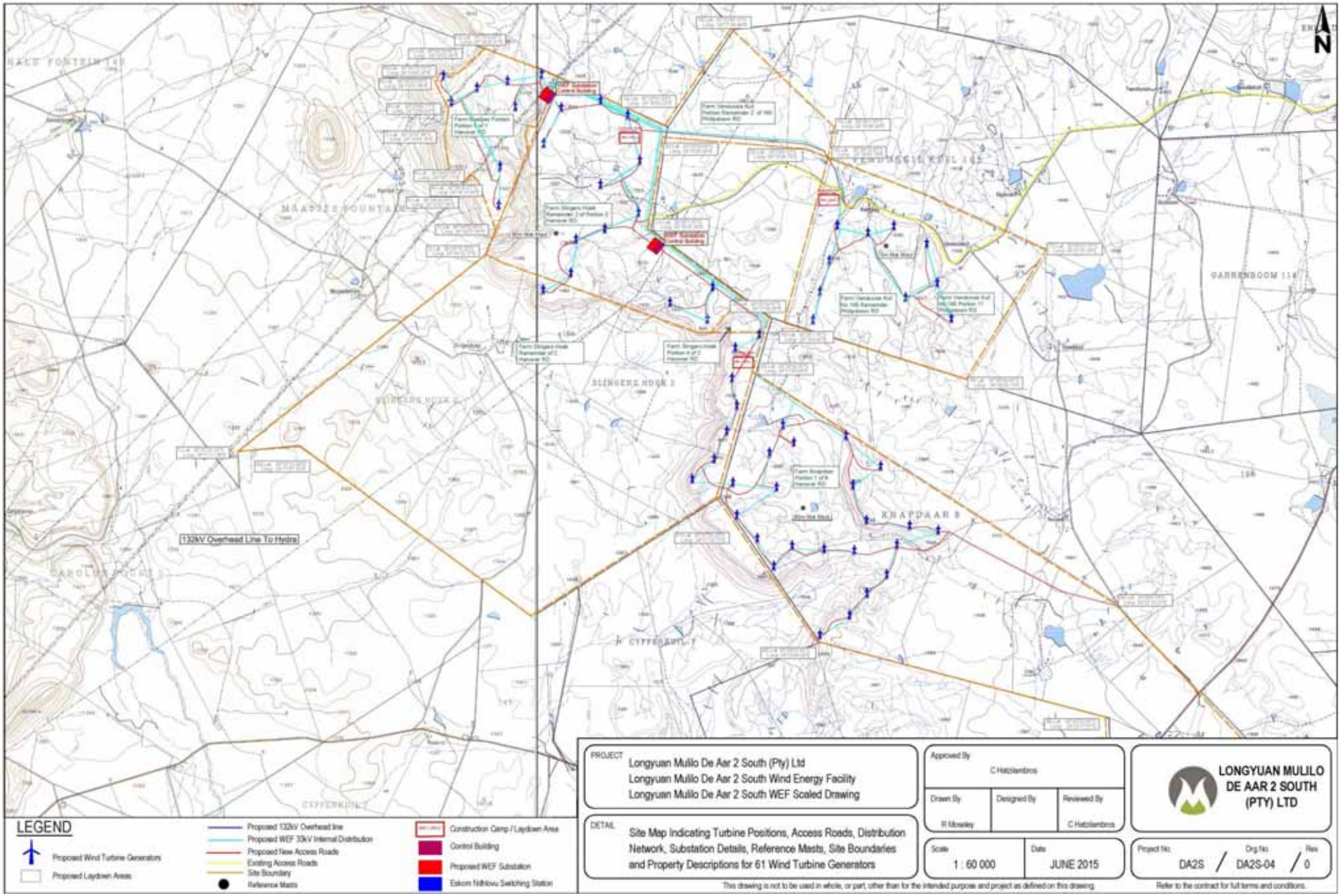

Figure 1. Map of the study area indicating the new proposed layout

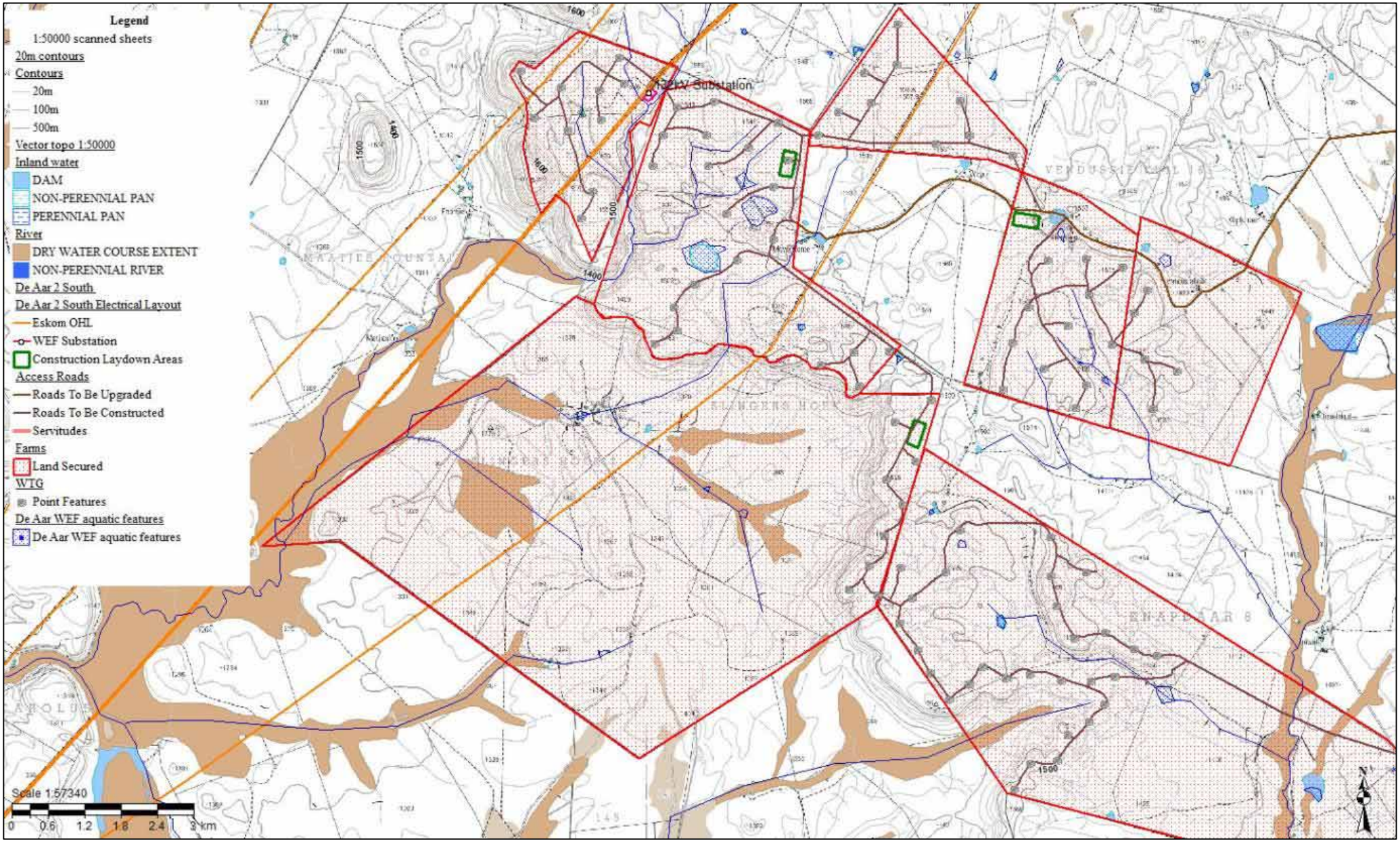

Figure 2. Initial proposed layout plan for De Aar 2 South WEF in relation to the mapped freshwater features in the area

Both the Brak and Hondeblaf Rivers have predominantly sandy/silty substrate with outcrops of bedrock. The rivers drain shrubland vegetation in an area with a very low rainfall. As a result, the water flowing in these rivers are saline, turbid and seasonally flowing. These rivers have been moderately modified by the surrounding farming activities. The Upper Brak Rivers is considered to be of a moderate to low Ecological Importance and Sensitivity while the Upper Hondeblaf River is scored as high due to the presence of juvenile Vaal-Orange Largemouth Yellowfish *Labeobarbus kimbeleyensis* in the lower reaches of the river.

Most of the smaller tributaries within the study area are ephemeral and are discernible only as slightly shallow depressions with no clear associated vegetation. They tend to be in a largely natural to moderately modified ecological state. Small, shallow instream dams have been constructed within many of these drainage channels. Associated with many of the streams and the small dams are small wetland areas or pans that are in a highly modified state and are of a low ecological significance. The only significant series of pans within the study area is located at Slingershoek and have been identified as FEPA wetlands. The layout plan for the WEF has been altered within this area to ensure that no turbines will be placed in close proximity to the pans.

3. CONSIDERATION OF REVISED PROPOSED LAYOUT

The De Aar 2 South WEF wishes to increase the generating size of the wind turbine generators (WTG) as follows:

- Increasing hub heights from 100 m to 120m
- Increasing blade lengths from 60 m to 80m
- Increasing WTG generation size from 2.3MW to 4.0MW

The above proposed changes will result in a change from 103 WTG at 2.3MW per turbine to 61 WTG at 2.3MW per turbine or at worst 30 WTG at 4MW per turbine. The maximum of 61 WTG is being applied for. The proposed amendments would result in an increase of the turbine tower-base diameter from 15m to 20m, however the construction hardstand pad would remain 40x50m, and an increase in the permanent foundation size from 16x16m at 2m depth to 18.4m diameter at a depth of 3.5m narrowing to 10.6m diameter at the surface.

Refinements to the WEF layout have also been made as shown in relation to the mapped freshwater features in Figure 3. With the new layout, the freshwater constraints mapping has been taken into account. No WTG are located in close proximity to any of the delineated freshwater features. There are approximately 12 road crossings over minor watercourses within the site. Three of these crossings are for existing roads that will be upgraded.

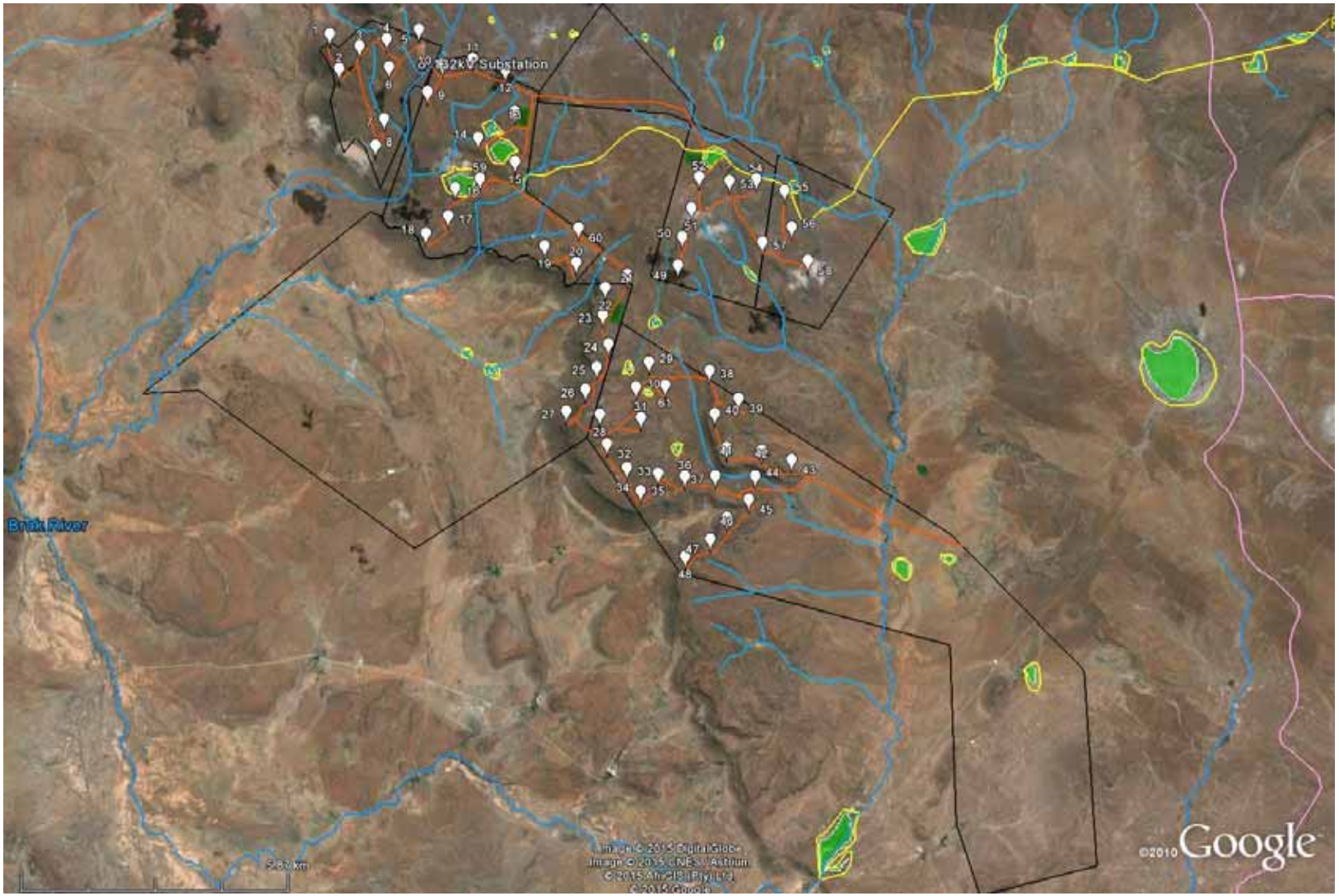

Figure 3. Google Earth image showing the proposed new layout together with the mapped freshwater features where the blue lines represent rivers and the green areas pans or wetland areas, the orange lines are new roads whilst the yellow lines are existing roads to be upgraded

Land use in the area surrounding De Aar currently consists of livestock farming. Due to the arid nature of the area, the carrying capacity of the land is low and livestock numbers in general are low. The land and climate are also not conducive to the cultivation of crops and pastures and the surface and groundwater tends to be brackish and available mostly during the wet winter months. Current land and water use impacts on the Brak River and its tributaries are low. Due to the ephemeral character of the surface water systems, they are also slow to recover from any impacts.

A number of power projects have been proposed in the area surrounding De Aar, particularly towards the east and south east where they can link up with the existing Hydra substation and transmission lines. Within the immediate surrounding area of the proposed De Aar 2 WEF, the other proposed projects are also for WEF. The nature of these projects allows them to have minimal impact on the surface water features as the turbines can be placed far enough away from the freshwater features so as to not impact on them. The largest potential impact of these projects is as a result of the associated infrastructure which can be mitigated such that its impact on the aquatic ecosystems is of a low significance.

Nature: Cumulative impacts of the combined project activities of all renewable energy projects in the De Aar area on the freshwater features (Brak River and its tributaries as well as pans and wetlands in the area)		
	Without mitigation	**With mitigation**
Extent	Regional / medium (3)	Site specific to local / low (1)
Duration	Long-term (4)	Short –term (1)
Magnitude	Moderate (6)	Small (3)
Probability	Probable (3)	Improbable (2)
Significance	Medium (39)	Low (10)
Status	Negative	Negative
Reversibility	Reversible	Reversible
Irreplaceability	Low	Low
Mitigation ability	Low	Low
Mitigation:	As stated in the following section	
Cumulative impacts:	As stated above	
Residual impacts:	Potential for increased erosion and sedimentation of freshwater features with an associated habitat loss	

Below is a summary of the assessment of potential impacts of the individual proposed activities for the proposed amended project description:

Construction Phase:

Potential impact on freshwater features	Proposed wind energy facilities and buildings associated with the WEF
Nature of impact:	Limited disturbance of freshwater related habitats at the construction sites
Extent and duration of impact:	Localised short term impacts
Intensity of Impact	Moderate to high – depends on proximity to freshwater features
Probability of occurrence:	Probable if construction activities occur in close proximity to the freshwater features
Degree to which impact can be reversed:	Medium to high
Irreplaceability of resources:	Medium to low
Cumulative impact prior to mitigation:	Low to Very low – depends on proximity to freshwater features
Significance of impact pre-mitigation	Low
Degree of mitigation possible:	Very low
Proposed mitigation:	Construction activities should as far as possible be limited to the identified sites for the proposed wind energy facilities and the structures. A buffer of at least 30m (from centre of stream for smaller drainage lines and from top of bank for larger tributaries) should be maintained adjacent to the identified freshwater features, as well as from the edge of the pans and wetland areas. It is important that any of the

	cleared areas that are not hardened surfaces are rehabilitated after construction is completed by revegetating the areas disturbed by the construction activities with suitable indigenous plants. Invasive alien plants that currently exist within the immediate area of the construction activities should also be removed and the sites monitored for regrowth on an ongoing basis. To reduce the risk of erosion, the locality of the turbines and structures should preferably not be on any steep slopes or within the wide wash areas on the plains. Run-off over the exposed areas should be mitigated to reduce the rate and volume of run-off and prevent erosion occurring on the site and within the freshwater features and drainage lines. Contaminated runoff from the construction site(s) should be prevented from entering the rivers/streams. All materials on the construction sites should be properly stored and contained. Disposal of waste from the sites should also be properly managed. Construction workers should be given ablution facilities at the construction sites that are located at least 100m away from the river system and regularly serviced. These measures should be addressed, implemented and monitored in terms of the EMP for the construction phase.
Cumulative impact post mitigation:	Very Low
Significance after mitigation	Very Low

Potential impact on freshwater features	Proposed access routes and other linear infrastructure associated with the WEF
Nature of impact:	Disturbance of habitat and possibly impedance/diversion of flow at stream / drainage line crossings or adjacent to freshwater features
Extent and duration of impact:	Localised short term impacts
Intensity of Impact	Moderate to Low
Probability of occurrence:	Probable – depends on proximity to freshwater features
Degree to which impact can be reversed:	High
Irreplaceability of resources:	Medium to Low
Cumulative impact prior to mitigation:	Low to very low – depends on proximity to freshwater features
Significance of impact pre-mitigation	Low
Degree of mitigation possible:	Very low
Proposed mitigation:	The existing road infrastructure should be utilized as far as possible to minimize the overall disturbance created by the proposed project. Where new roads need to be constructed the existing road infrastructure should be rationalised and any unnecessary roads decommissioned and rehabilitated to reduce the disturbance of the area and within the stream beds. For new access roads to the turbines, these should rather be along the ridges of the hills than in the drainage/stream beds. Where access routes need to be constructed through streams/drainage lines, the disturbance of the channel should be limited. Wetland and pan areas should be avoided and any road adjacent to a wetland feature should also remain outside of the 30m buffer zone as far as possible. All crossings over drainage channels or stream beds should be such that the flow within the drainage channel is not impeded. Road infrastructure, transmission lines and cable alignments should coincide as much as possible to minimize the impact.
Cumulative impact post mitigation:	Very Low
Significance after mitigation	Very Low

Operation Phase:

Potential impact on freshwater features	Maintenance of wind energy facilities
Nature of impact:	Limited disturbance of freshwater related habitats at the stream / drainage line crossings or adjacent to the freshwater features for cables, transmission line and access roads
Extent and duration of impact:	Localised longer term impacts
Intensity of Impact	Low
Probability of occurrence:	Probable as a result of construction activities within stream beds and riparian zones
Degree to which impact can be	Medium to high

reversed:	
Irreplaceability of resources:	Medium to Low
Cumulative impact prior to mitigation:	Very low due to the existing disturbances within these streams
Significance of impact pre-mitigation	Very low
Degree of mitigation possible:	Very low
Proposed mitigation:	Operational activities should as far as possible be limited to the delineated site for the proposed development and the identified infrastructure routes. Invasive alien plant growth should be monitored on an ongoing basis to ensure that these disturbed areas do not become infested with invasive alien plants. Storm water run-off infrastructure must be maintained to mitigate both the flow and water quality impacts of any storm water leaving the wind energy facilities site. Should any erosion features develop, they should be stabilised as soon as possible. Water supply, sanitation services as well as solid waste management should preferably be provided by an off-site service provider. Any disturbed areas should be rehabilitated and monitored to ensure that these areas do not become subject to erosion or invasive alien plant growth.
Cumulative impact post mitigation:	Very Low
Significance after mitigation	Very Low

4. CONCLUSIONS

The overall impact of the proposed layout for the project as assessed in the freshwater report was deemed to be limited and of a low significance. One can therefore expect that the proposed amended project description and revised layout would potentially impact even less on the freshwater features in the area.

Prepared By:

Toni Belcher

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environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

DETAILS OF SPECIALIST AND DECLARATION OF INTEREST

	(For official use only)
File Reference Number:	12/12/20/ or 12/9/11/L
NEAS Reference Number:	DEA/EIA
Date Received:	

Application for integrated environmental authorisation and waste management licence in terms of the-

(1) National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended and the Environmental Impact Assessment Regulations, 2014; and

(2) National Environmental Management Act: Waste Act, 2008 (Act No. 59 of 2008) and Government Notice 921, 2013

PROJECT TITLE

PROPOSED WIND ENERGY FACILITY SITUATED ON THE EASTERN PLATEAU (SOUTH) NEAR DE AAR, NORTHERN CAPE PROVINCE: APPLICATION FOR AMENDMENT OF ENVIRONMENTAL AUTHORISATION

Specialist:	BlueScience		
Contact person:	Toni Belcher		
Postal address:	PO Box 455, Somerset Mall		
Postal code:	7137	Cell:	0828838055
Telephone:	021 851 80555	Fax:	-
E-mail:	toni@bluescience.co.za		
Professional affiliation(s) (if any)	SACNASP (400040/10 Environmental Science and Ecological Science)		

Project Consultant:	Holland & Associates Environmental Consultants		
Contact person:	Barry Wiesner		
Postal address:	P O Box 31108, Tokai		
Postal code:	7966	Cell:	082 4636221
Telephone:	-	Fax:	-
E-mail:	barry@hollandandassociates.net		

4.2 The specialist appointed in terms of the Regulations

I, Antonia Belcher, declare that -- General declaration:

I act as the independent specialist in this application;
I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
I declare that there are no circumstances that may compromise my objectivity in performing such work;
I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
I will comply with the Act, Regulations and all other applicable legislation;
I have no, and will not engage in, conflicting interests in the undertaking of the activity;
I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
all the particulars furnished by me in this form are true and correct; and
I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

Signature of the specialist:

Blue Science (Pty) Ltd

Name of company (if applicable):

5 June 2015

Date:

CURRICULUM VITAE: ANTONIA BELCHER

Name:	Antonia (Toni) Belcher ***(Pr. Sci. Nat)***
Profession:	Aquatic scientist
Nationality:	South African
Years experience	23 years
Academic Qualifications:	1998 - M.Sc. in Environmental Management, Potchefstroom University (*cum laude*) 1989 - B.Sc. (Hons) in Oceanography, University of Port Elizabeth 1987 - B.Sc. – Mathematics, Applied Mathematics, University of Port Elizabeth 1984 – Matriculation, Lawson Brown High School
Areas of specialisation:	• Aquatic ecosystem monitoring and assessments • Design of monitoring programmes for aquatic ecosystems • Compilation of State of River reports (aquatic data collection, interpretation, presentation, graphic layout and design and preparation of technical and glossy print ready copies) • Environmental Impact Assessments • River classification and environmental water requirements • Integrated Water Resource Management • River, Wetlands and Estuary management • Water quality management • Water resource legislation • Water resource institutions • Water education
Countries of Work Experience:	South Africa, Namibia, Swaziland, Lesotho, Rwanda
Employment Record:	2013 - BlueScience 2007 – 2012 Self-employed 1999 – 2007 Assistant and Deputy Director, Water Resource Protection, Western Cape Regional Office, Department of Water Affairs, Cape Town 1995 – 1999 Institute for Water Quality Studies, Department of Water Affairs, Pretoria 1991 – 1995 Water Pollution Control Officer, Water Quality Management, Department of Water Affairs, Pretoria 1989 – 1990 Mathematics tutor and administrator, Master maths, Randburg and Braamfontein Colleges, Johannesburg 1987 – 1988 Part-time field researcher, Department of Oceanography, University of Port Elizabeth
Awards and Achievements:	Woman in Water award for Environmental Education (2006) Runner up for the Woman in Water prize for Water Research (2006)
Professional membership and accreditations:	Accreditation: SASS Practitioner and Auditor (2007 – 2013) Member of the International Association of Impact Assessments (IAIA) Accredited as an Environmental Scientist with the SACNSP (number 400040/10) Accredited as an Ecological Sciences professional with the SACNSP (number 400040/10)
Summary of experience	**2007 to Present:** Toni has worked as an independent scientist in her private capacity and in association with Blue Science Consulting cc on water resource protection and management projects. • Free State river health monitoring programme. • Classification of the water resources of the Olifants Doorn Water Management Area. • Graphic design, layout, technical compilation and preparation of print ready glossy publications for the State-of-River reports for the Breede River South Africa • Development and piloting of a National Strategy to Improve Gender Representation in Water Management Institutions, where the focus is on improving the capacity (specifically amongst women) to participate in water related decision making. • Compilation of a background document as well as a framework management plan towards the development of an integrated water resources management plan for the Sandveld; • Aquatic specialist to the City of Cape Town project: Determination of additional resources to manage pollution in stormwater and river systems;

	• Framework for Education and Training in Water (FETWATER), Resource Directed Measures Network partner which has undertaken training initiatives on environmental water requirements in the SADC region; • More than 200 aquatic ecosystem assessments as input into the environmental impact assessment and water use authorisation processes and providing recommendations on water resource impact mitigation measures primarily in the Western and Northern Cape. **2000 –2007:** In the Western Cape Regional Office, Ms Belcher was the manager responsible for the implementation of the Reserve Directed Measures component of the National Water Act. Added to this, Ms Belcher was the Provincial Champion for the River Health Programme in the Western Cape and has initiated a number of activities and partnerships within the region towards ensuring that the programme was implemented in the province on a sustainable basis. On the completion of the sampling and data collection phases of the monitoring programmes Ms Belcher designed, implemented and compiled State-of-River reports for 7 catchment areas in the Western Cape. **1995 - 2000:** During this period Ms Belcher worked at the Institute for Water Quality Studies and had the following responsibilities or was involved in the following activities: Personnel management for the project team: Management Support Services and Strategic Business Unit leader for Monitoring Programme Development and Assessments; Project leader for a number of water quality situation assessment projects; Provided specialist input into various aspects of the new National Water Act and its implementation; Steering committee member on a number of WRC projects and Member of technical committee for SABS Environmental Management standards. **1991 -1995:** During this period Ms Belcher worked in the Directorate Water Quality Management and was involved in the projects or tasks: Compiled and maintained a Contingency Plan for Pollution Incidents for the Department of Water Affairs and Forestry. • Administrated exemptions from the Water Act for effluent discharges. • Managed and was involved in the following projects**:** Reappraisal of the Richard's Bay Pipelines; Impact of Fish Factory Effluents; Marine Water Quality Management Information System; Marine Water Quality Guidelines; South African Water Quality Guidelines (Phase II and Aquatic Ecosystems); and Quantifying the economic effect of salinisation of South Africa's Water Resources. • Development of information systems for the administration of permits and for catchment management. • Water quality catchment studies for Wilderness Lakes, and Knysna catchments. • Development and implementation of marine water quality policy. • Development of a water quality management strategy for the Hartenbos estuary
Publications:	More than **200 publications, papers and posters** relating mostly to water resource quality and river health assessments in Southern African rivers and their management.

Appendix C5:
Addendum to Noise Impact Assessment

Longyuan Mulilo De Aar 2 South (Pty) Ltd

ADDENDUM TO ENVIRONMENTAL NOISE IMPACT ASSESSMENT

Proposed Wind Energy Facility situated on the eastern plateau (South) near De Aar, Northern Cape

Study done for:

Holland & Associates
Environmental Consultants

Prepared by:

EAR
Enviro Acoustic Research

P.O. Box 2047, Garsfontein East, 0060
Tel: 012 – 993 2165, Fax: 086 – 621 0292, E-mail: info@eares.co.za

EXECUTIVE SUMMARY

Enviro-Acoustic Research cc was commissioned to undertake a specialist study to determine the potential noise impact on the surrounding sound environment due to the proposed establishment of the De Aar 2 South Wind Energy Facility. The facility is to be developed by Longyuan Mulilo De Aar 2 South (Pty) Ltd and is situated approximately 27 km east of De Aar in the Northern Cape.

The proposed amended option includes 61 Wind Turbines with a total generating capacity of 140 MW. The generating capacity per wind turbine could be as much as 4.0 MW, the rotor diameter up to 160m and the hub height up to 120m.

This report describes the potential noise impact that such a facility may have on the surrounding acoustic environment, describing the methods used, potential issues identified and providing findings, in the form of an impact significance ratings, and recommendations for mitigation (if required).

The area has been visited previously where ambient sound levels were measured. The data indicates that the area have a potential to be very quiet at night. The visual character of the area is mainly rural and it was accepted that the SANS 10103:20008 noise district classification would be rural for the study area.

The developer is considering two different wind turbines with this study using the noise emission characteristics of the Siemens SWT-3.3-130 wind turbine. With the input data as used, this assessment indicated that the change in layout as well as the reduction in wind turbines did reduce the projected noise levels at the surrounding receptors during both the construction and operational phase.

Therefore the proposed amendments would result in a reduction in the significance of both the construction and operational phase noise impacts, from "low" (authorised option) to "very low" (proposed amended option.

Further mitigation is not required or recommended, however if a valid and reasonable noise complaint is registered relating to the construction or operation of the facility additional noise measurements should be conducted by an acoustic consultant. Noise measurements must be continued as long as noise complaints are registered.

The developer should re-evaluate this study if the layout is changed (where any wind turbines are moved closer, or turbines are added within 800 m from any potential noise-sensitive receptor) or if the developer makes use of a different wind turbine that generates more than 108 dBA.

With its promise for environmental and economic advantages, wind power generation has significant potential to become a large industry in South Africa. However, when wind farms are near to potential sensitive receptors, consideration must be given to ensuring a compatible co-existence. The potential sensitive receptors should not be adversely affected and yet, at the same time the wind farms need to reach an optimal scale in terms of layout and number of units.

Wind turbines produce sound, primarily due to mechanical operations and aerodynamic effects at the blades. Modern wind turbine manufacturers have virtually eliminated the noise impact caused by mechanical sources and instituted measures to reduce the aerodynamic effects. But, as with many other activities, the wind turbines emit sound power levels at a level that can impact on areas at some distance away. When potentially sensitive receptors are nearby, care must be taken to ensure that the operations at the wind farm do not cause undue annoyance or otherwise interfere with the quality of life of the receptors.

It should be noted that this does not suggest that the sound from the wind turbines should not be audible under all circumstances - this is an unrealistic expectation that is not required or expected from any other agricultural, commercial, industrial or transportation related noise source – but rather that the sound due to the wind turbines should be at a reasonable level in relation to the ambient sound levels.

This report should be cited as:

De Jager, M. 2015: "*Addendum to Environmental Noise Impact Assessment: Proposed De Aar 2 South Wind Energy Facility north-east of De Aar, Northern Cape*". Enviro-Acoustic Research cc, Pretoria

Client:

Longyuan Mulilo De Aar 2 South (Pty)Ltd
PO Box 50
Cape Town International Airport
7525

Report no:

MRPD-DAWEF/ENIA/201506-Rev 0

Authors:

M. de Jager *(B. Ing (Chem))*

Review:

S. Weinberg *(B.Sc. Applied Mathematics and Physics Stream– in process)*

Date:

June 2015

environmental affairs
Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

DETAILS OF SPECIALIST AND DECLARATION OF INTEREST

	(For official use only)
File Reference Number:	12/12/20/2463/AM3
NEAS Reference Number:	DEAT/EIA/
Date Received:	

Application for authorisation in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended and the Environmental Impact Assessment Regulations, 2010

PROJECT TITLE

PROPOSED WIND ENERGY FACILITY SITUATED ON THE EASTERN PLATEAU (SOUTH) NEAR DE AAR, NORTHERN CAPE PROVINCE: APPLICATION FOR AMENDMENT OF ENVIRONMENTAL AUTHORISATION

Specialist:	Noise		
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Professional affiliation(s) (if any)	ASA, SAAI		

Project Consultant:			
Contact person:			
Postal address:			
Postal code:		Cell:	
Telephone:		Fax:	
E-mail:			

The specialist appointed in terms of the Regulations

I, **Morné de Jager**, declare that –

General declaration

- I act as the independent specialist in this application
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- all the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of Regulation 71 and is punishable in terms of section 24F of the Act.

Signature of the specialist:

Enviro-Acoustic Research cc
Name of company (if applicable):

Date:

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GLOSSARY OF ABBREVIATIONS

AZSL	Acceptable Zone Sound Level (Rating Level)
DEA	Department of Environmental Affairs
EAP	Environmental Assessment Practitioner
EARES	Enviro-Acoustic Research cc
ECA	Environment Conservation Act (Act 78 of 1989)
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EMS	Environmental Management System
IAPs	Interested and Affected Parties
IEM	Integrated Environmental Management
km	kilometres
kV	Kilovolt
m	Meters (measurement of distance)
m^2	Square meter
m^3	Cubic meter
mamsl	Meters above mean sea level
MW	Megawatt
NEMA	National Environmental Management Act, 1998 (Act 107 of 1998)
NCR	Noise Control Regulations (under Section 25 of the ECA)
NSD	Noise-sensitive development
SANS	South African National Standards
TLB	Tip Load Bucket
UTM	Universal Transverse Mercator
WEF	Wind Energy Facility
WHO	World Health Organisation
WTG	Wind Turbine Generator

1 INTRODUCTION

1.1 INTRODUCTION AND PURPOSE

Enviro-Acoustic Research cc (EARES) was commissioned to undertake an update to the specialist noise study, to review a revised layout and proposed amendments to the project description, to determine the potential noise impact on the surrounding environment due to the establishment of the proposed Wind Energy Facility situated on the Eastern Plateau (South) near De Aar (referred to as "De Aar 2 South Wind Energy Facility" (WEF)).

This report describes the potential noise impact that the proposed amendments may have on the surrounding acoustic environment, describing the methods used, potential issues identified and providing findings, in the form of an impact significance ratings, and recommendations for mitigation. The study involved a site visit where ambient sound levels on and around the site was measured where after sound propagation models were used to identify potential issues of concern.

1.2 PROJECT HISTORY

M2 Environmental Connections cc [1] originally did the Environmental Noise Impact Assessment (ENIA) for the Mulilo De Aar Projects in 2012. The Environmental Assessment Practitioner (EAP) managing the Environmental Impact Assessment (EIA) was Aurecon South Africa (Pty) Ltd. amendments The Authorized option was for a 103 turbine WEF, each with a generating capacity of 1.5 – 2.5 MW (rotor diameter of 120m and hub height of 100m). The facility was known as Plateau East 2 South WEF (see **Figure 1.1**).

The proposed amended option is presented in **Figure 1.2** and includes 61 Wind Turbines with a total generating capacity of 140 MW. The generating capacity per wind turbine could be as much as 4.0 MW (i.e. ranging from 2.3MW – 4.0MW), the rotor diameter up to 160m and the hub height up to 120m.

1.3 COMMENTS RECEIVED FROM INTERESTED OR AFFECTED PARTIES

The author is not aware of any comments received about noise for this WEF during the EIA phase.

[1] The company changed name in 2014, although the author of the previous and this report is the same.

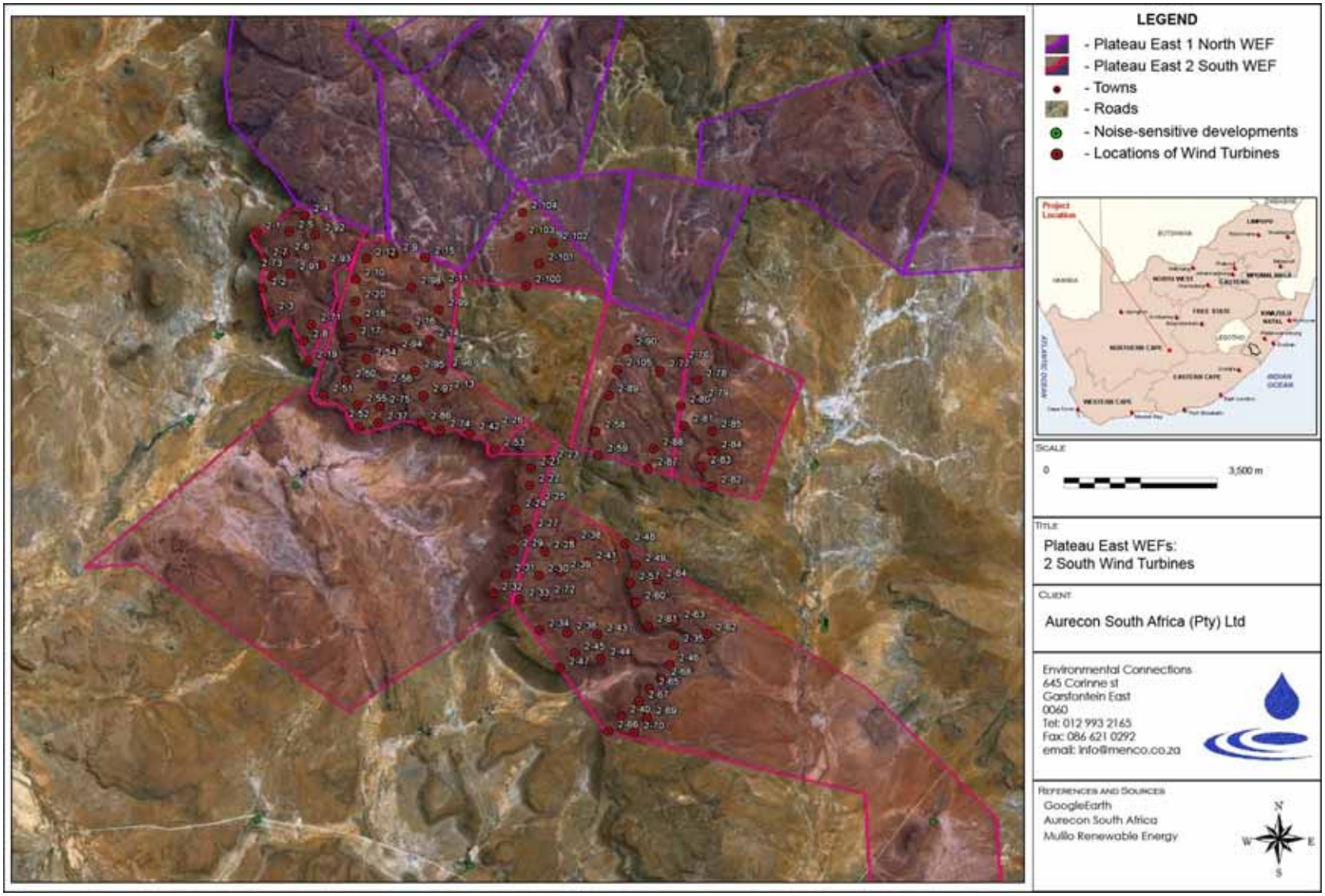

Figure 1.1: Authorized option: Previous layout as evaluated for the Plateau East 2 South WEF (Source: De Jager, 2012)

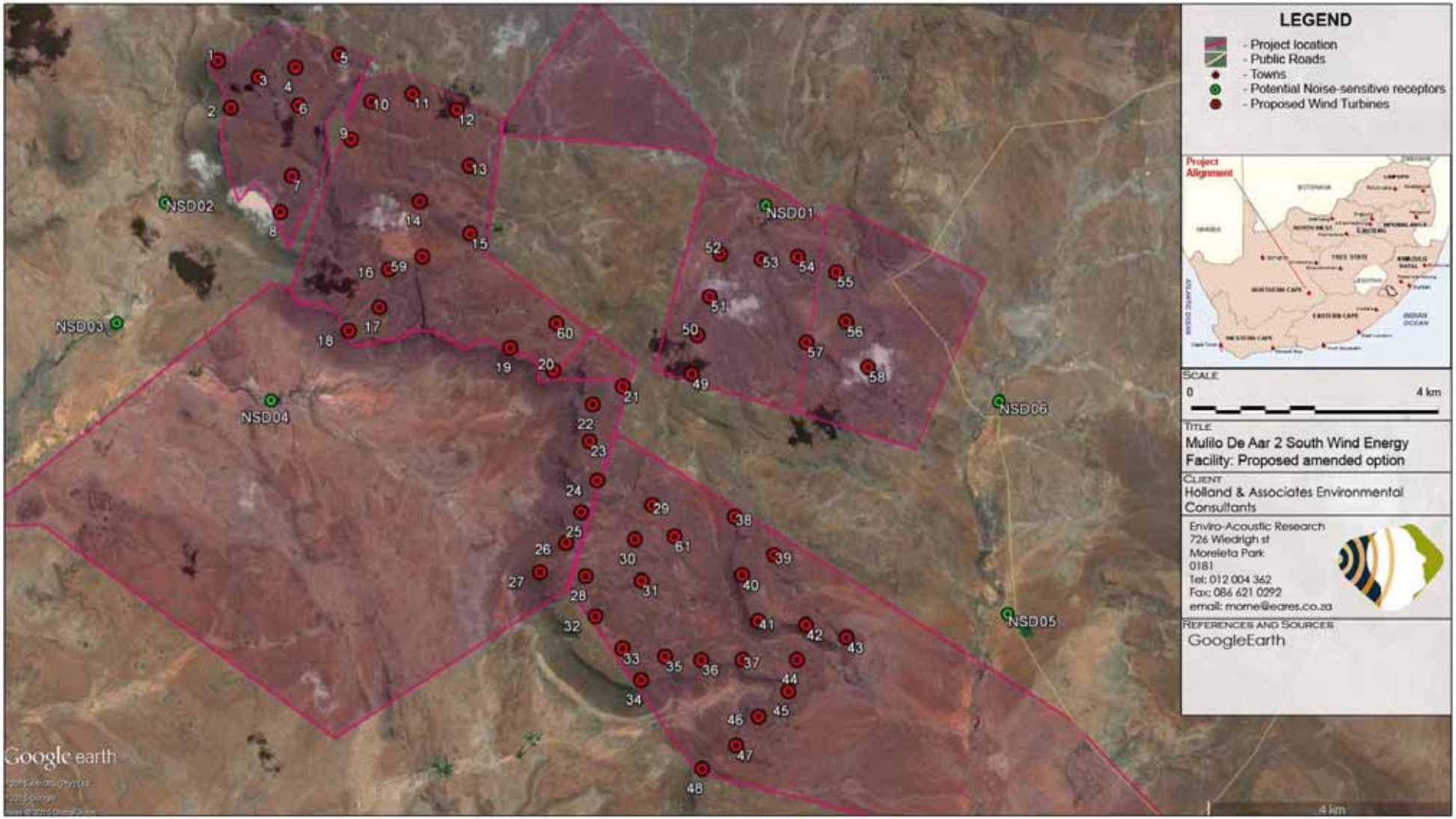

Figure 1.2: Proposed Amended Option: Ammended layout as evaluated for this report

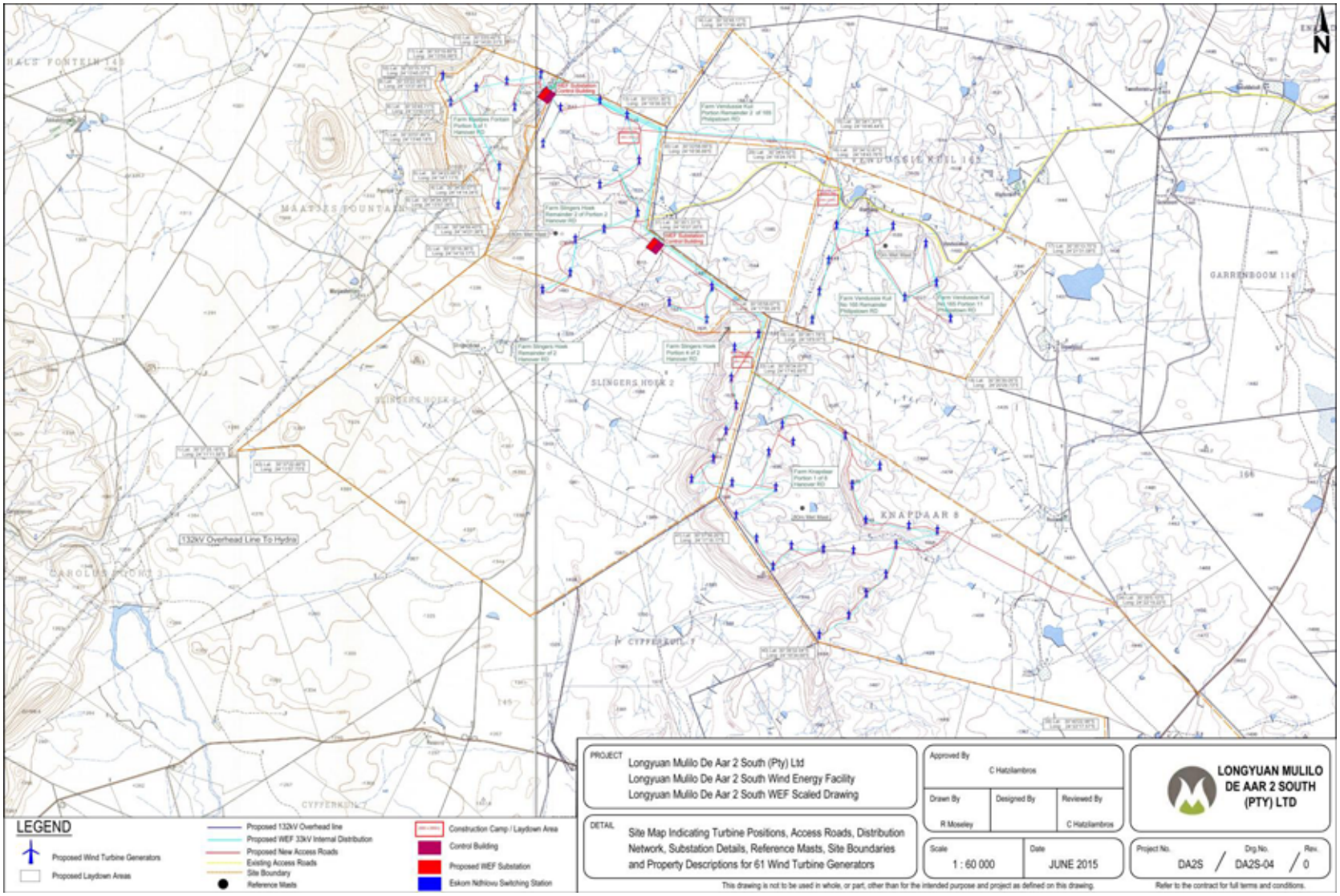

Figure 1.3: Proposed Amended Option: - Turbine positions, access roads, distribution network, substation details and other infrastructure locations

2 LEGAL CONTEXT, POLICIES AND GUIDELINES

This section includes a brief overview of the most important SANS guidelines as well as International Guidelines to set the basis on which the potential noise impacts are evaluated. A more comprehensive overview of legislation, policies and guidelines are contained in the original report (De Jager, 2012).

2.1 NOISE CONTROL REGULATIONS

In terms of section 25 of the ECA, the national noise-control regulations (GN R154 in *Government Gazette* No. 13717 dated 10 January 1992) were promulgated. The NCRs were revised under Government Notice Number R. 55 of 14 January 1994 to make it obligatory for all authorities to apply the regulations.

Subsequently, in terms of Schedule 5 of the Constitution of South Africa of 1996, legislative responsibility for administering the noise control regulations was devolved to provincial and local authorities. Provincial Noise Control Regulations exist in the Free State, Western Cape and Gauteng provinces, but the Northern Cape province have not yet adopted provincial regulations in this regard.

It should be noted that the National Noise Control Regulations defines:

"**controlled area**"

as a piece of land designated by a local authority where, in the case of--

c) industrial noise in the vicinity of an industry-

i. the reading on an integrating impulse sound level meter, taken outdoors at the end of a period of 24 hours while such meter is in operation, exceeds 61 dBA; or

ii. the calculated outdoor equivalent continuous "A"-weighted sound pressure level at a height of at least 1,2 meters, but not more than 1,4 meters, above the ground for a period of 24 hours, exceeds 61 dBA;

"**disturbing noise**"

As the noise level which exceeds the zone sound level or, if no zone sound level has been designated, a noise level which exceeds the ambient sound level at the same measuring point by 7 dBA or more.

"**zone sound level**"

as a derived dBA value determined indirectly by means of a series of measurements, calculations or table readings and designated by a local authority for an area. *This is the same as the Rating Level as defined in SANS 10103.*

In addition:

In terms of Regulation 2 (d):

"A local authority may –

before changes are made to existing facilities or existing uses of land or buildings, or before new buildings are erected, in writing require that noise impact assessments or tests are conducted to the satisfaction of that local authority by the owner, developer, tenant or occupant of the facilities, land or buildings or that, for the purposes of regulation 3(b) or (c), reports or certificates in relation to the noise impact to the satisfaction of that local authority are submitted by the owner, developer, tenant or occupant to the local authority on written demand";

In terms of Regulation 3 (c):

"No person shall –

make changes to existing facilities or existing uses of land or buildings or erect new buildings, if it shall in the opinion of a local authority house or cause activities which shall, after such change or erection, cause a disturbing noise, unless precautionary measures to prevent the disturbing noise have been taken to the satisfaction of the local authority";

In terms of Regulation 4 of the Noise Control Regulations:

"No person shall make, produce or cause a disturbing noise, or allow it to be made, produced or caused by any person, machine, device or apparatus or any combination thereof".

2.2 NOISE STANDARDS

Two South African Bureau of Standards (SABS) scientific standards are considered relevant to noise from a Wind Energy Facility. They are:

- SANS 10103:2008. 'The measurement and rating of environmental noise with respect to annoyance and to speech communication'.
- SANS 10328:2008. 'Methods for environmental noise impact assessments'.

The relevant standards use the equivalent continuous rating level as a basis for determining what is acceptable. The levels may take single event noise into account, but

single event noise by itself does not determine whether noise levels are acceptable for land use purposes. The recommendations that the standards make are likely to inform decisions by authorities, but non-compliance with the standards will not necessarily render an activity unlawful *per se.*

2.3 INTERNATIONAL GUIDELINES

While there exist a number of international guidelines and standards that could encompass a document in itself, the two mentioned below were selected as they are used by different countries in the subject of environmental noise management, specifically focussing on the noises associated by wind energy facilities.

2.3.1 The Assessment and Rating of Noise from Wind Farms (ETSU, 1996)

This report describes the findings of a Working Group on Wind Turbine Noise, facilitated by the United Kingdom Department of Trade and Industry. It was developed as an Energy Technology Support Unit [2] (ETSU) project. The aim of the project was to provide information and advice to developers and planners on noise from wind turbines. The report represents the consensus view of a number of experts (experienced in assessing and controlling the environmental impact of noise from wind farms). Their findings can be summarised as follows:

1. Absolute noise limits applied at all wind speeds are not suited to wind farms; limits set relative to the background sound levels as wind speeds change are more appropriate.
2. $L_{A90,10mins}$ is a much more accurate descriptor when monitoring ambient and turbine noise levels.
3. The effects of other wind turbines in a given area should be added to the effect of any proposed wind energy facility, to calculate the cumulative effect.
4. Noise from a wind energy facility should be restricted to no more than 5 dBA above the current ambient noise level at a potential sensitive receptor.
5. Wind farms should be limited to within the range of 35dBA to 40dBA (day-time) in a low noise environment. A fixed limit of 43 dBA should be implemented during all night time noise environments. This should increase to 45 dBA (day and night) if the potential receptor has financial investments in the wind energy facility.

[2] ETSU was set up in 1974 as an agency by the United Kingdom Atomic Energy Authority to manage research programmes on renewable energy and energy conservation. The majority of projects managed by ETSU were carried out by external organisations in academia and industry. In 1996, ETSU became part of AEA Technology plc which was separated from the UKAEA by privatisation.

7. A penalty system should be implemented for wind turbine/s that operates with a tonal characteristic.

2.3.2 Noise Guidelines for Wind Farms (MoE, 2008)

This document establishes the sound level limits for land-based wind power generating facilities and describes the information required for noise assessments and submissions under the Environmental Assessment Act and the Environmental Protection Act, Canada.

The document defines:

- Sound Level Limits for different areas (similar to rural and urban areas), defining limits for different wind speeds at 10 m height[3]
- The Noise Assessment Report, including;
    - Information that must be part of the report
    - Full description of noise sources
    - Adjustments, such as due to the wind speed profile (wind shear)
    - The identification and defining of potential sensitive receptors
    - Prediction methods to be used (ISO 9613-2)
    - Cumulative impact assessment requirements
    - It also defines specific model input parameters
    - Methods on how the results must be presented
    - Assessment of Compliance (defining magnitude of noise levels)

Table 2.1: Summary of Sound Level Limits for Wind Farms

Wind speed (m/s) at 10 m height	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Wind Turbine Sound Level Limits, Class 3 Area, dBA	40	40	40	43	45	49	51
Wind Turbine Sound Level Limits, Class 1 & 2 Areas, dBA	45	45	45	45	45	49	51

The document used the $L_{Aeq,1h}$ noise descriptor to define noise levels.

It should be noted that these Sound Level Limits are included for the reader as information. It is not used in the determination of the potential noise impact significance.

[3] The measurement of wind induced background sound level is not required to establish the applicable limit. The wind induced background sound level reference curve (Figure 2.1), was determined by correlating the A-weighted ninetieth percentile sound level (L90) with the average wind speed measured at a particularly quiet site. The applicable Leq sound level limits at higher wind speeds are given by adding 7 dB to the wind induced background L90 sound level reference values

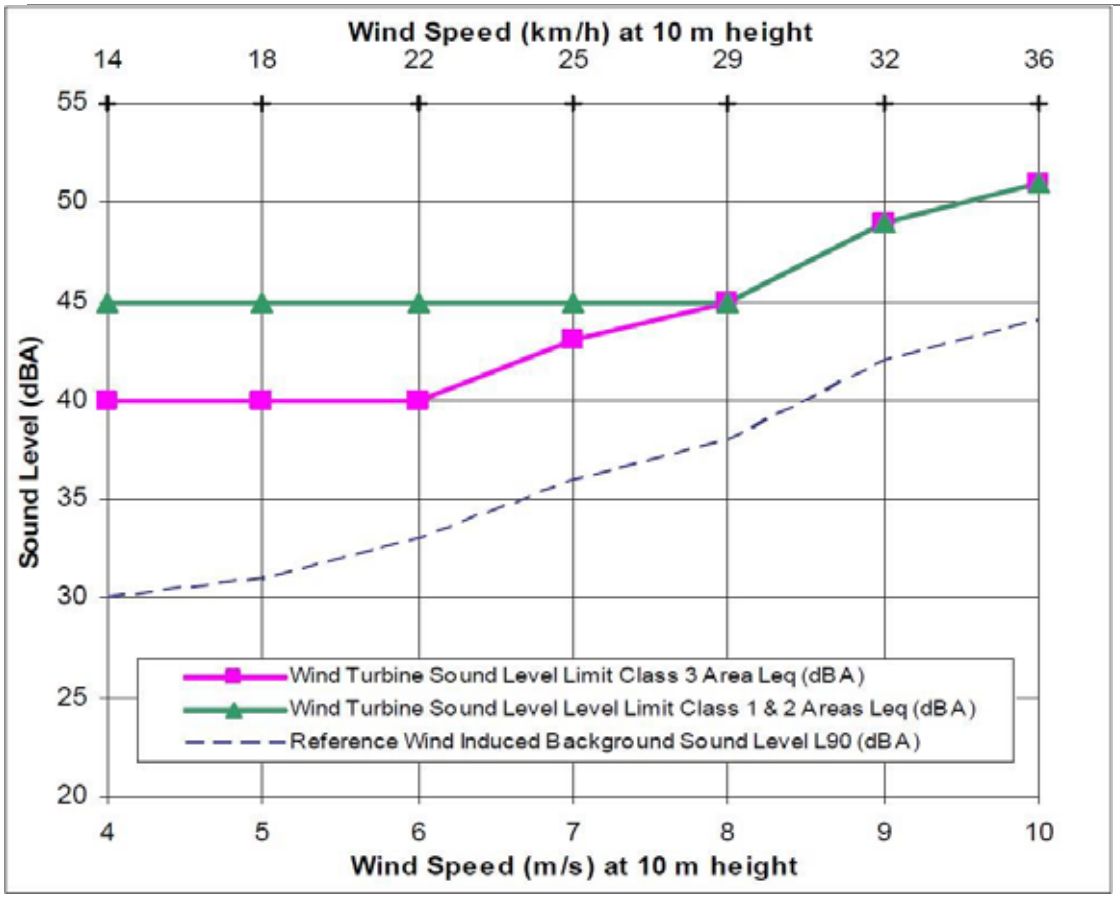

Figure 2.1: Summary of Sound Level Limits for Wind Turbines

2.3.3 IFC: General EHS Guidelines – Environmental Noise Management

These guidelines are applicable to noise created beyond the property boundaries of a development that conforms to the Equator Principle.

It states that noise prevention and mitigation measures should be applied where predicted or measured noise impacts from a project facility or operations exceed the applicable noise level guideline at the most sensitive point of reception. The preferred method for controlling noise from stationary sources is to implement noise control measures at source. It goes as far as to proposed methods for the prevention and control of noise emissions, including:

- Selecting equipment with lower sound power levels;
- Installing silencers for fans;
- Installing suitable mufflers on engine exhausts and compressor components;
- Installing acoustic enclosures for equipment casing radiating noise;
- Improving the acoustic performance of constructed buildings, apply sound insulation;

- Installing acoustic barriers without gaps and with a continuous minimum surface density of 10 kg/m^2 in order to minimize the transmission of sound through the barrier. Barriers should be located as close to the source or to the receptor location to be effective;
- Installing vibration isolation for mechanical equipment;
- Limiting the hours of operation for specific pieces of equipment or operations, especially mobile sources operating through community areas ;
- Re-locating noise sources to less sensitive areas to take advantage of distance and shielding;
- Placement of permanent facilities away from community areas if possible;
- Taking advantage of the natural topography as a noise buffer during facility design;
- Reducing project traffic routing through community areas wherever possible;
- Planning flight routes, timing and altitude for aircraft (airplane and helicopter) flying over community areas; and
- Developing a mechanism to record and respond to complaints.

It sets noise level guidelines (see **Table 2-2**) as well as highlighting the certain monitoring requirements pre- and post-development.

Table 2-2: IFC Table .7.1-Noise Level Guidelines

Receptor type	One hour L_{Aeq} (dBA)	
	Daytime 07:00 - 22:00	Night-time 22:00 – 07:00
Residential; institutional; educational	55	45
Industrial; commercial	70	70

The document uses the $L_{Aeq,1\ hr}$ noise descriptors to define noise levels. It does not determine the detection period, but refers to the IEC standards, which requires the fast detector setting on the Sound Level Meter during measurements for Europe.

3 CURRENT ENVIRONMENTAL SOUND CHARACTER

3.1 INFLUENCE OF WIND ON AMBIENT SOUND LEVELS

Natural sounds have been a part of the environmental noise surrounding humans. In rural areas the sounds from insects and birds would dominate the ambient sound character, with noises as wind flowing through vegetation increasing as wind speed increase. Work by Fégeant (2002) stressed the importance of wind speed and turbulence causing variations in the level of vegetation generated noise. In addition, factors such as the season (e.g. dry or no leaves versus green leaves), the type of vegetation (e.g. grass, conifers, deciduous), the vegetation density as well as the total vegetation surface all determine both the sound level as well as spectral characteristics.

While the total ambient sound levels are of importance, the spectral characteristics also determines the likelihood that some-one will hear external noises that may or may not be similar in spectral characteristics to that of vegetation created noise. Bolin (2006) did investigate spectral characteristics and determined the annoyance might occur at levels where noise generated by wind turbine noise exceeds natural ambient sounds with 3dB or more.

However, current local regulations and standards do not consider changing ambient (background) sound levels due to natural events such as can be found near the coast or areas where wind-induced noises are prevalent. This is unfeasible with wind energy facilities as these facilities will only operate when the wind is blowing. It is therefore important that the contribution of wind-induced noises be considered when determining the potential noise impact from such as a facility. This is the approach followed in most international countries, however, care should be taken when taking this approach due to other factors that complicate noise propagation from wind turbines (see also **Section 4.2**).

This is further complicated due to the evidence that low frequency noises can be associated with some developments. Separating the potential low frequency noise from wind turbines from that generated from natural sources and well as other anthropogenic sources can and will be a challenge.

There are a number of factors that determine how ambient sound levels close to a dwelling (or the low-frequency noise levels inside the house) might differ from the ambient sound levels further away (or even at another dwelling in the area), including:

- Type of activities taking place in the vicinity of the dwelling;

- Equipment being use near the dwelling, especially equipment such as water pumps, compressors and air conditioners;
- Whether there are any wind pumps close to the dwelling;
- Type of trees around dwelling (conifers vs. broad-leaved trees, habitat that it provides to birds, food that it may provide to birds);
- The number, type and distance between the dwelling (measuring point) and trees. This is especially relevant when the trees are directly against the house (where the branches can touch the roof);
- Distance to large infrastructural development, including roads, railroads and even large diameter pipelines;
- Distances to other noise sources, whether anthropogenic or natural (such as the ocean or running water);
- The material used in the construction of the dwelling;
- The design of the building, including layout and number of openings;
- How well the dwelling was maintained; and
- The type and how many farm animals are in the vicinity of the dwelling.

3.2 LIMITATIONS: ACOUSTICAL MEASUREMENT

A brief methodology and limitations for acoustical measurement as per experience, current National and International guidelines are supplied below:

- Ambient sound levels are the cumulative effects of innumerable sounds generated at various instances both far and near. High measurements may not necessarily mean that noise levels in the area are high. Similarly, a low sound level measurement will not necessarily mean that the area is always quiet, as sound levels will vary over seasons, time of the day, faunal characteristics, vegetation in the area and meteorological conditions (especially wind). This is excluding the potential effect of sounds from anthropogenic origin. It is impossible to quantify and identify the numerous sources that influenced one 10-minute measurement using the reading result at the end of the measurement;
- Because a sound level measured is the combination of sounds both near and far, sound measurements can only indicate likely sound levels. These measurements cannot define the origin of potential noise sources, neither easily differentiate between a loud far-off noise nor a softer, but closer sound;
- Measurements over wind speeds of 3 m/s will provide data potentially influenced by wind-induced noises. Therefore sound data will have to be read in conjunction with meteorological (wind) data. SANS methodologies specifically recommend that data collected during windy conditions be discarded. If this data is to be used

special precautions should be taken, including the use of all-weather wind shields specifically designed for use in higher wind conditions;

- Ambient sounds will vary with seasons as faunal activity increase and decrease, similarly as vegetation (in particular foliage) changes;
- Accurately defining ambient sound/noise levels at a community or house requires that measurements must be collected at that location for a long period of time;
- Exact location of a sound level meter in a small area (such as a single dwelling) in relation to structures, vegetation and external noise sources will impact on the measurements;
- While not audible while an instrument is erected at a measurement location, there could be a noise source in the area that can only be detected during the quieter periods or when the data is analysed at a future period (such as a water pump that only operates for a short period of time periodically during the day);
- Measurements recorded near rivers, streams, wetlands, trees and bushy areas can be high. This is due to faunal activity which can dominate the sound levels around the measurement point. It is technically very difficult to "mask" fauna activity during a measurement period or find an area where there is no faunal activity that will not contribute unwanted sounds to measurements; and
- Considering one variable/weighted/time is not sufficient for and acoustical assessment. **L_{AMin}, L_{AIeq}, L_{Aeq}, L_{Ceq}, L_{AMax}, L_{A10}, L_{A90}** and spectral analysis forms part of the many variables to be considered.

3.3 PREVIOUS MEASUREMENTS

Ambient sound levels were previously measured in the area, indicating an area with a sound level character typical of a rural area (away from any dwellings, roads and towns) during periods when wind speeds were below 3 m/s.

4 POTENTIAL NOISE SOURCES

Increased noise levels are directly linked to various activities associated with the construction of the facility and related infrastructure as well as the operational phase of the activity.

4.1 POTENTIAL NOISE SOURCES: CONSTRUCTION PHASE

4.1.1 Construction equipment

Construction activities include:

- Establishment of internal access roads - the internal road alignment is governed by the positioning of the wind turbines;
- Site preparation activities will include clearance of vegetation at the footprint of each turbine. These activities will require the stripping of topsoil which will need to be stockpiled, backfilled and/or spread on site;
- Construct foundations – it is expected that the volume of concrete required for each turbine foundation will be in the order 600 m³. The nature of the site is such that blasting and or hydraulic breakers may be required to excavate the gravity foundations into the rock. Due to the volume of concrete that will be required, an on-site batching plant could be required to ensure a continuous concreting operation. The source of aggregate is yet undefined but is expected to be derived from an offsite source or brought in as ready-mix;
- Transport of components & equipment to site – all components will be brought to site in sections by means of flatbed trucks. Additionally, components of various specialized construction and lifting equipment are required on site to erect the wind turbines and will need to be transported to site. The typical civil engineering construction equipment will need to be brought to the site for the civil works (e.g. excavators, trucks, graders, compaction equipment, cement trucks, etc.). The transportation of ready-mix concrete to site or the materials for onsite concrete batching will result in temporary increase in heavy traffic (one turbine foundation = 100 concrete trucks, and is undertaken as a continuous pour) The components required for the establishment of the overhead power line (including towers and cabling) will be transported to site as required;
- Establishment of laydown & hard standing areas - laydown areas will need to be established at each turbine position for the placement of wind turbine components. Laydown and storage areas will also be required to be established for the civil engineering construction equipment which will be required on site. Hard standing

areas will need to be established for operation of the crane. Cranes of the size required to erect turbines are sensitive to differential movement during lifting operations and require a hard standing area;

- Erect turbines - a crane will be used to lift the tower sections into place and then the nacelle will be placed onto the top of the assembled tower. The next step will be to assemble or partially assemble the rotor on the ground; it will then be lifted to the nacelle and bolted in place. A small crane will likely be needed for the assembly of the rotor while the large crane will be needed to put it in place;
- Construct substation - the underground cables carrying the generated power from the individual turbines will connect at the substation. The construction of the substation would require a site survey; site clearing and levelling (including the removal / cutting of rock outcrops) and construction of access road/s (where required); construction of a substation terrace and foundation; assembly, erection and installation of equipment (including transformers); connection of conductors to equipment; and rehabilitation of any disturbed areas and protection of erosion sensitive areas;
- Establishment of ancillary infrastructure - A workshop as well as a contractor's equipment camp may be required. The establishment of these facilities/buildings will require the clearing of vegetation and levelling of the development site and the excavation of foundations prior to construction. A laydown area for building materials and equipment associated with these buildings will also be required;
- Connection of wind turbines to the substation - each wind turbine will be connected to the on-site substation via electrical cables, to be lain underground where possible. The installation of these cables will require the excavation of trenches of approximately 1 m deep within which they can then be laid. The underground cables will be planned to follow the internal access roads, where possible;
- An overhead **power line** to connect to the Eskom's infrastructure; and
- Site rehabilitation - once construction is completed and once all construction equipment is removed, the site will be rehabilitated where practical and reasonable.

There are a number of factors that determine the audibility as well as the potential of a noise impact on receptors. Maximum noises generated can be audible over a large distance, however, are generally of very short duration. If maximum noise levels however exceed 65 dBA at a receptor, or if it is clearly audible with a significant number of instances where the noise level exceeds the prevailing ambient sound level with more than 15 dB, the noise can increase annoyance levels and may ultimately result in noise

complaints. Potential maximum noise levels generated by various construction equipment as well as the potential extent of these sounds are presented in **Table 4-1**.

Average or equivalent sound levels are another factor that impacts on the ambient sound levels and is the constant sound level that the receptor can experience. Typical sound power levels associated with various activities that may be found at a construction site is presented **Table 4-2**.

The equipment likely to be required to complete the above tasks will typically include:

- excavator/graders, bulldozer(s), dump trucks(s), vibratory roller, bucket loader, rock breaker(s), drill rig, flatbed truck(s), pile drivers, TLB, concrete truck(s), crane(s), fork lift(s) and various 4WD and service vehicles.

4.1.2 Blasting

Blasting may be required as part of the civil works to clear obstacles or to prepare foundations. However, blasting will not be considered for the following reasons:

- Blasting is highly regulated, and control of blasting to protect human health, equipment and infrastructure will ensure that any blasts will use the minimum explosives and will occur in a controlled manner. The breaking of obstacles with explosives is also a specialized field and when correct techniques are used, causes significantly less noise than using a hydraulic rock-breaker.
- People are generally more concerned about ground vibration and air blast levels that might cause building damage than the impact of the noise from the blast. However, these are normally associated with close proximity mining/quarrying.
- Blasts are an infrequent occurrence, with a loud but a relative instantaneous character. Potentially affected parties generally receive sufficient notice (siren) and the knowledge that the duration of the siren noise as well as the blast will be over relative fast results in a higher acceptance of the noise. Note that with the selection of explosives and blasting methods, noise levels from blasting is relatively easy to control.

Table 4-1: Potential maximum noise levels generated by construction equipment

Equipment Description[4]	Impact Device?	Maximum Sound Power Levels (dBA)	Operational Noise Level at given distance considering potential **maximum** noise levels (Cumulative as well as the mitigatory effect of potential barriers or other mitigation not included – simple noise propagation modelling only considering distance) (dBA)											
			5 m	10 m	20 m	50 m	100 m	150 m	200 m	300 m	500 m	750 m	1000 m	2000 m
Auger Drill Rig	No	119.7	94.7	88.7	82.6	74.7	68.7	65.1	62.6	59.1	54.7	51.2	48.7	42.6
Backhoe	No	114.7	89.7	83.7	77.6	69.7	63.7	60.1	57.6	54.1	49.7	46.2	43.7	37.6
Chain Saw	No	119.7	94.7	88.7	82.6	74.7	68.7	65.1	62.6	59.1	54.7	51.2	48.7	42.6
Compactor (ground)	No	114.7	89.7	83.7	77.6	69.7	63.7	60.1	57.6	54.1	49.7	46.2	43.7	37.6
Compressor (air)	No	114.7	89.7	83.7	77.6	69.7	63.7	60.1	57.6	54.1	49.7	46.2	43.7	37.6
Concrete Batch Plant	No	117.7	92.7	86.7	80.6	72.7	66.7	63.1	60.6	57.1	52.7	49.2	46.7	40.6
Concrete Mixer Truck	No	119.7	94.7	88.7	82.6	74.7	68.7	65.1	62.6	59.1	54.7	51.2	48.7	42.6
Concrete Pump Truck	No	116.7	91.7	85.7	79.6	71.7	65.7	62.1	59.6	56.1	51.7	48.2	45.7	39.6
Concrete Saw	No	124.7	99.7	93.7	87.6	79.7	73.7	70.1	67.6	64.1	59.7	56.2	53.7	47.6
Crane	No	119.7	94.7	88.7	82.6	74.7	68.7	65.1	62.6	59.1	54.7	51.2	48.7	42.6
Dozer	No	119.7	94.7	88.7	82.6	74.7	68.7	65.1	62.6	59.1	54.7	51.2	48.7	42.6
Drill Rig Truck	No	118.7	93.7	87.7	81.6	73.7	67.7	64.1	61.6	58.1	53.7	50.2	47.7	41.6
Drum Mixer	No	114.7	89.7	83.7	77.6	69.7	63.7	60.1	57.6	54.1	49.7	46.2	43.7	37.6
Dump Truck	No	118.7	93.7	87.7	81.6	73.7	67.7	64.1	61.6	58.1	53.7	50.2	47.7	41.6
Excavator	No	119.7	94.7	88.7	82.6	74.7	68.7	65.1	62.6	59.1	54.7	51.2	48.7	42.6
Flat Bed Truck	No	118.7	93.7	87.7	81.6	73.7	67.7	64.1	61.6	58.1	53.7	50.2	47.7	41.6
Front End Loader	No	114.7	89.7	83.7	77.6	69.7	63.7	60.1	57.6	54.1	49.7	46.2	43.7	37.6
Generator	No	116.7	91.7	85.7	79.6	71.7	65.7	62.1	59.6	56.1	51.7	48.2	45.7	39.6
Generator (<25KVA)	No	104.7	79.7	73.7	67.6	59.7	53.7	50.1	47.6	44.1	39.7	36.2	33.7	27.6
Grader	No	119.7	94.7	88.7	82.6	74.7	68.7	65.1	62.6	59.1	54.7	51.2	48.7	42.6
Impact Pile Driver	Yes	129.7	104.7	98.7	92.6	84.7	78.7	75.1	72.6	69.1	64.7	61.2	58.7	52.6
Jackhammer	Yes	119.7	94.7	88.7	82.6	74.7	68.7	65.1	62.6	59.1	54.7	51.2	48.7	42.6
Man Lift	No	119.7	94.7	88.7	82.6	74.7	68.7	65.1	62.6	59.1	54.7	51.2	48.7	42.6
Mounted Impact Hammer	Yes	124.7	99.7	93.7	87.6	79.7	73.7	70.1	67.6	64.1	59.7	56.2	53.7	47.6

[4] Equipment list and Sound Power Level source: http://www.fhwa.dot.gov/environment/noise/construction_noise/handbook/handbook09.cfm

Equipment Description[4]	Impact Device?	Maximum Sound Power Levels (dBA)	Operational Noise Level at given distance considering potential **maximum** noise levels (Cumulative as well as the mitigatory effect of potential barriers or other mitigation not included – simple noise propagation modelling only considering distance) (dBA)											
			5 m	10 m	20 m	50 m	100 m	150 m	200 m	300 m	500 m	750 m	1000 m	2000 m
Paver	No	119.7	94.7	88.7	82.6	74.7	68.7	65.1	62.6	59.1	54.7	51.2	48.7	42.6
Pickup Truck	No	89.7	64.7	58.7	52.6	44.7	38.7	35.1	32.6	29.1	24.7	21.2	18.7	12.6
Pumps	No	111.7	86.7	80.7	74.6	66.7	60.7	57.1	54.6	51.1	46.7	43.2	40.7	34.6
Rivit Buster/Chipping Gun	Yes	119.7	94.7	88.7	82.6	74.7	68.7	65.1	62.6	59.1	54.7	51.2	48.7	42.6
Rock Drill	No	119.7	94.7	88.7	82.6	74.7	68.7	65.1	62.6	59.1	54.7	51.2	48.7	42.6
Roller	No	119.7	94.7	88.7	82.6	74.7	68.7	65.1	62.6	59.1	54.7	51.2	48.7	42.6
Sand Blasting (single nozzle)	No	119.7	94.7	88.7	82.6	74.7	68.7	65.1	62.6	59.1	54.7	51.2	48.7	42.6
Scraper	No	119.7	94.7	88.7	82.6	74.7	68.7	65.1	62.6	59.1	54.7	51.2	48.7	42.6
Sheers (on backhoe)	No	119.7	94.7	88.7	82.6	74.7	68.7	65.1	62.6	59.1	54.7	51.2	48.7	42.6
Slurry Plant	No	112.7	87.7	81.7	75.6	67.7	61.7	58.1	55.6	52.1	47.7	44.2	41.7	35.6
Slurry Trenching Machine	No	116.7	91.7	85.7	79.6	71.7	65.7	62.1	59.6	56.1	51.7	48.2	45.7	39.6
Soil Mix Drill Rig	No	114.7	89.7	83.7	77.6	69.7	63.7	60.1	57.6	54.1	49.7	46.2	43.7	37.6
Tractor	No	118.7	93.7	87.7	81.6	73.7	67.7	64.1	61.6	58.1	53.7	50.2	47.7	41.6
Vacuum Excavator	No	119.7	94.7	88.7	82.6	74.7	68.7	65.1	62.6	59.1	54.7	51.2	48.7	42.6
Vacuum Street Sweeper	No	114.7	89.7	83.7	77.6	69.7	63.7	60.1	57.6	54.1	49.7	46.2	43.7	37.6
Ventilation Fan	No	119.7	94.7	88.7	82.6	74.7	68.7	65.1	62.6	59.1	54.7	51.2	48.7	42.6
Vibrating Hopper	No	119.7	94.7	88.7	82.6	74.7	68.7	65.1	62.6	59.1	54.7	51.2	48.7	42.6
Vibratory Concrete Mixer	No	114.7	89.7	83.7	77.6	69.7	63.7	60.1	57.6	54.1	49.7	46.2	43.7	37.6
Vibratory Pile Driver	No	129.7	104.7	98.7	92.6	84.7	78.7	75.1	72.6	69.1	64.7	61.2	58.7	52.6
Warning Horn	No	119.7	94.7	88.7	82.6	74.7	68.7	65.1	62.6	59.1	54.7	51.2	48.7	42.6
Welder/Torch	No	107.7	82.7	76.7	70.6	62.7	56.7	53.1	50.6	47.1	42.7	39.2	36.7	30.6

Table 4-2: Potential equivalent noise levels generated by various equipment

Equipment Description	Equivalent (average) Sound Levels (dBA)	Operational Noise Level at given distance considering equivalent (average) sound power emission levels (Cumulative as well as the mitigatory effect of potential barriers or other mitigation not included – simple noise propagation modelling only considering distance) (dBA)											
		5 m	10 m	20 m	50 m	100 m	150 m	200 m	300 m	500 m	750 m	1000 m	2000 m
Bulldozer CAT D10	111.9	86.9	80.9	74.9	66.9	60.9	57.4	54.9	51.3	46.9	43.4	40.9	34.9
Bulldozer CAT D11	113.3	88.4	82.3	76.3	68.4	62.3	58.8	56.3	52.8	48.4	44.8	42.3	36.3
Bulldozer CAT D9	111.9	86.9	80.9	74.9	66.9	60.9	57.4	54.9	51.3	46.9	43.4	40.9	34.9
Bulldozer CAT D6	108.2	83.3	77.3	71.2	63.3	57.3	53.7	51.2	47.7	43.3	39.8	37.3	31.2
Bulldozer CAT D5	107.4	82.4	76.4	70.4	62.4	56.4	52.9	50.4	46.9	42.4	38.9	36.4	30.4
Bulldozer Komatsu 375	114.0	89.0	83.0	77.0	69.0	63.0	59.5	57.0	53.4	49.0	45.5	43.0	37.0
Bulldozer Komatsu 65	109.5	84.5	78.5	72.4	64.5	58.5	54.9	52.4	48.9	44.5	41.0	38.5	32.4
Diesel Generator (Large - mobile)	106.1	81.2	75.1	69.1	61.2	55.1	51.6	49.1	45.6	41.2	37.6	35.1	29.1
Dumper/Haul truck - CAT 700	115.9	91.0	85.0	78.9	71.0	65.0	61.4	58.9	55.4	51.0	47.5	45.0	38.9
Dumper/Haul truck - Terex 30 ton	112.2	87.2	81.2	75.2	67.2	61.2	57.7	55.2	51.7	47.2	43.7	41.2	35.2
Dumper/Haul truck - Bell 25 ton (B25D)	108.4	83.5	77.5	71.4	63.5	57.5	53.9	51.4	47.9	43.5	40.0	37.5	31.4
Excavator - Cat 416D	103.9	78.9	72.9	66.8	58.9	52.9	49.3	46.8	43.3	38.9	35.4	32.9	26.8
Excavator - Hitachi EX1200	113.1	88.1	82.1	76.1	68.1	62.1	58.6	56.1	52.6	48.1	44.6	42.1	36.1
Excavator - Hitachi 870 (80 t)	108.1	83.1	77.1	71.1	63.1	57.1	53.6	51.1	47.5	43.1	39.6	37.1	31.1
Excavator - Hitachi 270 (30 t)	104.5	79.6	73.5	67.5	59.6	53.5	50.0	47.5	44.0	39.6	36.0	33.5	27.5
FEL - CAT 950G	102.1	77.2	71.2	65.1	57.2	51.2	47.6	45.1	41.6	37.2	33.7	31.2	25.1
FEL - Komatsu WA380	100.7	75.7	69.7	63.7	55.7	49.7	46.2	43.7	40.1	35.7	32.2	29.7	23.7
General noise	108.8	83.8	77.8	71.8	63.8	57.8	54.2	51.8	48.2	43.8	40.3	37.8	31.8
Grader - Operational Hitachi	108.9	83.9	77.9	71.9	63.9	57.9	54.4	51.9	48.4	43.9	40.4	37.9	31.9
Grader	110.9	85.9	79.9	73.9	65.9	59.9	56.4	53.9	50.3	45.9	42.4	39.9	33.9
JCB TLB	108.8	83.8	77.8	71.8	63.8	57.8	54.3	51.8	48.3	43.8	40.3	37.8	31.8
Road Transport Reversing/Idling	108.2	83.3	77.2	71.2	63.3	57.2	53.7	51.2	47.7	43.3	39.7	37.2	31.2
Road Truck average	109.6	84.7	78.7	72.6	64.7	58.7	55.1	52.6	49.1	44.7	41.1	38.7	32.6
Vibrating roller	106.3	81.3	75.3	69.3	61.3	55.3	51.8	49.3	45.8	41.3	37.8	35.3	29.3
Water Dozer, CAT	113.8	88.8	82.8	76.8	68.8	62.8	59.3	56.8	53.3	48.8	45.3	42.8	36.8

4.2 POTENTIAL NOISE SOURCES: OPERATIONAL PHASE

Noise emitted by wind turbines can be associated with two types of noise sources. These are aerodynamic sources due to the passage of air over the wind turbine blades and mechanical sources that are associated with components of the power train within the turbine, such as the gearbox and generator and control equipment for yaw, blade pitch, etc. These sources generally have different characteristics and can be considered separately. In addition there are other lesser noise sources, such as the substations themselves, traffic (maintenance) as well as transmission line noise.

4.2.1 Wind Turbine Noise: Aerodynamic sources[5]

Aerodynamic noise is emitted by a wind turbine blade through a number of sources such as:

1. Self-noise due to the interaction of the turbulent boundary layer with the blade trailing edge
2. Noise due to inflow turbulence (turbulence in the wind interacting with the blades)
3. Discrete frequency noise due to trailing edge thickness
4. Discrete frequency noise due to laminar boundary layer instabilities (unstable flow close to the surface of the blade)
5. Noise generated by the rotor tips

Noise due to aerodynamic instabilities (mechanisms 3 and 4) can be reduced to insignificant levels by careful design. The other mechanisms are an inescapable consequence of the aerodynamics of the turbine that produces the power and between them they will make up most, if not all, of the aerodynamic noise radiated by the wind turbine. The relative contribution of each source will depend upon the detailed design of the turbine and the wind speed and turbulence at the time.

The mechanisms responsible for tip noise (mechanism 5) are currently under investigation and it appears that methods for its control through design of the tip shape are available. Self-noise (mechanism 1) is most significant at low wind speeds, whereas noise due to inflow turbulence (mechanism 2) becomes the dominant source at the higher wind speeds. Both mechanisms increase in strength as the wind speed increases, particularly inflow turbulence. The overall result is that at low to moderate wind speeds, the noise from a fixed speed wind turbine increases at a rate of 0.5-1.5 dBA /m/s up to a maximum at wind

[5] *Renewable Energy Research Laboratory, 2006; ETSU R97: 1996*

speeds of 7 -12 m/s (noise generated by the WTG does not increase significantly at wind speeds above 12 m/s generally staying at the same level).

Therefore, as the wind speed increases, noises created by the wind turbine also increases. At a low wind speed the noise created by the wind turbine is generally (relatively) low, and increases to a maximum at a certain wind speed when it either remains constant, increase very slightly or even drops as illustrated in **Figure 4-1**. The sound power emissions (in octave sound power levels) as used in this report are presented in **Table 7-3**.

The developer indicated that they are investigating two wind turbines at this stage, although other wind turbines are not excluded. These wind turbines include:

- The Siemens SWT-3.3-130 turbine;
- The Acciona AW132/3000 turbine.

It should be noted that the findings of this report will remain valid, even if the developer use another wind turbine, if the sound power emission levels are within 1 dB, or lower than the sound power emission levels used in this report.

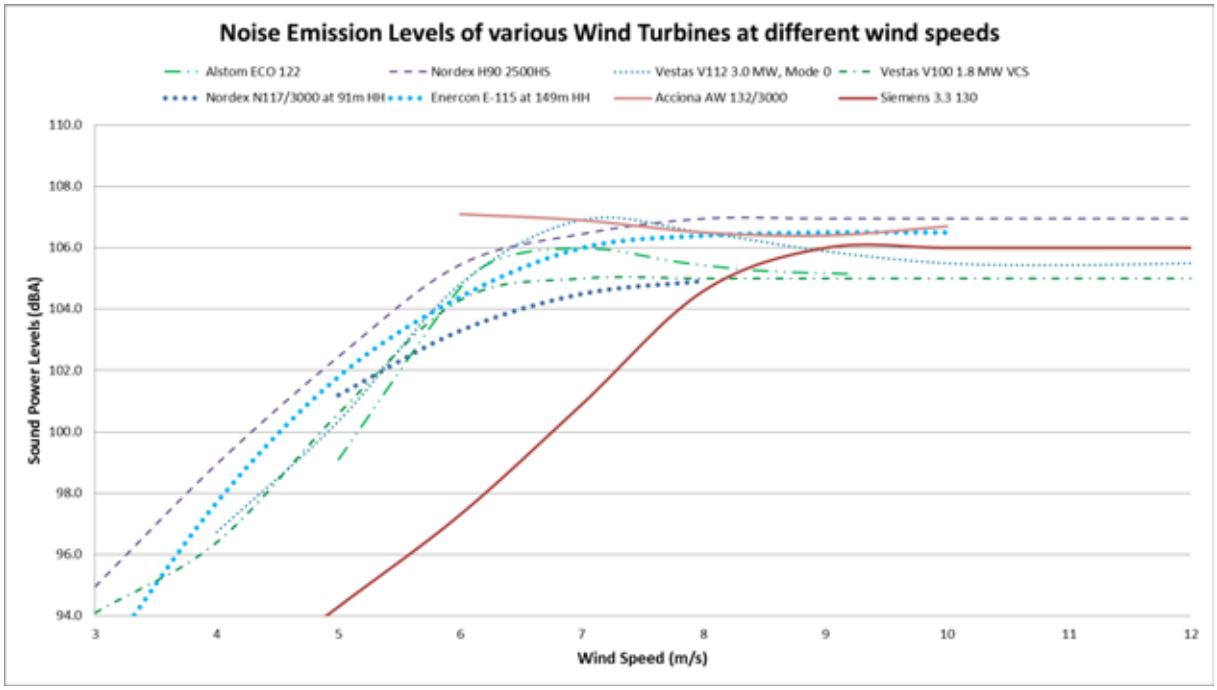

Figure 4-1: Noise Emissions Curve of a number of different wind turbines (figure for illustration purposes only)

The propagation model makes use of various frequencies, because these frequencies are affected in different ways as it propagates through air, over barriers and over different

ground conditions providing a higher accuracy than models that only use the total sound power level. The octave sound power levels for various wind turbines are presented on **Figure 4-2**.

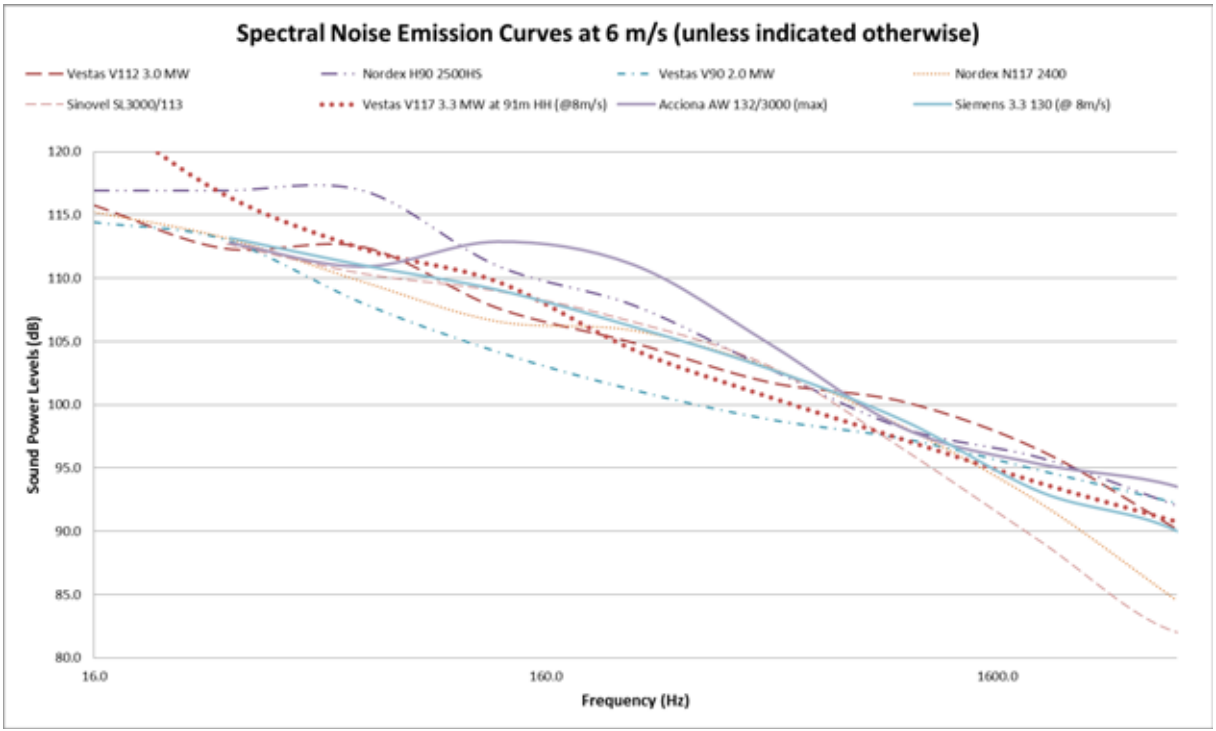

Figure 4-2: Octave sound power emissions of various wind turbines

4.2.1.1 Control Strategies to manage Noise Emissions during operation

Wind turbine manufacturers provide their equipment with control mechanisms to allow for a certain noise reduction during operation that can include:

- A reduction of rotational speed, and/or
- the increase of the pitch angle and/or reduction of nominal generator torque to reduce the angle of attack.

These mechanisms are used in various ways to allow the reduction of noise levels from the wind turbines, although this also results in a reduction of power generation.

4.2.2 Wind Turbine: Other noise sources[6]

While there are other noises from the operation of wind turbines, these noises are generally low and normally dominated by aerodynamic noises as discussed above. These noise sources include:

- Mechanical noises associated with the gearbox and the tooth mesh frequencies of the step up stages; generator noise caused by coil flexure of the generator windings that is associated with power regulation and control; generator noise caused by cooling fans; control equipment noise caused by hydraulic compressors for pitch regulation and yaw control.
- Transformer noises (Substations) due to magnetostriction.
- Transmission Line Noise (Corona noise).
- Low Frequency Noise[7] associated with the low rotation of very large blades significant acoustic energy is radiated by large wind turbines in the infrasonic range.
- Amplitude modulation[8] of the sound emissions from the wind turbines creates a repetitive rise and fall in sound levels synchronised to the blade rotation speed, sometimes referred to as a "swish" or "thump".

4.2.3 Summary Conclusions on Wind Turbine Noise

Wind turbines do generate sound in both the inaudible and audible frequency range. However, the manner how this sound is perceived by people would range between people, communities as well as the surrounding environmental conditions in which they live. There are some studies[9] that show correlations between noise annoyance and a dislike to the facility, with other studies showing a link between wind turbines and increased annoyance levels[10]. Annoyance levels can be further subdivided into people that are annoyed by increased noise levels to the point where people report having to leave their houses to get relieve from the noise.

How widespread annoyance and health issues are yet to be defined, as there has not been an industry wide scientific study covering noise from wind turbines. Values of 5 – 15%

[6] *Renewable Energy Research Laboratory, 2006; ETSU R97: 1996; Audiology Today, 2010; HGC Engineering, 2007; DELTA, 2008; DEFRA, 2003; HGC Engineering, 2006; Whitford, Jacques, 2008; Noise-con, 2008; Minnesota DoH, 2009; Kamperman, 2008, Van den Berg, 2004; Bolin, 2011; Thorne, 2010; Ambrose, 2011;* Møller, 2010; O'Neal, 2011

[8] *Renewable Energy Research Laboratory, 2006; Audiology Today, 2010; HGC Engineering, 2007; Whitford, 2008; Noise-con, 2008; DEFRA, 2007; Bowdler, 2008; Smith (2012); Stigwood (2013); Tachibana (2013)*

[9] Gibbons, 2014; Crichton, 2014; Atkinson-Palmbo, 2014; Chapman, 2013; Pedersen, 2003.

[10] Thorne, 2010; *Ambrose, 2011; Pierpont, 2009; Nissenbaum, 2012; Knopper, 2011; Kroesen, 2011; Philips, 2011; Shepherd, 2011a; Shepherd, 2011b; Pedersen, 2011; Wang, 2011; Cooper, 2012; McMurtry, 2011; Havas, 2011; Jeffery, 2013*

appear to be the most cited, although it depends on the source. When questioned (during a presentation to the Lee County Zoning Board of Appeals) Phillips (2011) told the board "*that there have not been solid studies of that, but that his best guess, based on what research has been done, is about 5% of those within a mile or so, with some reports of health effects out to two miles*"[11].

A search on the internet identifies groups that scour the internet for studies, reports and articles about wind energy; some focusing on the positive stories yet others gathering everything mentioned about the negatives, unfortunately also reporting all the negatives as fact without considering all the data. There are numerous wind farms where there has been no noise complaints (a UK study suggest that about 20% of wind farms generated noise complaints, Cummings, 2011), yet there has been no study assessing the differences between these wind farms.

Cummings (2012) also reports that:
"*it's notable that in ranching country, where most residents are leaseholders and many live within a quarter to half mile of turbines, health and annoyance complaints are close to non-existent; some have suggested that this is evidence of an antidote to wind turbine syndrome: earning some money from the turbines. More to the point, though, the equanimity with which turbine sound is accommodated in ranching communities again suggests that those who see turbines as a welcome addition to their community are far less likely to be annoyed, and thus to trigger indirect stress-related effects. Equally important to consider, ranchers who work around heavy equipment on a daily basis are also likely to be less noise sensitive than average, whereas people who live in the country for peace and quiet and solitude are likely more noise-sensitive than average. And, there are some indications that in flat ranching country, turbine noise levels may be more steady, less prone to atmospheric conditions that make turbines unpredictably louder or more intrusive. When considering the dozens of wind farms in the midwest and west where noise complaints are minimal or non-existent, it remains true that the vast majority of U.S. wind turbines are built either far from homes or in areas where there is widespread tolerance for the noise they add to the local soundscape.*"

[11] Cummings, 2012

5 NOISE IMPACT ASSESSMENT AND SIGNIFICANCE

5.1 IMPACT ASSESSMENT CRITERIA

5.1.1 Noise criteria of concern

The criteria used in this report were drawn from the criteria for the description and assessment of environmental impacts from the EIA Regulations, published by the Department of Environmental Affairs (June 2006) in terms of the NEMA, SANS 10103:2008 as well as guidelines from the World Health Organization.

There are a number of criteria that are of concern for the assessment of noise impacts. These can be summarised in the following manner:

- *Increase in noise levels:* People or communities often react to an increase in the ambient noise level they are used to, which is caused by a new source of noise. With regards to the Noise Control Regulations (promulgated in terms of the ECA), an increase of more than 7 dBA is considered a disturbing noise. See also **Figure 5.1**.
- *Zone Sound Levels:* Previously referred to as the acceptable rating levels, it sets acceptable noise levels for various areas. See also **Table 5.1**.
- *Absolute or total noise levels:* Depending on their activities, people generally are tolerant to noise up to a certain absolute level, e.g. 65 dBA. Anything above this level will be considered unacceptable.

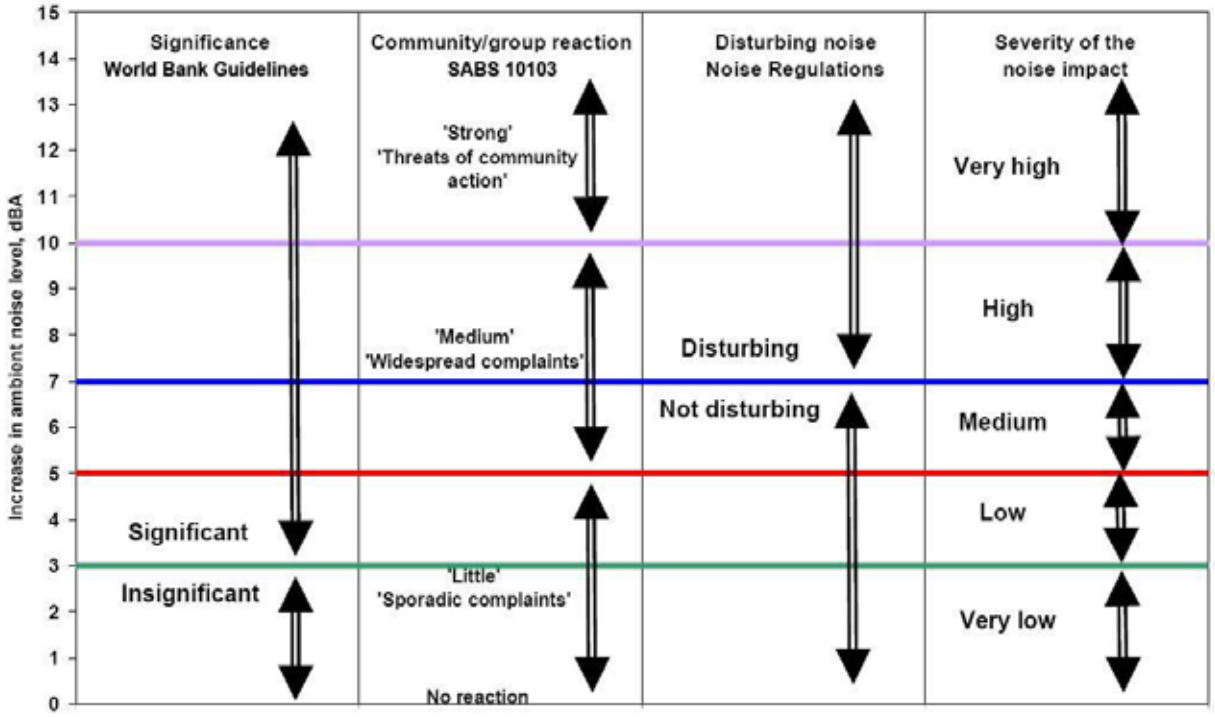

Figure 5.1: Criteria to assess the significance of impacts stemming from noise

In South Africa, the document that addresses the issues concerning environmental noise is SANS 10103:2008 (See also **Table 5.1**). It provides the equivalent ambient noise levels (referred to as Rating Levels), $L_{Req,d}$ and $L_{Req,n}$, during the day and night respectively to which different types of developments may be exposed. For rural areas the Zone Sound Levels are:

- Day (06:00 to 22:00) - $L_{Req,d}$ = 45 dBA; and
- Night (22:00 to 06:00) - $L_{Req,n}$ = 35 dBA.

International guidelines should also be considered. The International IFC (Equator Principle) Residential; institutional and educational referenced areas includes ratings of:

- Use of L_{day} of 55 dBA during the daytimes; and
- Use of L_{night} of 45 dBA during the night-times.

SANS 10103:2008 also provides a guideline for estimating community response to an increase in the general ambient sound level caused by an intruding noise. If Δ is the increase in sound level, the following criteria are of relevance:

- **Δ ≤ 3 dBA:** An increase of 3 dBA or less will not cause any response from a community. It should be noted that for a person with average hearing acuity an increase of less than 3 dBA in the general ambient noise level would not be noticeable.
- **3 < Δ ≤ 5 dBA:** An increase of between 3 dBA and 5 dBA will elicit 'little' community response with 'sporadic complaints'. People will just be able to notice a change in the sound character in the area.
- **5 < Δ ≤ 15 dBA:** An increase of between 5 dBA and 15 dBA will elicit a 'medium' community response with 'widespread complaints'. In addition, an increase of 10 dBA is subjectively perceived as a doubling in the loudness of a noise. For an increase of more than 15 dBA the community reaction will be 'strong' with 'threats of community action'.

For the purpose of this Environmental Noise Impact Assessment the Zone Sound Levels as proposed in SANS 10103:2008 would be adopted to be acceptable to the noise sensitive developments in the area during periods when the wind speeds are less than 4 m/s.

Table 5.1: Acceptable Zone Sound Levels for noise in districts (SANS 10103:2008)

1	2	3	4	5	6	7
Type of district	**Equivalent continuous rating level ($L_{Req.T}$) for noise** dBA					
	Outdoors			**Indoors, with open windows**		
	Day/night $L_{R,dn}$ [a]	**Daytime $L_{Req,d}$** [b]	**Night-time $L_{Req,n}$** [b]	**Day/night $L_{R,dn}$** [a]	**Daytime $L_{Req,d}$** [b]	**Night-time $L_{Req,n}$** [b]
a) Rural districts	45	45	35	35	35	25
b) Suburban districts with little road traffic	50	50	40	40	40	30
c) Urban districts	55	55	45	45	45	35
d) Urban districts with one or more of the following: workshops; business premises; and main roads	60	60	50	50	50	40
e) Central business districts	65	65	55	55	55	45
f) Industrial districts	70	70	60	60	60	50

5.1.2 Determining acceptable Zone Sound Levels

SANS 10103:2008 does not cater for instances when background ambient sound levels change due to the impact of external forces. Locations close (closer than 500 meters from coastline) from the sea for instance always has an ambient sound level exceeding 35 dBA, and, in cases where the sea is rather turbulent, it can easily exceed 45 dBA. Similarly, noise induced by high winds is not considered in the SANS standard.

Setting noise limits relative to the ambient sound level is relatively straightforward when the prevailing ambient sound level and source level are constant. However, wind turbines only start to operate when wind speeds exceed 3 m/s. Noise emissions therefore relates to the wind speed and similarly, the environment in which they are heard also depends upon the strength of the wind and the noise associated with its effects. It is therefore necessary to derive an ambient sound level that is indicative of the noise environment at the receiving property for different wind speeds so that the turbine noise level at any particular wind speed can be compared with the ambient sound level in the same wind conditions.

5.1.2.1 Using International Guidelines to set Noise Limits

When assessing the overall noise levels emitted by a Wind Energy Facility, it is necessary to consider the full range of operating wind speeds of the wind turbines. This covers the wind speed range from around 3-5 m/s (the turbine cut-in wind speed) up to a wind speed

range of 25-35 m/s measured at the hub height of a wind turbine. However, ETSU-R97 (1996) proposes that noise limits only be placed up to a wind speed of 12 m/s for the following reasons:

1. Wind speeds are not often measured at wind speeds greater than 12 m/s at 10 m height;
2. Reliable measurements of background ambient sound levels and turbine noise will be difficult to make in high winds due to the effects of wind noise on the microphone and the fact that one could have to wait several months before such winds were experienced;
3. Turbine manufacturers are unlikely to be able to provide information on sound power levels at such high wind speeds for similar reasons; and
4. If a wind farm meets noise limits at wind speeds lower than 12m/s, it is most unlikely to cause any greater loss of amenity at higher wind speeds. Turbine noise levels increase only slightly as wind speeds increase; however, background ambient sound levels increase significantly with increasing wind speeds due to the force of the wind.

Ambient sound vs. wind speed data is presented in the following figures (**Figure 5-2** and **Figure 5-3**)[12]. These are two quiet (as per the opinion of the author) locations where there were no apparent or observable sounds that would have impacted on the measurements. The figures present the A-Weighted as well as C-Weighted sound levels at an inland area. The figures clearly indicate a trend where sound levels increase if the wind speed increase. This has been found at all locations where measurements have been done for a sufficiently long enough period of time (more than 30 locations – more than 38,000 measurements).

[12] The sound level measuring instruments were located at a quiet location in the garden of the various houses. Data was measured in 10-minute bins and then co-ordinated with the 10 m wind speed derived from the wind mast of the developer. This wind mast normally was not close to the dwelling, at times being further than 5,000 meters from the measurement location. It is possible that the wind may be blowing at the location of the wind mast with no wind at the measurement location, resulting in low sound levels recorded.

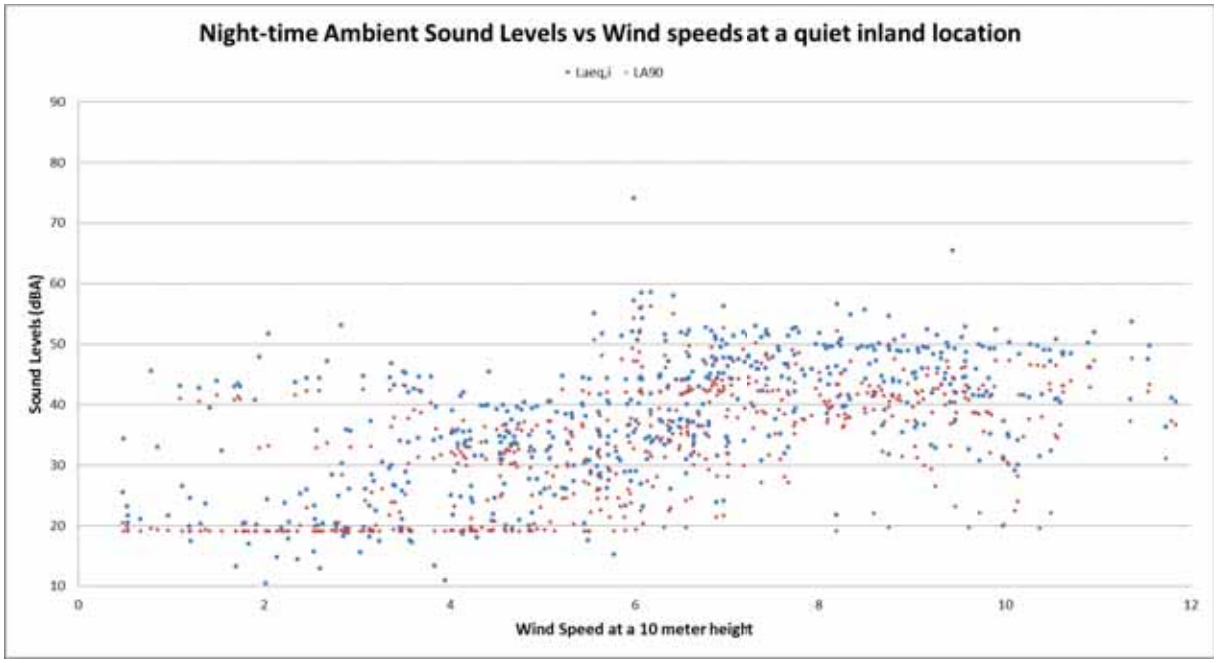

Figure 5-2: Ambient sound levels – Quiet inland location (A-Weighted)

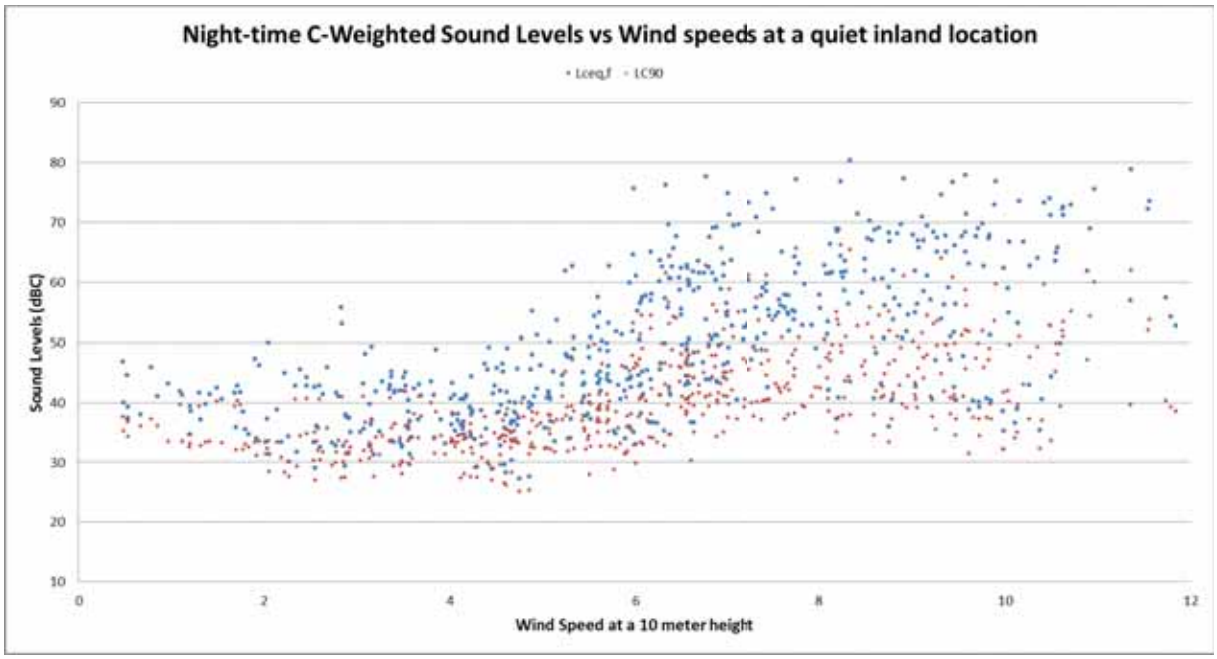

Figure 5-3: Ambient sound levels - Quiet inland location (C-Weighted)

Considering this data as well as the international guidelines (MOE, see **Table 2-2**; IFC, see **Table 2.1**), noise limits starting at 40 dB that increases to more than 45 dB (as wind speeds increase) is acceptable.

In addition, project participants could be exposed to noise levels up to 45 dBA (ETSU-R97) at lower wind speeds.

5.1.2.2 Using local regulations to set noise limits

The National Noise Control Regulations (GN 154 of 1992) defines a "**disturbing noise**" as the noise that —

- the noise level which exceeds the zone sound level or, if no zone sound level has been designated, a noise level which exceeds the ambient sound level at the same measuring point by 7 dBA or more.

Although there has been no long-term study in the area where the ambient sound levels have been measured, it is highly likely that the ambient sound level would be 35 dBA, potentially lower at night (with no wind blowing). Accepting that the area may be a rural district, acceptable rating levels would be 45 and 35 dBA and a noise level exceeding 52 and 42 dBA could be a disturbing noise (day- and night-time respectively).

5.1.3 Determining the Significance of the Noise Impact

As per the previous report (de Jager, 2012), it is necessary to establish a rating system to define the impact significance. The impact consequence is determined by the summing the scores of Magnitude (**Table 5-2**), Duration (**Table 5-3**) and Spatial Extent (**Table 5-4**). The impact significance (see **sections 5.1.4** and **5.1.5**) is determined by multiplying the Consequence result with the Probability score (**Table 5-5**). An explanation of the impact assessment criteria is defined in the following tables.

Table 5-2: Impact Assessment Criteria - Magnitude

This defines the impact as experienced by any receptor. In this report the receptor is defined as any resident in the area, but excludes faunal species.		
Rating	**Description**	**Score**
Low	Increase in average sound pressure levels between 0 and 1 dB from the expected wind induced ambient sound level (proposed rating level - **Table 5-6**). No change in ambient sound levels discernible. Total projected noise level is less than the Zone Sound Level in wind-still conditions.	2
Low Medium	Increase in average sound pressure levels between 1 and 3 dB from the (expected) wind induced ambient sound level (proposed rating level - **Table 5-6**). The change is barely discernible, but the noise source might become audible.	4
Medium	Increase in average sound pressure levels between 3 and 5 dB from the (expected) wind induced ambient sound level (proposed night rating level - **Table 5-6**). Sporadic complaints expected. Any point where the zone sound levels are exceeded during wind still conditions.	6
High	Increase in average sound pressure levels between 5 and 7 dB from the (expected) wind induced ambient sound level (proposed night rating level - **Table 5-6**). Medium to widespread complaints expected.	8
Very High	Increase in average sound pressure levels higher than 7 dBA from the (expected) wind induced ambient sound level (proposed night rating level - **Table 5-6**). Change of 10 dBA is perceived as 'twice as loud', leading to widespread complaints and even threats of community or group action. Any point where noise levels exceed 65 dBA at any receptor.	10

Table 5-3: Impact Assessment Criteria - Duration

The lifetime of the impact that is measured in relation to the lifetime of the proposed development (construction, operational and closure phases). Will the receptors be subjected to increased noise levels for the lifetime duration of the project, or only infrequently.		
Rating	**Description**	**Score**
Temporary	Impacts are predicted to be of short duration (portion of construction period) and intermittent/occasional.	1
Short term	Impacts that are predicted to last only for the duration of the construction period.	2
Long term	Impacts that will continue for the life of the Project, but ceases when the Project stops operating.	4
Permanent	Impacts that cause a permanent change in the affected receptor or resource (e.g. removal or destruction of ecological habitat) that endures substantially beyond the Project lifetime.	5

Table 5-4: Impact Assessment Criteria – Spatial extent

Classification of the physical and spatial scale of the impact		
Rating	**Description**	**Score**
Site	The impacted area extends only as far as the activity, such as footprint occurring within the total site area.	1
Local	The impact could affect the local area (within 1,000 m from site).	2
Regional	The impact could affect the area including the neighbouring farms, the transport routes and the adjoining towns.	3
National	The impact could have an effect that expands throughout the country (South Africa).	4
International	Where the impact has international ramifications that extend beyond the boundaries of South Africa.	5

Table 5-5: Impact Assessment Criteria - Probability

This describes the likelihood of the impacts actually occurring, and whether it will impact on an identified receptor. The impact may occur for any length of time during the life cycle of the activity, and not at any given time. The classes are rated as follows:		
Rating	**Description**	**Score**
Improbable	The possibility of the impact occurring is none, due either to the circumstances, design or experience. The chance of this impact occurring is zero (0 %).	1
Possible	The possibility of the impact occurring is very low, due either to the circumstances, design or experience. The chances of this impact occurring is defined to be up to 25 %.	2
Likely	There is a possibility that the impact will occur to the extent that provisions must therefore be made. The chances of this impact occurring is defined to be between 25% and 50 %.	3
Highly Likely	It is most likely that the impacts will occur at some stage of the development. Plans must be drawn up before carrying out the activity. The chances of this impact occurring is defined to be between 50 % to 75 %.	4
Definite	The impact will take place regardless of any prevention plans, and only mitigation actions or contingency plans to contain the effect can be relied on. The chance of this impact occurring is defined to be between 75% and 100 %.	5

5.1.4 Identifying the Potential Impacts without Mitigation Measures (WOM)

Following the assignment of the necessary weights to the respective aspects, criteria are summed and multiplied by their assigned probabilities, resulting in a Significance Rating (SR) value for each impact (prior to the implementation of mitigation measures).

Significance without mitigation is rated on the following scale:

SR<30	Low (L)	Impacts with little real effect and which should not have an influence on or require modification of the project design or alternative mitigation. No mitigation is required.
30<**SR** <60	Medium (M)	Where it could have an influence on the decision unless it is mitigated. An impact or benefit which is sufficiently important to require management. Of moderate significance - could influence the decisions about the project if left unmanaged.
SR>60	High (H)	Impact is significant, mitigation is critical to reduce impact or risk. Resulting impact could influence the decision depending on the possible mitigation. An impact which could influence the decision about whether or not to proceed with the project.

5.1.5 Identifying the Potential Impacts with Mitigation Measures (WM)

In order to gain a comprehensive understanding of the overall significance of the impact, after implementation of the mitigation measures, it will be necessary to re-evaluate the impact. Significance with mitigation is rated on the following scale:

SR<30	Low (L)	The impact is mitigated to the point where it is of limited importance.
30<**SR** <60	Medium (M)	Notwithstanding the successful implementation of the mitigation measures, to reduce the negative impacts to acceptable levels, the negative impact will remain of significance. However, taken within the overall context of the project, the persistent impact does not constitute a fatal flaw.
SR>60	High (H)	The impact is of major importance. Mitigation of the impact is not possible on a cost-effective basis. The impact is regarded of high importance and taken within the overall context of the project, is regarded as a fatal flaw. An impact regarded as high significance, after mitigation could render the entire development option or entire project proposal unacceptable.

5.2 EXPRESSION OF THE NOISE IMPACTS

The noise impacts can be expressed in terms of total ambient noise levels as well as the increase in present ambient sound levels caused by noise emissions from the proposed project. Predicted ambient sound levels as well as change in ambient sound levels will be presented in appropriate contours of constant sound pressure levels.

For modelling and assessing the potential noise impact the values as proposed in **Table 5-6** and MoE Noise Guidelines (see **Table 2.1**) will be considered.

Table 5-6: Proposed ambient sound levels and acceptable rating levels

10 meter Wind Speed (m/s)	MoE Sound Level Limits of Class 3 areas	ETSU-R97 limit for project participants	Noise limit based on Night-time rural Zone Sound Level (SANS 10103:2008) dBA	Proposed Night Rating Level (dBA)
4	40	45	35 (42)	40
5	40	45	35 (42)	40
6	40	45	35 (42)	40
7	43	45	35 (42)	43
8	45	45	35 (42)	45
9	49	45	35 (42)	45

The report will in addition also consider the potential ambient sound levels as measured at other sites to estimate the likelihood (probability) of a noise impact occurring.

6 METHODS: CALCULATION OF FUTURE NOISE EMISSIONS DUE TO PROPOSED PROJECT

6.1 NOISE EMISSIONS INTO THE SURROUNDING ENVIRONMENT[13]

The noise emissions into the environment from the various sources as defined by the project developer were calculated for the construction and operational phases in detail, using the sound propagation models described by SANS 10357 (Construction phase) as well as ISO 9613-2 (Operational phase).

The following was considered:

- The octave band sound pressure emission levels of processes and equipment (SANS and ISO);
- The impact of atmospheric absorption (SANS and ISO);
- The operational details of the proposed project, such as the location of each Wind Turbine Generator (SANS and ISO);
- Topographical layout (SANS and ISO);
- Meteorological correction of 0 dBA; and
- Acoustical characteristics of the ground. Low ground conditions were modelled, as the area where the facility is proposed to be constructed is well vegetated and sufficiently uneven to allow the consideration of mixed ground conditions (25% of area is soft for both the SANS and ISO models).

The noise emission into the environment due to additional traffic will be calculated using the sound propagation model described in SANS 10210. Corrections such as the following will be considered:

- Distance of receptor from the road;
- Road construction material;
- Average speeds;
- Types of vehicles used; and
- Ground acoustical conditions.

[13] *Acoustics, 2008; Acoustics Bulletin, 2009; Duncan, 2008; ETSU R97: 1996; Whitford, 2008,* SANS 10357:2004 The calculation of sound propagation by the Concave method', SANS 10210:2004. 'Calculating and predicting road traffic noise'

7 RESULTS AND IMPACT ASSESSMENT

7.1 CONSTRUCTION PHASE IMPACT

The amended layout as provided by the developer is presented **Figure 1.2**. As can be seen from this layout a number of different activities might take place close to potentially sensitive receptors, each with a specific potential impact. The activities have been defined in detail in **Section 4.1**.

7.1.1 Description of Construction Activities Considered

The following construction activities could take place simultaneously and were considered:

- General work at a temporary workshop area. This would be activities such as equipment maintenance, off-loading and material handling. All vehicles will travel to this site where most equipment and material will be off-loaded (general noise, crane). Material, such as aggregate and building sand, will be taken directly to the construction area (foundation establishment). It was assumed that activities will be taking place for 16 hours during the 16 hour daytime period.
- Surface preparation prior to civil work. This could be the removal of topsoil and levelling with compaction, or the preparation of an access road (bulldozer/grader). Activities will be taking place for 8 hours during the 16 hour daytime period.
- Preparation of foundation area (sub-surface removal until secure base is reached – excavator, compaction, and general noise). Activities will be taking place for 10 hours during the 16 hour daytime period.
- Pouring and compaction of foundation concrete (general noise, electric generator/compressor, concrete vibration, mobile concrete plant, TLB). As foundations must be poured in one go, the activity is projected to take place over the full 16 hour day time period.
- Erecting of the wind turbine generator (general noise, electric generator/compressor and a crane). Activities will be taking place for 16 hours during the 16 hour daytime period.
- Traffic on the site (trucks transporting material, aggregate/concrete, work crews) moving from the workshop/store area to the various activity sites. All vehicles to travel at less than 60 km/h, with a maximum of five (5) trucks and vehicles per hour to be modelled travelling to the areas where work is taking place (red line).

There will be a number of smaller equipment, but the addition of the general noise source (at each point) covers most of these noise sources. It is assumed that all equipment would be operating under full load (generate the most noise) at a number of locations and that

atmospheric conditions would be ideal for sound propagation. This is likely the worst case scenario that can occur during the construction of the facility.

As it is unknown where the different activities may take place it was selected to model the impact of the noisiest activity (laying of foundation totalling 113.6 dBA cumulative noise impact) at all locations (over the full daytime period of 16 hours) where wind turbines may be erected (worst case, layout in **Figure 1.2**), calculating how this may impact on potential noise-sensitive developments as well as mapping this modelled construction activity over distance (**Figure 7-1**). Noise created due to linear activities (roads) were also evaluated and plotted against distance as illustrated in **Figure 7-2**.

Even though construction activities are projected to take place only during day time, it might be required at times that construction activities take place during the night (particularly for a large project). Construction activities that may occur during night time:

- Concrete pouring: Large portions of concrete do require pouring and vibrating to be completed once started, and work is sometimes required until the early hours of the morning to ensure a well-established concrete foundation. However the work force working at night for this work will be considerably smaller than during the day.
- Working late due to time constraints: Weather plays an important role in time management in construction. A spell of bad weather can cause a construction project to fall behind its completion date. Therefore, it is hard to judge beforehand if a construction team would be required to work late at night.

7.1.2 Results: Construction Phase

The scenario as defined in the previous section (**section 7.1**) was modelled with the output presented in **Figure 7-1** and **Figure 7-2**. Modelled noise levels are estimated with the impact table presented in **Table 7-2**.

Only the calculated daytime ambient noise levels are presented, as construction activities that might impact on sensitive receptors should be limited to the 06:00 – 22:00 time period. The worst case scenario is presented with all activities taking place simultaneously at each proposed wind turbine location during wind-still conditions, in good sound propagation conditions (20°C and 80% humidity).

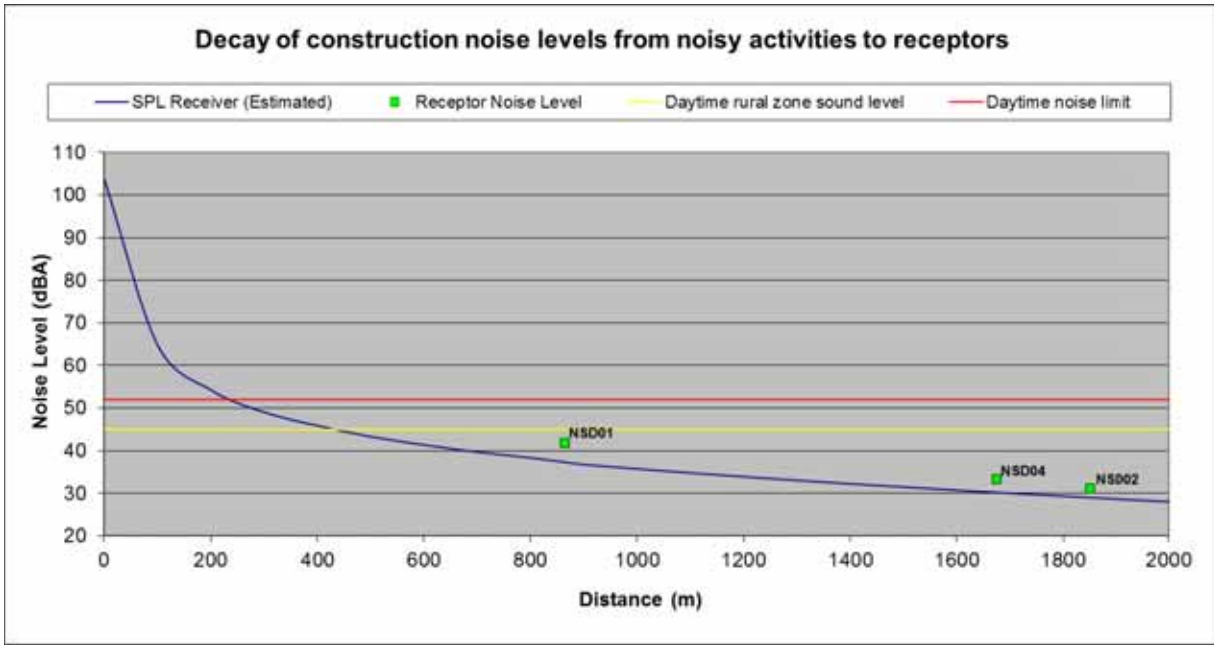

Figure 7-1: Construction noise: Projected Construction Noise Rating Levels as distances increase between NSDs and locations where construction can take place (worst case scenario)

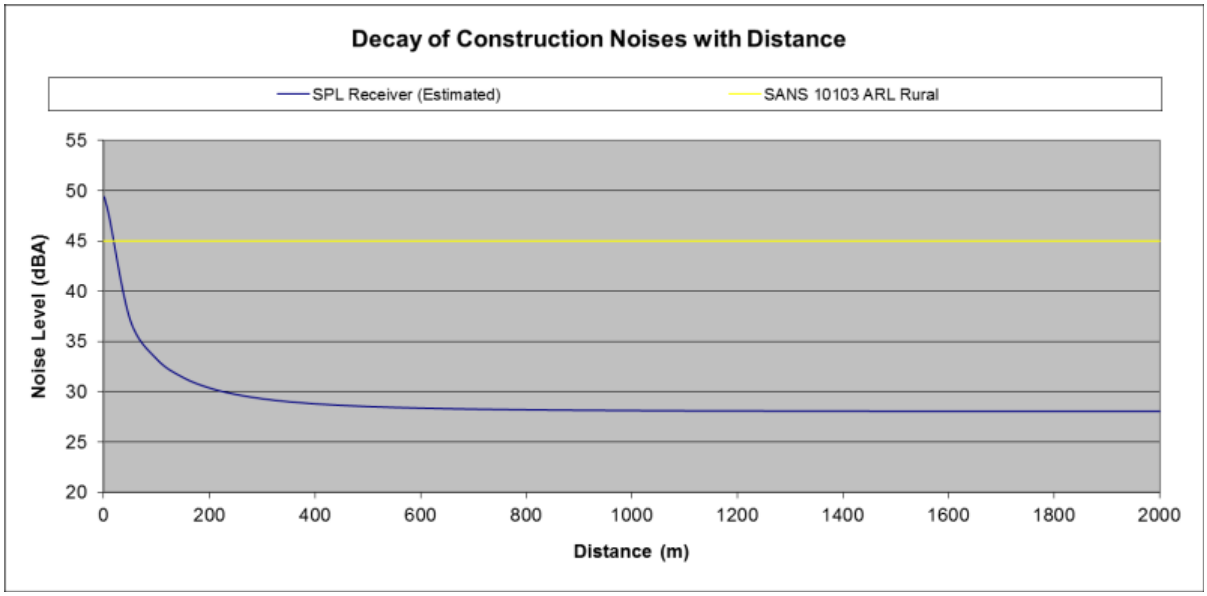

Figure 7-2: Construction noise: Projected Road Traffic Noise Levels as distances increase between a conceptual NSD and access roads (5 LDV and 5x Trucks travelling at 50 km/hr on a gravel road)

Figure 7-1 can also be used the estimate the potential noise impact should the developer select the development of onsite borrow-pits. If the quarrying activities take place further than 500 meters during the day from the closest NSD, the significance of the impact is expected to be low. Note that this is for a worst-case scenario, with all heavy-duty

equipment operating under full load for the full daytime period. Realistic noise levels would be less than the projected noise rating levels illustrated above.

7.1.3 Impact Assessment: Construction Phase

The impact assessment for the various construction activities that may impact on the surrounding environment is presented in the **Table 7-2**.

Table 7-1: Detailed impact assessment: Construction Activities

NSD	Noise level (maximum equivalent)	Daytime-time rating level	Magnitude	Duration	Extent	Probability	Significance
1	41.8	45	2	2	2	1	**6**
2	31	45	2	2	2	1	**6**
3	27.6	45	2	2	2	1	**6**
4	33.2	45	2	2	2	1	**6**
5	29	45	2	2	2	1	**6**
6	30.5	45	2	2	2	1	**6**

Table 7-2: Impact Assessment: Construction phase - overview

Nature:	Numerous simultaneous construction activities that could impact on receptors.
Acceptable Rating Level	Rural district (excluding construction traffic): 45 dBA outside during. Use of $L_{Req,D}$ of 45 dBA for rural areas. Ambient sound level = 35 - 50 dBA
Extent ($\Delta L_{Aeq,D}$>7dBA)	**Local** – Change in ambient sound levels would not extend further than 1,000 meters from activities **(2)**
Duration	**Short term** – Noisy activities in the vicinity of the receptors would last a portion of, or the duration of the construction period **(2)**
Magnitude	Noise Rating Levels < Potential disturbing noise level – **Low (2)**
Probability	While it is likely that receptors would hear construction noises during quiet periods, it is considered unlikely that the noise levels will change the ambient sound levels sufficiently to result in complaints at the receptors. **Improbable (1**)
Significance	**12 (Low - (2 + 2 + 2) x 2)**
Status	Negative.
Reversibility	High.
Irreplaceable loss of resources?	Not relevant.
Comments	*Modelling considered a worst-case scenario with significant activities taking place for 16 hours each day at all possible locations*
Can impacts be mitigated?	*Mitigation not required.*
Mitigation:	*Not required.*
Effectiveness of mitigation:	*Not applicable, mitigation not required*
Cumulative impacts:	This impact is cumulative with existing ambient sound as well as other noisy activities conducted in the same area.
Residual Impacts:	This impact will only disappear once construction activities cease.

Table 7-2 defines the significance of noise impacts during construction as low for the identified potential noise-sensitive receptors.

7.2 OPERATIONAL PHASE IMPACT

7.2.1 Description of Operational Activities Modelled

Typical day time activities would include:

- The operation of the various Wind Turbines,
- Maintenance activities (relatively insignificant noise source).

The daytime period (working day) was not considered for the EIA because noise generated during the day by the WEF is generally masked by other noises from a variety of sources surrounding potentially noise-sensitive developments.

At times when a quiet environment is desired (at night for sleeping, weekends etc.) ambient sound levels are more critical. The time period investigated therefore would be a quieter period, normally associated with the 22:00 – 06:00 timeslot. Maintenance activities would therefore not be considered, concentrating on the ambient sound levels created due to the operation of the various Wind Turbine Generators (WTGs) at night.

The developer is considering two different wind turbines (see **Table 7-3**). This report makes use of the sound power emission levels for the Siemens SWT 3.3-3000 wind turbine. The calculated octave sound power levels of this noise source as used for modelling are presented in **Table 7-3**. Noise levels would be slightly higher should the developer use the Acciona wind turbine but this will be with an insignificant amount.

Table 7-3: Octave Sound Power Emission Levels used for modelling

Wind Turbine: Acciona AW 132/3000								
Source Reference: Doc.: DG200506, Rev. A dated 2014-09-30								
A-Weighted Octave Sound Power Levels (dBA)								
Frequency	32.0	63.0	125.0	250.0	500.0	1000.0	2000.0	4000.0
Octave sound power Levels (dBA)	73.6	84.7	96.7	102.4	101.6	98.1	96.5	94.5
Estimated sound power levels (dBA)								
Wind Speed (at 10m reference height)				*6*	*7*	*8*	*9*	*10*
Sound power Levels (dBA)				*107.1*	*106.9*	*106.5*	*106.4*	*106.7*

Wind Turbine: Siemens SWT 3.3/3000							
Source Reference: Doc.: DG200506, Rev. A dated 2014-09-30							
A-Weighted Octave Sound Power Levels (dBA)							
Frequency	63.0	125.0	250.0	500.0	1000.0	2000.0	4000.0
Octave sound power Levels (dBA @ 8 m/s wind)	84.8	92.9	97.5	99.6	98.7	94.3	91.0
Estimated sound power levels (dBA)							
Wind Speed (at 10m reference height)	*4*	*5*	*6*	*7*	*8*	*9*	*10*
Sound power Levels (dBA)	*91.3*	*94.3*	*100.9*	*104.6*	*106.0*	*106.0*	*106.0*

7.2.2 Results: Operational Phase

Figure 7-3 shows the potential noise rating levels with all the wind turbines operating simultaneously. This figure indicates that the noise rating level would be the highest from about 8 m/s wind speed (and upwards) and this data is further used to develop the 3D-isopleth contour maps illustrated in **Figure 7-4**.

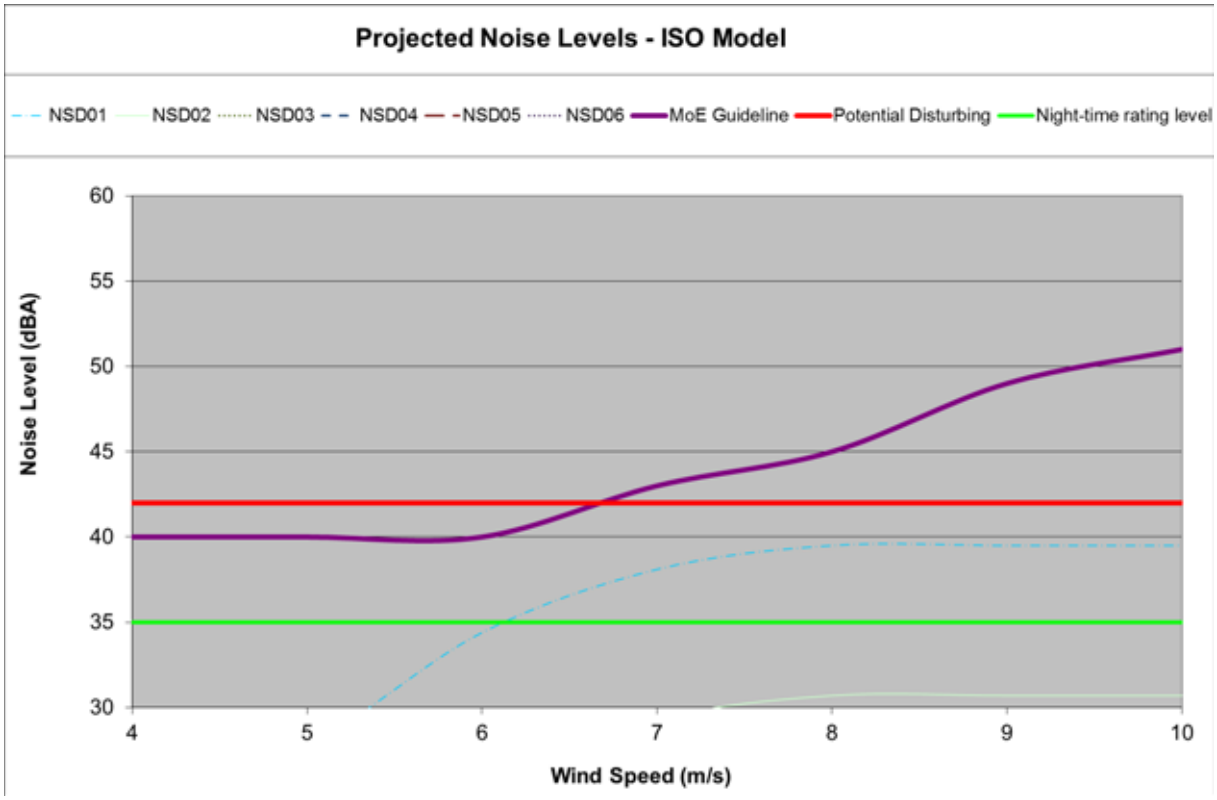

Figure 7-3: Projected noise levels at NSDs due to the operation of the WEF at different wind speeds, ISO Model

Figure 7-4 illustrates the projected noise levels due to the operation of the proposed WEF, illustrating the potential noise impact of all these wind turbines operating simultaneously (ISO model for an 8 m/s wind or higher – peak noise emission as per **Figure 7-3**).

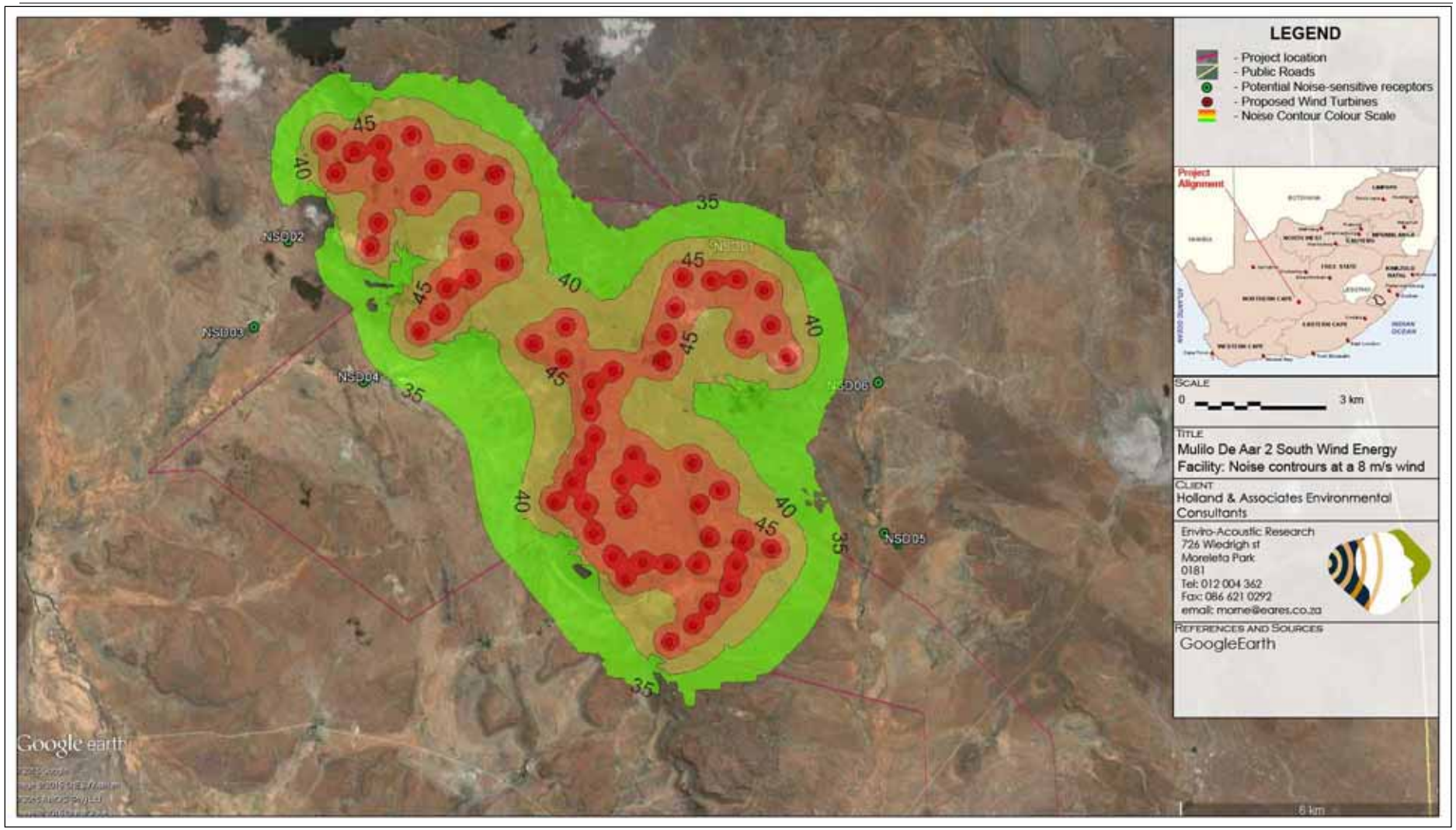

Figure 7-4: Projected Night-time Noise Levels; Contours of constant sound levels for a 8 m/s wind

Considering the preceding figures, the following observations are possible (Using the noise emission characteristics of the selected wind turbine (**Table 7-3**):

- Projected Noise Rating levels do not exceed the recommended noise limit of 42 dBA.
- The noise rating levels are not higher than the noise limits recommended by the Ministry of Environment (Canada, see **section 2.3.2**).
- Considering **Figure 5-2**, the operation of wind turbines may change the ambient sound levels during very quiet times and the wind turbines may be audible at NSD01 during these periods.

7.2.3 Impact Assessment: Operational Phase

This Environmental Noise Impact Assessment focuses on the impacts on the surrounding sound environment during times when a quiet environment is highly desirable. Noise limits are therefore appropriate for the most noise-sensitive activity, such as sleeping, or areas used for relaxation or other activities (places of worship, school, etc).

Appropriate Zone Sound Levels are therefore important, yet it has been shown that the SANS recommended (fixed) Night Rating Level ($L_{Req,N}$ = 35 dBA) might be inappropriate due to the increased ambient sounds relating to wind action. A more appropriate method to determine the potential noise impact would be to make use of the projected noise levels due to the operation of the WEF as well as the likely ambient sound levels due to wind induced noises.

Table 7-4: Impact Assessment: Operational phase

Nature:	*Numerous wind turbines operating simultaneously during a period when a quiet environment is desirable.*
Acceptable Rating Level	Rural district, refer to **Table 5-6** for the acceptable Night Rating Level – 42 dBA. Night-time ambient sound levels are expected to be range between 40 and 45 dBA (wind speeds exceeding 8 m/s).
Magnitude	The noise level is higher than the SANS 10103:2008 rating level of 35 dBA. The noise level will not be more than 7 dB than the expected ambient sound level and it is not expected that it will be higher than 3 dBA during quiet times. The magnitude of the noise impact is set at **low-Medium (see Table 5-2)**. **(4)**
Duration	Facility will operate for a number of years **Long term** – **(4 –** see **Table 5-3).**
Extent ($\Delta L_{Req,N}$>7dBA)	**Regional (Table 5-4)** – Impact would not extend further than 1,000 meters from the closest wind turbines. **(2).**
Probability	Ambient sound levels were measured in similar areas ranging between 20 – 65 dBA at night (with an 8 m/s wind) with a mathematical average of **37.94 dBA**. Noise rating levels were predicted to be a maximum of 41 dBA at NSD01. It is therefore likely that the wind turbines may be audible at NSD01 during quiet periods. It should be noted that audibility should not be confused with a Noise Impact. International studies indicate that approximately 5 - 15% of receptors staying close to wind farms may complain. Considering **Figure 5-2** (potential ambient sound levels), the findings of international studies and the criteria defined in **Table 5-5** the probability of a noise impact occurring is estimated at Possible (2), raised by 1 to **Likely** (**3** – precautionary principle)
Significance	**30 (Low) for all NSD**
Status	Negative.
Reversibility	High.
Irreplaceable loss of resources?	*Not relevant.*
Comments	-
Can impacts be mitigated?	Yes, but not required
Mitigation:	-
Cumulative impacts:	This impact is cumulative with existing ambient background noises.
Residual Impacts:	This impact will only disappear once the operation of the facility stops, or the sensitive receptor no longer exists.

8 MITIGATION OPTIONS

8.1 CONSTRUCTION PHASE

The proposed amendments would result in a reduction in the significance of construction phase noise impacts, from "low" (authorised option) to "very low" (proposed amended option). No additional mitigation measures are required or recommended.

8.2 OPERATIONAL PHASE

The noise impact is considered to be of a **low significance** for all the identified receptors. Projected noise levels will not be higher than 42 dBA and these noise levels will not be disturbing (in terms of the National Noise Control Regulations). As with the construction phase, the proposed amendments would result in a reduction in the significance of construction phase noise impacts, from "low" (authorised option) to "very low" (proposed amended option).

Further statements are included in this report for the developer to note, and include:

1. Good public relations are essential. At all stages surrounding receptors should be informed about the sound generated by wind turbines. The information presented to stakeholders should be factual and should not set unrealistic expectations. It is counterproductive to suggest that the wind turbines will be inaudible, or to use vague terms like "quiet". Modern wind turbines produce a sound due to the aerodynamic interaction of the wind with the turbine blades, audible as a "swoosh", which can be heard at some distance from the turbines. The magnitude of the sound will depend on a multitude of variables and will vary from day to day and from place to place with environmental and operational conditions. Similarly, potential annoyance levels have been linked to visibility and audibility. Audibility is distinct from the sound level, because it depends on the relationship between the sound level from the wind turbines and the ambient background sound level and character.
2. Community involvement needs to continue throughout the project. Annoyance is a complicated psychological phenomenon; as with many industrial operations, expressed annoyance with sound can reflect an overall annoyance with the project, rather than a rational reaction to the sound itself. Wind projects offer a benefit to the environment and the energy supply for the greater population, and offer economic benefits to the land owners leasing installation sites to the wind farm. A positive community attitude throughout the greater area should be

fostered, particularly with those residents near the wind farm, to ensure they do not feel that advantage have been taken of them.

3. The developer must implement a line of communication (i.e. a help line where complaints could be lodged). All potential sensitive receptors should be made aware of these contact numbers. The Wind Energy Facility should maintain a commitment to the local community and respond to concerns in an expedient fashion. Sporadic and legitimate noise complaints could develop. For example, sudden and sharp increases in sound levels could result from mechanical malfunctions or perforations or slits in the blades. Problems of this nature can be corrected quickly, and it is in the developer's interest to do so.

9 ENVIRONMENTAL MANAGEMENT PLAN

9.1 CONSTRUCTION PHASE

Projected noise levels during construction of the Wind Energy Facility were modelled using the methods as proposed by SANS 10357:2004. The resulting future noise projections indicated that the construction activities, as modelled for the worst case scenario will comply with the National Noise Control Regulations for daytime activities.

Various construction activities would be taking place during the development of the facility and may pose a low noise risk to the closest receptors. While this study investigated likely and significant noisy activities, it did not evaluate all potential activities that could result in a noise impact. These activities could include temporary or short-term activities where small equipment is used (such as the digging of trenches to lay underground power-lines). The impact of such activities is generally very low.

Using the available information the significance of the construction noise impact was defined to be of a low significance. No mitigation measures were proposed.

The following measures are recommended to define the performance of the developer in mitigating the projected impacts and reducing the significance of the noise impact.

OBJECTIVE	**Control noise pollution stemming from construction activities**
Project Component(s)	Construction of infrastructure, including but not limited to: turbine system (foundation, tower, nacelle and rotor), substation(s), access roads and electrical power cabling.
Potential Impact	• Increased noise levels at potentially sensitive receptors • Potentially changing the acceptable land use capability.
Activity/Risk source	Any construction activities taking place within 500 meters from any potentially noise-sensitive developments (NSDs).
Mitigation Target/Objective	• Ensure equivalent A-weighted daytime noise levels below 45 dBA at potentially sensitive receptors. • Ensure that maximum noise levels at potentially sensitive receptors be less than 65 dBA; • Prevent the generation of disturbing or nuisance noises; • Ensure acceptable noise levels at surrounding stakeholders and potentially sensitive receptors; • Ensuring compliance with the National Noise Control Regulations.

Mitigation: Action/Control	Responsibility	Timeframe
Establish a line of communication and notify all stakeholders and NSDs of the means of registering any issues, complaints or comments.	- Environmental Control Officer	All phases of project
Notify potentially sensitive receptors about work to take place at least 2 days before the activity in the vicinity (within 500 meters) of the NSD is to start. Following information to be presented in writing: - Description of Activity to take place; - Estimated duration of activity; - Working hours; - Contact details of responsible party.	- Contractor -Environmental Control Officer	At least 2 days, but not more than 5 days before activity is to commence
Ensure that all equipment is maintained and fitted with the required noise abatement equipment.	- Contractor Environmental Control Officer	Weekly inspection
When any noise complaints are received, noise monitoring should be conducted at the complainant, followed by feedback regarding noise levels measured.	- Acoustical Consultant	Within 7 days after complaint was registered
The construction crew must abide by the local by-laws regarding noise.	- Contractor - Environmental Control Officer	Duration of construction phase
Where possible construction work should be undertaken during normal working hours (06H00 – 22H00), from Monday to Saturday; If agreements can be reached (in writing) with the all the surrounding (within a 1,000 distance) potentially sensitive receptors, these working hours can be extended.	- Contractor	As required

Performance indicator	• **Equivalent A-weighted noise levels below 45 dBA at potentially sensitive receptors (over 8 hours) due to construction activities.** • **Ensure that maximum noise levels at potentially sensitive receptors are less than 65 dBA.** • **No noise complaints are registered**
Monitoring	No noise monitoring is recommended unless a reasonable and valid noise complaint is registered.

9.2 OPERATIONAL PHASE

Projected noise levels during operation of the Wind Energy Facility were modelled using the methodology as proposed by ISO 9613-2.

The resulting future noise projections indicated that the operation of the facility would comply with the acceptable rating levels proposed in this report (refer **Table 5-6**). Further mitigation measures are not required or recommended.

The following measures are recommended to define the performance of the developer in terms of best international practice.

OBJECTIVE	**Control noise pollution stemming from operation of WEF**
Project Component(s)	Operational Phase
Potential Impact	• Increased noise levels at potentially sensitive receptors; • Changing ambient sound levels could change the acceptable land use capability; and • Disturbing character of noise from the wind turbines.
Activity/Risk source	Simultaneous operation of a number of Wind Turbines
Mitigation Target/Objective	• No noise complaints.

Mitigation: Action/Control	**Responsibility**	**Timeframe**
None required		

Performance indicator	**Ensure that the change in ambient sound levels as experienced by Potentially Sensitive Receptors is less than 5 dBA**
Monitoring	If a valid and reasonable complaint is registered relating to the operation of the facility additional noise monitoring should be undertaken as recommended by an acoustic consultant.

10 CONCLUSIONS AND RECOMMENDATIONS

This report is an Addendum to the Environmental Noise Impact Assessment of the predicted noise environment for the proposed amended De Aar 2 South WEF, east of De Aar, making use of sound propagation models to identify potential issues of concern.

This study uses the noise emission characteristics of the Siemens SWT-3.3-130 wind turbine. With the input data as used, this assessment indicated that the change in layout as well as the reduction in wind turbines did reduce the projected noise levels at the surrounding receptors during both the construction and operational phase.

Therefore the proposed amendments would result in a reduction in the significance of both the construction and operational phase noise impacts, from "low" (authorised option) to "very low" (proposed amended option). Further mitigation is not required or recommended.

However, if a valid and reasonable noise complaint is registered relating to the construction or operation of the facility, additional noise monitoring should be conducted by an acoustic consultant. Noise monitoring must be continued as long as noise complaints are registered.

The developer should re-evaluate this study if the layout is changed (where any wind turbines are moved closer, or turbines are added within 800 meters from any potential noise-sensitive receptor) or if the developer makes use of a different wind turbine that generate more than 108 dBA.

With its promise for environmental and economic advantages, wind power generation has significant potential to become a large industry in South Africa. However, when wind farms are near to potential sensitive receptors, consideration must be given to ensuring a compatible co-existence. The potential sensitive receptors should not be adversely affected and yet, at the same time the wind farms need to reach an optimal scale in terms of layout and number of units.

Wind turbines produce sound, primarily due to mechanical operations and aerodynamic effects at the blades. Modern wind turbine manufacturers have virtually eliminated the noise impact caused by mechanical sources and instituted measures to reduce the aerodynamic effects. But, as with many other activities, the wind turbines emit sound power levels at a level that can impact on areas at some distance away. When potentially

sensitive receptors are nearby, care must be taken to ensure that the operations at the wind farm do not cause undue annoyance or otherwise interfere with the quality of life of the receptors.

It should be noted that this does not suggest that the sound from the wind turbines should not be audible under all circumstances - this is an unrealistic expectation that is not required or expected from any other agricultural, commercial, industrial or transportation related noise source – but rather that the sound due to the wind turbines should be at a reasonable level in relation to the ambient sound levels.

11 THE AUTHOR

The author of this report, M. de Jager (B. Ing (Chem), UP) graduated in 1998 from the University of Pretoria. He has been interested in acoustics as from school days, doing projects mainly related to loudspeaker enclosure design. Interest in the matter brought him into the field of Environmental Noise Measurement, Prediction and Control. As from 2007 he has been involved with the following projects:

Wind Energy Facilities	*Zen (Savannah Environmental – SE), Goereesoe (SE), Springfontein (SE), Garob (SE), Project Blue (SE), ESKOM Kleinzee (SE), iNCa Gouda (Aurecon SA), Kangnas (Aurecon), Walker Bay (SE), Oyster Bay (SE), Hidden Valley (SE), Happy Valley (SE), Deep River (SE), Saldanha WEF (Terramanzi), Loeriesfontein (SiVEST), Noupoort (SiVEST), Prieska (SiVEST), Plateau East and West (Aurecon), Saldanha (Aurecon), Veldrift (Aurecon), Tsitsikamma (SE), AB (SE), West Coast One (SE), Namakwa Sands (SE), Dorper (SE), VentuSA Gouda (SE), Amakhala Emoyeni (SE), Klipheuwel (SE), Cookhouse (SE), Cookhouse II (SE), Canyon Springs (Canyon Springs), Rheboksfontein (SE), Suurplaat (SE), Karoo Renewables (SE), Outeniqwa (Aurecon), Koningaas (SE), Eskom Aberdene (SE), Spitskop (SE), Rhenosterberg (SiVEST), Bannf (Vidigenix), Wolf WEF (Aurecon)*
Mining and Industry	*BECSA – Middelburg (Golder Associates), Kromkrans Colliery (Geovicon Environmental), SASOL Borrow Pits Project (JMA Consulting), Lesego Platinum (AGES), Tweefontein Colliery (Cleanstream), Evraz Vametco Mine and Plant (JMA), Goedehoop Colliery (Geovicon), Hacra Project (Prescali Environmental), Der Brochen Platinum Project (J9 Environment), Delft Sand (AGES), Brandbach Sand (AGES), Verkeerdepan Extension (CleanStream), Dwaalboom Limestone (AGES), Jagdlust Chrome (MENCO), WPB Coal (MENCO), Landau Expansion (CleanStream), Otjikoto Gold (AurexGold), Klipfontein Colliery (MENCO), Imbabala Coal (MENCO), ATCOM East Expansion (Jones and Wagner), IPP Waterberg Power Station (SE), Kangra Coal (ERM), Schoongesicht (CleanStream), EastPlats (CleanStream), Chapudi Coal (Jacana Environmental), Generaal Coal (JE), Mopane Coal (JE), Boshoek Chrome (JMA), Langpan Chrome (PE), Vlakpoort Chrome (PE), Sekoko Coal (SE), Frankford Power (REMIG), Strahrae Coal (Ferret Mining), Transalloys Power Station (Savannah), Pan Palladum Smelter, Iron and PGM Complex (Prescali)*
Road and Railway	*K220 Road Extension (Urbansmart), Boskop Road (MTO), Sekoko Mining (AGES), Davel-Swaziland-Richards Bay Rail Link (Aurecon), Moloto Transport Corridor Status Quo Report and Pre-Feasibility (SiVEST), Postmasburg Housing Development (SE), Tshwane Rapid Transport Project, Phase 1 and 2 (NRM Consulting/City of Tshwane)*
Airport	*Oudtshoorn Noise Monitoring (AGES), Sandton Heliport (Alpine Aviation), Tete Airport Scoping*
Noise monitoring	*Peerboom Colliery (EcoPartners), Thabametsi (Digby Wells), Doxa Deo (Doxa Deo), Harties Dredging (Rand Water), Xstrata Coal – Witbank Regional, Sephaku Delmas (AGES), Amakhala Emoyeni WEF (Windlab Developments), Oyster Bay WEF (Renewable Energy Systems), Tsitsikamma WEF (Cennergi*

	and SE), Hopefield WEF (Umoya), Wesley WEF (Innowind), Ncora WEF (Innowind), Boschmanspoort (Jones and Wagner), Nqamakwe WEF (Innowind), Dassiesfontein WEF Noise Analysis (BioTherm), Transnet Noise Analysis (Aurecon)
Small Noise Impact Assessments	*TCTA AMD Project Baseline (AECOM), NATREF (Nemai Consulting), Christian Life Church (UrbanSmart), Kosmosdale (UrbanSmart), Louwlardia K220 (UrbanSmart), Richards Bay Port Expansion (AECOM), Babalegi Steel Recycling (AGES), Safika Slag Milling Plant (AGES), Arcelor Mittal WEF (Aurecon), RVM Hydroplant (Aurecon), Grootvlei PS Oil Storage (SiVEST), Rhenosterberg WEF, (SiVEST), Concerto Estate (BPTrust), Ekuseni Youth Centre (MENCO), Kranskop Industrial Park (Cape South Developments), Pretoria Central Mosque (Noman Shaikh), Soshanguve Development (Maluleke Investments), Seshego-D Waste Disposal (Enviroxcellence), Zambesi Safari Equipment (Owner), Noise Annoyance Assessment due to the Operation of the Gautrain (Thornhill and Lakeside Residential Estate), Upington Solar (SE), Ilangalethu Solar (SE), Pofadder Solar (SE), Flagging Trees WEF (SE), Uyekraal WEF (SE), Ruuki Power Station (SE), Richards Bay Port Expansion (AECOM), Babalegi Steel Recycling (AGES), Safika Ladium (AGES), Safika Cement Isando (AGES), Natref (NEMAI), RareCo (SE), Struisbaai WEF (SE)*
Project reviews and amendment reports	*Loperberg (Savannah), Dorper (Savannah), Penhoek Pass (Savannah), Oyster Bay (RES), Tsitsikamma (Cennergi), Amakhala Emoyeni (Windlab), Spreeukloof (Savannah), Spinning Head (Savannah), Kangra Coal (ERM), West Coast One (Moyeng Energy), Rheboksfontein (Moyeng Energy)*

The author is an independent consultant to the project, the developer as well as Holland & Associates Environmental Consultants. He,

- does not and will not have any financial interest in the undertaking of the activity, other than remuneration for work performed in terms of the Environmental Impact Assessment Regulations
- have no, and will not have a vested interest in the proposed activity proceeding
- have no, and will not, engage in conflicting interests in the undertaking of the activity
- undertake to disclose all material information collected, calculated and/or findings, whether favourable to the developer or not
- will ensure that all information containing all relevant facts be included in this report.

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APPENDIX A

Glossary of Acoustic Terms, Definitions and General Information

1/3-Octave Band	A filter with a bandwidth of one-third of an octave representing four semitones, or notes on the musical scale. This relationship is applied to both the width of the band, and the centre frequency of the band. See also definition of octave band.
A – Weighting	An internationally standardised frequency weighting that approximates the frequency response of the human ear and gives an objective reading that therefore agrees with the subjective human response to that sound.
Air Absorption	The phenomena of attenuation of sound waves with distance propagated in air, due to dissipative interaction within the gas molecules.
Alternatives	A possible course of action, in place of another, that would meet the same purpose and need (of proposal). Alternatives can refer to any of the following, but are not limited hereto: alternative sites for development, alternative site layouts, alternative designs, alternative processes and materials. In Integrated Environmental Management the so-called "no go" alternative refers to the option of not allowing the development and may also require investigation in certain circumstances.
Ambient	The conditions surrounding an organism or area.
Ambient Noise	The all-encompassing sound at a point being composed of sounds from many sources both near and far. It includes the noise from the noise source under investigation.
Ambient Sound	The all-encompassing sound at a point being composite of sounds from near and far.
Ambient Sound Level	Means the reading on an integrating impulse sound level meter taken at a measuring point in the absence of any alleged disturbing noise at the end of a total period of at least 10 minutes after such a meter was put into operation. In this report the term Background Ambient Sound Level will be used.
Amplitude Modulated Sound	A sound that noticeably fluctuates in loudness over time.
Applicant	Any person who applies for an authorisation to undertake a listed activity or to cause such activity in terms of the relevant environmental legislation.
Assessment	The process of collecting, organising, analysing, interpreting and communicating data that is relevant to some decision.
Attenuation	Term used to indicate reduction of noise or vibration, by whatever method necessary, usually expressed in decibels.
Audible frequency Range	Generally assumed to be the range from about 20 Hz to 20,000 Hz, the range of frequencies that our ears perceive as sound.
Ambient Sound Level	The level of the ambient sound indicated on a sound level meter in the absence of the sound under investigation (e.g. sound from a particular noise source or sound generated for test purposes). Ambient sound level as per Noise Control Regulations.
Bin	A series of sound level measurements (numerical values) into which data are sorted for statistical analysis. In this report it is the collective term of all the measurements collected in 600 seconds.
Broadband Noise	Spectrum consisting of a large number of frequency components, none of which is individually dominant.
C-Weighting	This is an international standard filter, which can be applied to a pressure signal or to a *SPL* or *PWL* spectrum, and which is essentially a pass-band filter in the frequency range of approximately 63 to 4000 Hz. This filter provides a more constant, flatter, frequency response, providing significantly less adjustment than the A-scale filter for frequencies less than 1000 Hz.
dB(A)	Sound Pressure Level in decibel that has been A-weighted, or filtered, to match the response of the human ear.
Decibel (db)	A logarithmic scale for sound corresponding to a multiple of 10 of the threshold of hearing. Decibels for sound levels in air are referenced to an atmospheric

	pressure of 20 μ Pa.
Diffraction	The process whereby an acoustic wave is disturbed and its energy redistributed in space as a result of an obstacle in its path, Reflection and refraction are special cases of diffraction.
Direction of Propagation	The direction of flow of energy associated with a wave.
Disturbing noise	Means a noise level that exceeds the zone sound level or, if no zone sound level has been designated, a noise level that exceeds the ambient sound level at the same measuring point by 7 dBA or more.
Environment	The external circumstances, conditions and objects that affect the existence and development of an individual, organism or group; these circumstances include biophysical, social, economic, historical, cultural and political aspects.
Environmental Control Officer	Independent Officer employed by the applicant to ensure the implementation of the Environmental Management Plan (EMP) and manages any further environmental issues that may arise.
Environmental impact	A change resulting from the effect of an activity on the environment, whether desirable or undesirable. Impacts may be the direct consequence of an organisation's activities or may be indirectly caused by them.
Environmental Impact Assessment	An Environmental Impact Assessment (EIA) refers to the process of identifying, predicting and assessing the potential positive and negative social, economic and biophysical impacts of any proposed project, plan, programme or policy that requires authorisation of permission by law and that may significantly affect the environment. The EIA includes an evaluation of alternatives, as well as recommendations for appropriate mitigation measures for minimising or avoiding negative impacts, measures for enhancing the positive aspects of the proposal, and environmental management and monitoring measures.
Environmental issue	A concern felt by one or more parties about some existing, potential or perceived environmental impact.
Equivalent continuous A-weighted sound exposure level ($L_{Aeq,T}$)	The value of the average A-weighted sound pressure level measured continuously within a reference time interval *T*, which have the same mean-square sound pressure as a sound under consideration for which the level varies with time.
Equivalent continuous A-weighted rating level ($L_{Req,T}$)	The Equivalent continuous A-weighted sound exposure level *($L_{Aeq,T}$)* to which various adjustments has been added. More commonly used as ($L_{Req,d}$) over a time interval 06:00 – 22:00 (T=16 hours) and ($L_{Req,n}$) over a time interval of 22:00 – 06:00 (T=8 hours).
F (fast) time weighting	(1) Averaging detection time used in sound level meters. (2) Fast setting has a time constant of 125 milliseconds and provides a fast reacting display response allowing the user to follow and measure not too rapidly fluctuating sound.
Footprint area	Area to be used for the construction of the proposed development, which does not include the total study area.
Free Field Condition	An environment where there is no reflective surfaces.
Frequency	The rate of oscillation of a sound, measured in units of Hertz (Hz) or kiloHertz (kHz). One hundred Hz is a rate of one hundred times per second. The frequency of a sound is the property perceived as pitch: a low-frequency sound (such as a bass note) oscillates at a relatively slow rate, and a high-frequency sound (such as a treble note) oscillates at a relatively high rate.
Green field	A parcel of land not previously developed beyond that of agriculture or forestry use; virgin land. The opposite of Greenfield is Brownfield, which is a site previously developed and used by an enterprise, especially for a manufacturing or processing operation. The term Brownfield suggests that an investigation should be made to determine if environmental damage exists.
G-Weighting	An International Standard filter used to represent the infrasonic components of a sound spectrum.

Harmonics	Any of a series of musical tones for which the frequencies are integral multiples of the frequency of a fundamental tone.
I (impulse) time weighting	(1) Averaging detection time used in sound level meters as per South African standards and Regulations. (2) Impulse setting has a time constant of 35 milliseconds when the signal is increasing (sound pressure level rising) and a time constant of 1,500 milliseconds while the signal is decreasing.
Impulsive sound	A sound characterized by brief excursions of sound pressure (transient signal) that significantly exceed the ambient sound level.
Infrasound	Sound with a frequency content below the threshold of hearing, generally held to be about 20 Hz. Infrasonic sound with sufficiently large amplitude can be perceived, and is both heard and felt as vibration. Natural sources of infrasound are waves, thunder and wind.
Integrated Development Plan	A participatory planning process aimed at developing a strategic development plan to guide and inform all planning, budgeting, management and decision-making in a Local Authority, in terms of the requirements of Chapter 5 of the Municipal Systems Act, 2000 (Act 32 of 2000).
Integrated Environmental Management	IEM provides an integrated approach for environmental assessment, management, and decision-making and to promote sustainable development and the equitable use of resources. Principles underlying IEM provide for a democratic, participatory, holistic, sustainable, equitable and accountable approach.
Interested and affected parties	Individuals or groups concerned with or affected by an activity and its consequences. These include the authorities, local communities, investors, work force, consumers, environmental interest groups and the general public.
Key issue	An issue raised during the Scoping process that has not received an adequate response and that requires further investigation before it can be resolved.
Listed activities	Development actions that is likely to result in significant environmental impacts as identified by the delegated authority (formerly the Minister of Environmental Affairs and Tourism) in terms of Section 21 of the Environment Conservation Act.
L_{AMin} *and* L_{AMax}	Is the RMS (root mean squared) minimum or maximum level of a noise source.
Loudness	The attribute of an auditory sensation that describes the listener's ranking of sound in terms of its audibility.
Magnitude of impact	Magnitude of impact means the combination of the intensity, duration and extent of an impact occurring.
Masking	The raising of a listener's threshold of hearing for a given sound due to the presence of another sound.
Mitigation	To cause to become less harsh or hostile.
Negative impact	A change that reduces the quality of the environment (for example, by reducing species diversity and the reproductive capacity of the ecosystem, by damaging health, or by causing nuisance).
Noise	a. Sound that a listener does not wish to hear (unwanted sounds). b. Sound from sources other than the one emitting the sound it is desired to receive, measure or record. c. A class of sound of an erratic, intermittent or statistically random nature.
Noise Level	The term used in lieu of sound level when the sound concerned is being measured or ranked for its undesirability in the contextual circumstances.
Noise-sensitive development	developments that could be influenced by noise such as: a) districts (see table 2 of SANS 10103:2008) 1. rural districts, 2. suburban districts with little road traffic, 3. urban districts, 4. urban districts with some workshops, with business premises, and with main roads, 5. central business districts, and 6. industrial districts;

	b) educational, residential, office and health care buildings and their surroundings; c) churches and their surroundings; d) auditoriums and concert halls and their surroundings; e) recreational areas; and f) nature reserves. In this report Noise-sensitive developments is also referred to as a Potential Sensitive Receptor
Octave Band	A filter with a bandwidth of one octave, or twelve semi-tones on the musical scale representing a doubling of frequency.
Positive impact	A change that improves the quality of life of affected people or the quality of the environment.
Property	Any piece of land indicated on a diagram or general plan approved by the Surveyor-General intended for registration as a separate unit in terms of the Deeds Registries Act and includes an erf, a site and a farm portion as well as the buildings erected thereon
Public Participation Process	A process of involving the public in order to identify needs, address concerns, choose options, plan and monitor in terms of a proposed project, programme or development
Reflection	Redirection of sound waves.
Refraction	Change in direction of sound waves caused by changes in the sound wave velocity, typically when sound wave propagates in a medium of different density.
Reverberant Sound	The sound in an enclosure which results from repeated reflections from the boundaries.
Reverberation	The persistence, after emission of a sound has stopped, of a sound field within an enclosure.
Significant Impact	An impact can be deemed significant if consultation with the relevant authorities and other interested and affected parties, on the context and intensity of its effects, provides reasonable grounds for mitigating measures to be included in the environmental management report. The onus will be on the applicant to include the relevant authorities and other interested and affected parties in the consultation process. Present and potential future, cumulative and synergistic effects should all be taken into account.
S (slow) time weighting	(1) Averaging times used in sound level meters. (2) Time constant of one [1] second that gives a slower response which helps average out the display fluctuations.
Sound Level	The level of the frequency and time weighted sound pressure as determined by a sound level meter, i.e. A-weighted sound level.
Sound Power	Of a source, the total sound energy radiated per unit time.
Sound Pressure Level (SPL)	Of a sound, 20 times the logarithm to the base 10 of the ratio of the RMS sound pressure level to the reference sound pressure level. International values for the reference sound pressure level are 20 micropascals in air and 100 millipascals in water. SPL is reported as L_p in dB (not weighted) or in various other weightings.
Soundscape	Sound or a combination of sounds that forms or arises from an immersive environment. The study of soundscape is the subject of acoustic ecology. The idea of soundscape refers to both the natural acoustic environment, consisting of natural sounds, including animal vocalizations and, for instance, the sounds of weather and other natural elements; and environmental sounds created by humans, through musical composition, sound design, and other ordinary human activities including conversation, work, and sounds of mechanical origin resulting from use of industrial technology. The disruption of these acoustic environments results in noise pollution.
Study area	Refers to the entire study area encompassing all the alternative routes as indicated on the study area map.
Sustainable Development	Development that meets the needs of the present without compromising the ability of future generations to meet their own needs. It contains within it two key concepts: the concept of "needs", in particular the essential needs of the

	world's poor, to which overriding priority should be given; and the idea of limitations imposed by the state of technology and social organization on the environment's ability to meet present and the future needs (Brundtland Commission, 1987).
Zone of Potential Influence	The area defined as the radius about an object, or objects beyond which the noise impact will be insignificant.
Zone Sound Level	Means a derived dBA value determined indirectly by means of a series of measurements, calculations or table readings and designated by a local authority for an area. This is similar to the Rating Level as defined in SANS 10103:2008.

End of report.

environmental affairs
Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

DETAILS OF SPECIALIST AND DECLARATION OF INTEREST

	(For official use only)
File Reference Number:	12/12/20/
NEAS Reference Number:	DEAT/EIA/
Date Received:	

Application for authorisation in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended and the Environmental Impact Assessment Regulations, 2010

PROJECT TITLE

PROPOSED WIND ENERGY FACILITY SITUATED ON THE EASTERN PLATEAU (SOUTH) NEAR DE AAR, NORTHERN CAPE PROVINCE: APPLICATION FOR AMENDMENT OF ENVIRONMENTAL AUTHORISATION

Specialist:	Noise		
Contact person:	Morné de Jager		
Postal address:	Box 2047, Garsfontein East		
Postal code:	0060	Cell:	082 565 4059
Telephone:	012 993 2165	Fax:	086 621 0292
E-mail:	morne@menco.co.za		
Professional affiliation(s) (if any)	SAAI, ASA		

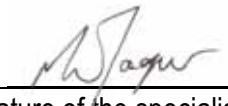
Project Consultant:			
Contact person:			
Postal address:			
Postal code:		Cell:	
Telephone:		Fax:	
E-mail:			

4.2 The specialist appointed in terms of the Regulations_

I, **Morné de Jager** declare that --

General declaration:

- I act as the independent specialist in this application
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- all the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of Regulation 71 and is punishable in terms of section 24F of the Act.



Signature of the specialist:

Enviro Acoustic Research cc

Name of company (if applicable):

19 June 2015

Date:

Appendix C6:
Addendum to Visual Impact Assessment

KAREN HANSEN
LANDSCAPE ARCHITECT
VISUAL IMPACT ASSESSMENTS

PROPOSED APPLICATION FOR AMENDMENT OF THE ENVIRONMENTAL AUTHORISATION FOR THE PROPOSED WIND ENERGY FACILITY SITUATED ON THE PLATEAU (SOUTH) NEAR DE AAR, NORTHERN CAPE PROVINCE (DEA REF NO.: 12/12/20/2463/AM3)

Specialist Visual Impact Assessment, January/March 2012 refers.
Date of this ADDENDUM: June 2015

1.0 INTRODUCTION

1.1 Background

KHLA was commissioned by Holland and Associates, Environmental Consultants, June 2015, to undertake this ADDENDUM study on behalf of the Applicant.

1.2 Original Approved Scheme

Mulilo Renewable Energy (Pty) Ltd was granted Environmental Authorisation from the Department of Environmental Affairs (DEA) in 2013 to establish a Wind Energy Facility (WEF) and associated infrastructure on the eastern plateau of De Aar (approximately 20 km to the east of the town) 'De Aar 2 South WEF'. The proposed development site is approximately 12,832ha, in 8 portions of 4 farms. The *Authorised Option* WEF comprised approximately 103 turbines, each with a generation capacity of 1.5 - 2.5MW. The potential generation capacity of the WEF has subsequently been limited to 140MW.

1.3 Change of Special Purpose Vehicle Name

An EA amendment application was later submitted to change the Special Purpose Vehicle (SPV) name from Mulilo Renewable Energy (Pty) Ltd to Longyuan Mulilo De Aar 2 South (Pty) Ltd.

1.4 Current Proposed Amended Option

Longyuan Mulilo De Aar 2 South (Pty) Ltd, (Applicant) now propose to amend the project description of the proposed WEF. The *Authorised Option* will be compared with the new *Proposed Amended Option*; this will require the re-assessment of the potential impacts associated with the project to update the specialist study.

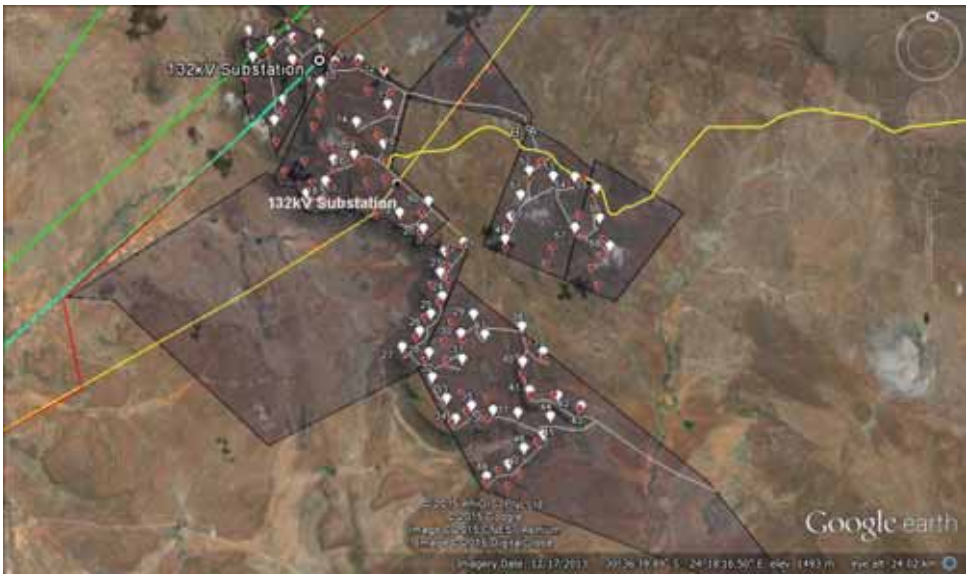


Figure 1.1, the site area, terrain, existing transmission layout and proposed wind turbine locations.
Source: Google Earth/Mulilo/Holland

2.0 COMPARISON: AUTHORISED OPTION WITH PROPOSED AMENDED OPTION

2.1 Original Report Section 1 'Introduction':
No change to the original section content apart from the references to the North part of the study, the expansion of the rating criteria, and to the **Terms of Reference** which are now:

Compile an addendum to the original specialist report addressing the following:

- The **implications** of the proposed amendments in terms of the potential impact(s);
- A re-assessment of the **significance** (before and after mitigation) of the identified impact(s) in light of the proposed amendments (as required in terms of the 2014 EIA Regulations), for the construction and operational phases, including consideration of the following:
    - Cumulative impacts;
    - The nature, significance and consequence of the impact;
    - The extent and duration of the impact;
    - The probability of the impact occurring;
    - The degree to which the impact can be reversed;
    - The degree to which the impact may cause irreplaceable loss of resources;
    - The degree to which the impact can be avoided, managed or mitigated;
- The addendum to the report to include an **impact summary table** outlining the findings of the re-assessment in terms of the abovementioned assessment criteria;
- A statement as to whether the proposed amendments will result in a **change to the significance of the impact** assessed in the original EIA for the proposed project (and if so, how the significance would change). The advantages and disadvantages associated with the proposed change.
- A detailed description of measures to **ensure avoidance, management and mitigation** of impacts associated with the proposed changes.
- The re-assessment must take into account and address public comments received during the **Public Participation Process** (PPP).

2.2 Original Report Section 2 'Project Context'
This section defined the study area including both the North and the South layouts, and illustrated the *Authorised Option*/proposed scheme layout. The following changes to the original section content are relevant, commencing with Figures 2.1 and 2.2 illustrating the *Proposed Amended Option* layout.

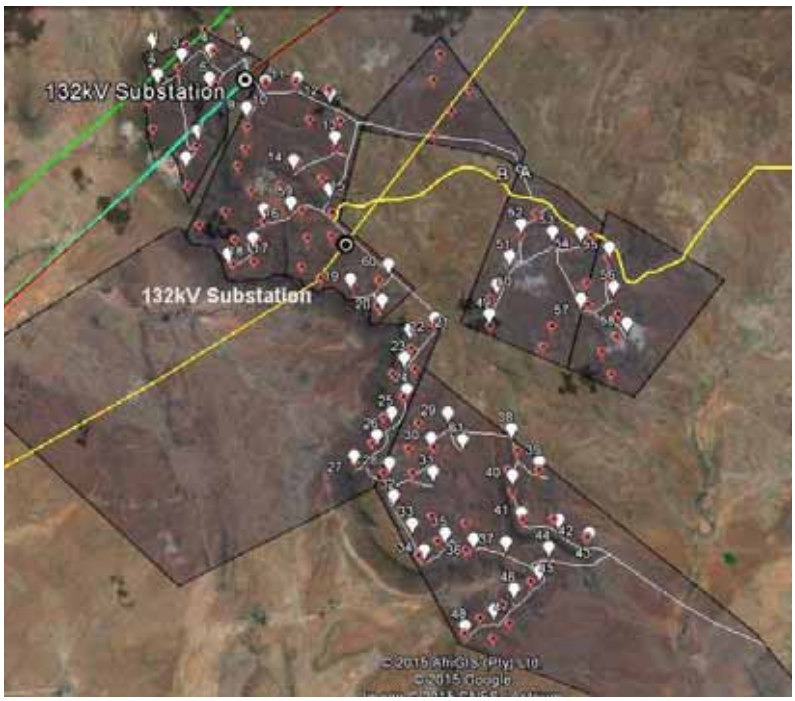


Figure 2.1, the site area, terrain, existing transmission layout and proposed wind turbine locations.

This enlarged image shows the *Authorised Option turbines* in red and the *Proposed Amended Option* turbine locations in white; 40% fewer turbines could lead to less visual clutter.
The main transmission lines to evacuate the power to Hydra are existing. The location of two potential sites for the new substation and control buildings, are shown.
Source: Google Earth/ Mulilo/ Holland

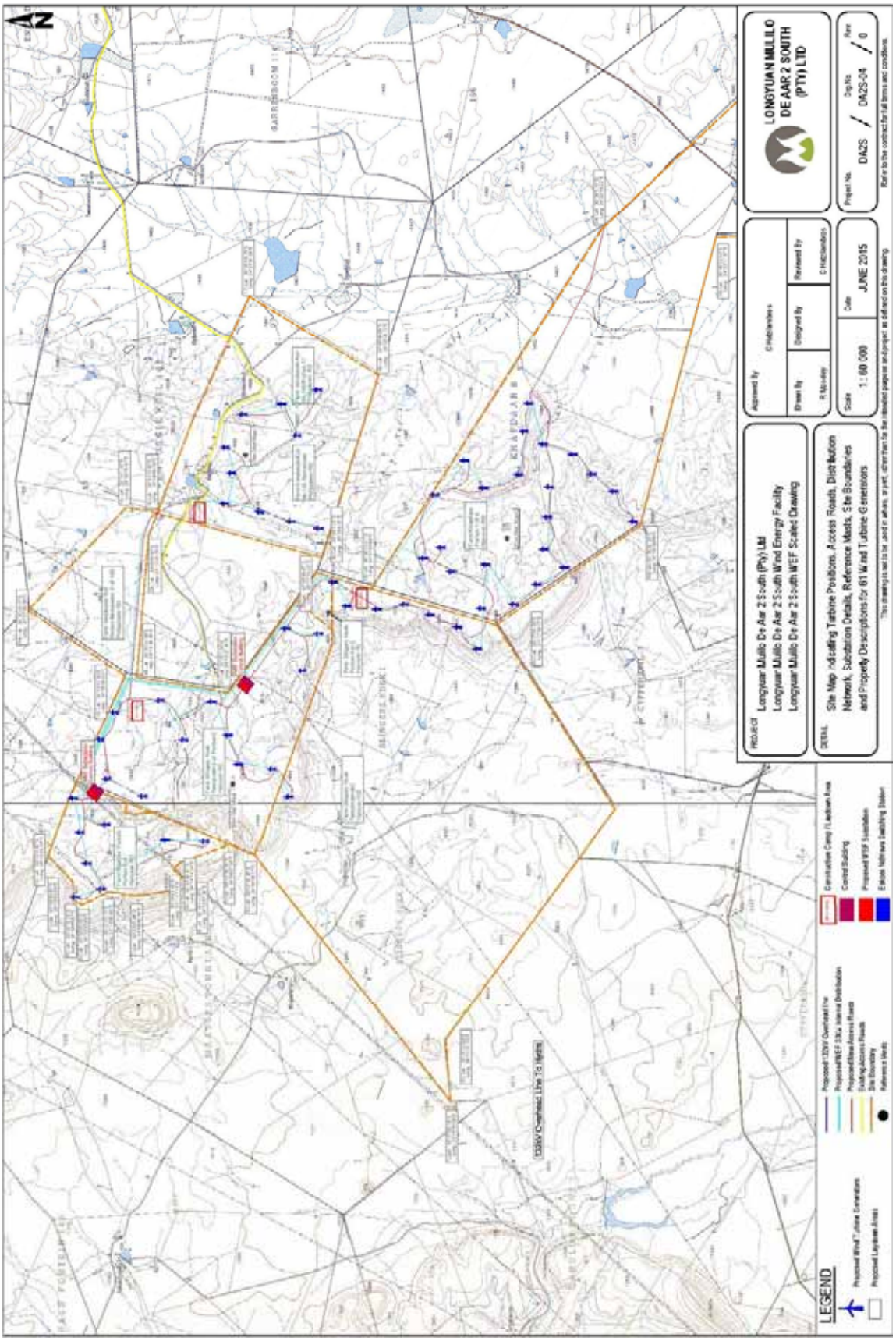


Figure 2.2The site boundary is shown with an orange dashed line; the proposed turbines are dark blue, the proposed 33kV internal distribution line, light blue. Also illustrated are two locations of potential sites for the proposed substation, laydown areas, wind measuring masts, existing and proposed access routes. Source: Surveyor Generals Mapping/Mulilo/Holland

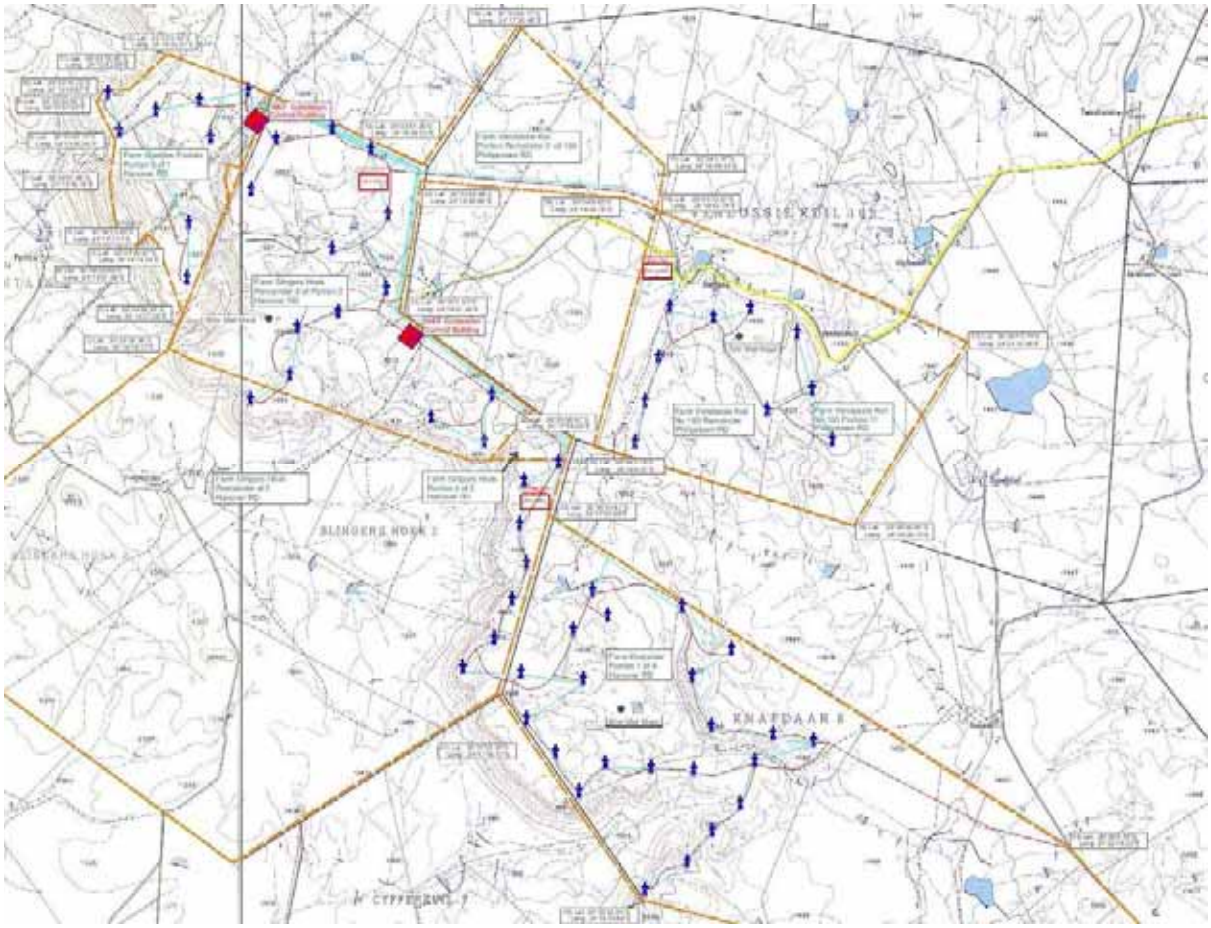


Figure 2.3 an extract of Figure 2.2. The site boundary is shown with an orange dashed line; the proposed turbines are dark blue, the proposed 33kV internal distribution line, light blue. Also illustrated are two locations of potential sites for the proposed substation, laydown areas, wind measuring masts, existing and proposed access routes. Source: Surveyor Generals Mapping/Mulilo/Holland.

Fig 2.4 from 5km due south of the southern group of turbines, where there is a road linking Hydra with some farmsteads. There would be an open and distant view of the project. Source Hansen

2.3 Original Report Section 3 'Project Description'
This section described the Project and the following table compares the *Authorised Option* with the *Proposed Amended Option.*

2.3.1 Schedule of the Proposed Amendments:

Table 2.1

	Authorised Option	Proposed Amended Option
Infrastructure elements changed:		
Number of Turbines	103	61 Turbines @ 2.3MW per turbine (to 30 Turbines @ 4MW per turbine). The maximum of 61 will be applied for.
Generation capacity per turbine	1.5 – 2.5MW	2.3 - 4.0MW *
Generation capacity of the full WEF	155 - 258MW	140MW
Rotor/blade diameters (ø)	120m ø	Max 160m ø
Lower base diameter of mast	15m ø	20m ø
Hub Height	100m	Max 120m
Permanent construction pad; disturbed ground	40 x 50m, (2000m^2)	40 x 50m, (2000m^2)
Permanent affected area, (foundation size)	16 x 16 x 2m deep (256m^2, visible)	18.4m ø, narrowing up to a visible portion of 10,6m ø at the surface once the foundation is complete; depth 3.5m; 277.3m^2 visible
Network of 22kV transmission lines through the site	Each turbine linked with network	Each turbine linked with network; 33kV transmission lines reduced pro rata
4m wide gravel roadways through the site	Link each turbine	Link each turbine, gravel roads reduced pro rata
Infrastructure mainly unchanged:		
Built form, no significant change	Control centre, substations, turbine transformers, laydown areas	Control centre, local substation, laydown areas
Power evacuated with 3 existing distribution lines to:	Hydra substation	No change
Access to the site	From 2 existing gravel roads	No change
Affected locations	Eastern Plateau	No change
Sensitive Receptors affected by the change in scale of impact	People living in adjacent farmsteads, distant views from De Aar, N10, R48	No change

* Note: The Application for amendment of the EA will assess the "worst case scenario" of 61 turbines @ 2.3MW per turbine with the understanding that should the Applicant use 4MW turbines (which will be the same dimensions as the 2.3MW turbines) then the Applicant would reduce the number of turbines to 30. It is furthermore noted that the generation capacity of the WEF is limited to 140MW. Although 61 turbines of 2.3MW = 140.3MW, the Applicant will be limited to 140MW, (60 x 2.3MW turbines =138MW).

2.3.2 In summary the proposed scheme provides for:

- 40% fewer turbines
- Correspondingly reduced visual clutter from transmission lines through the site
- The turbines have increased in total height by a factor of 20%
- The lower mast ø has increased by a factor of 25%
- Permanently affected local ground area at each turbine has only increased by a factor of 8%

The site area, the disposition of the proposed turbines in the landscape, and the access road network is similar to the original scheme.

2.4 Original Report Section 4 'Nature of the Receiving Environment'
No change to the original section content.

2.5 Original Report Section 5 'Visual Impact Assessment'
The following changes to the original section content are relevant:
2.5.1 Visual Envelope

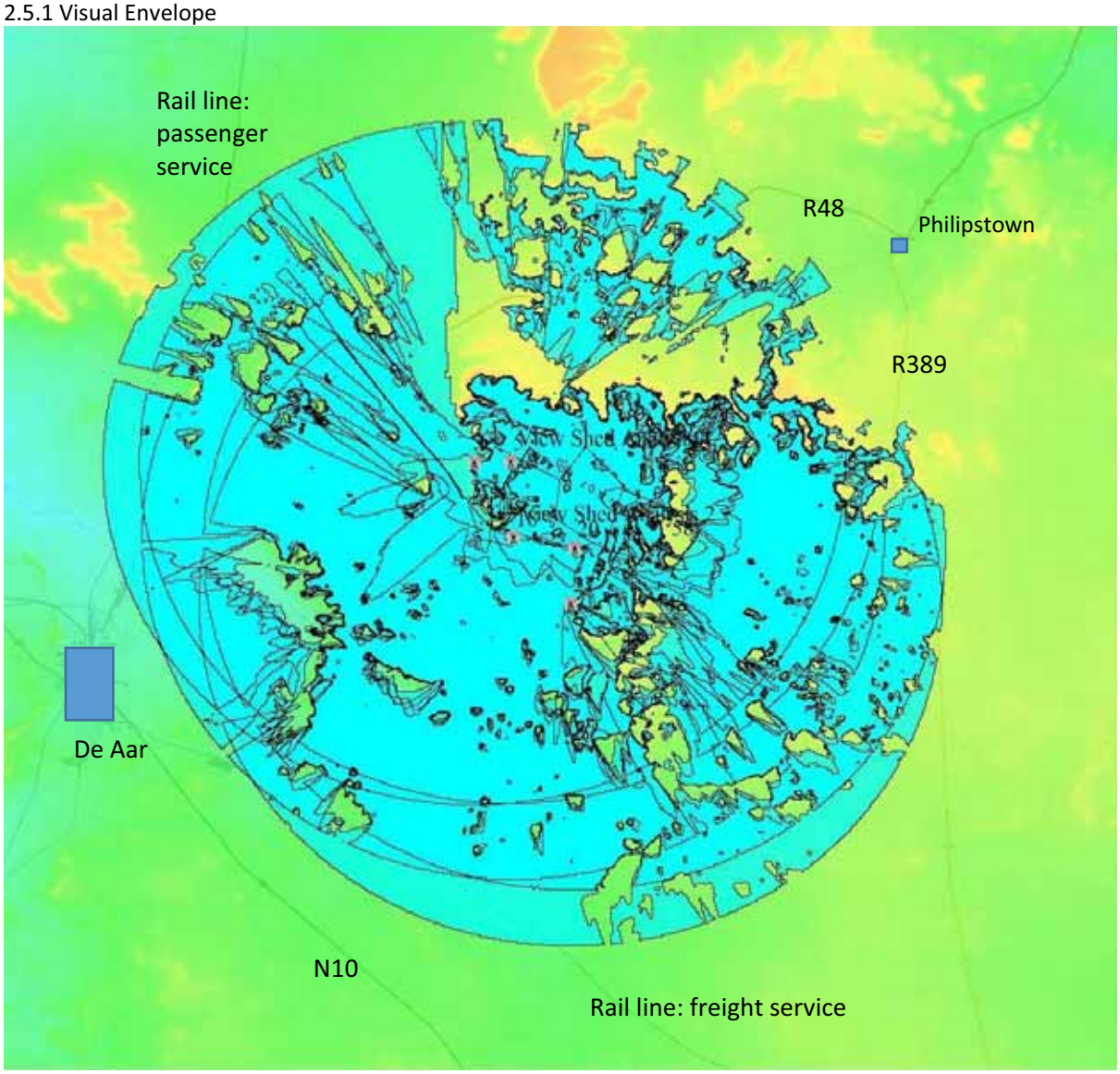


Figure 2.5 image generated by digital terrain mapping to assess the overall visibility of the turbines in the 'west' group, (numbers 1, 5, 18, 20, and 27). Lower ground is represented by the green colour, higher ground by orange. The viewshed for each turbine is shown in blue and they overlap with one another.

A representative sample of five turbines was identified based on the criterion of 'most likely to be visible to the main population centre, De Aar'. The geographic locations were fixed by their co-ordinates and the viewshed tool set to the full height of the turbines. Population centres, and the N10 would be unaffected. The R48 and the (passenger) Rail line, would be visually impacted upon for traffic in both directions.

2.5.2 Localities from which the development would be seen are farmsteads and transport corridors:

These sensitive receptors would be in a similar spatial relationship with the proposed turbines in *the Authorised Option* and the *Proposed Amended Option*.

Local Farmsteads affected are unchanged from those impacted upon by the *Authorised Option*, viz., Slingershoek, Meyersfontein, Witput, Kranskop, and Vendusiekuil; but they would be visually aware of fewer turbines, at no greater proximity.

Transport corridors: for travellers in either direction, the visual impact from the R48 would be continuous for a period of time similar to, but no greater than, the *Authorised Option*. For travellers in either direction, the visual impact from the R389 would be brief and distant. Rail line, passenger and freight services are affected to the same degree as before.

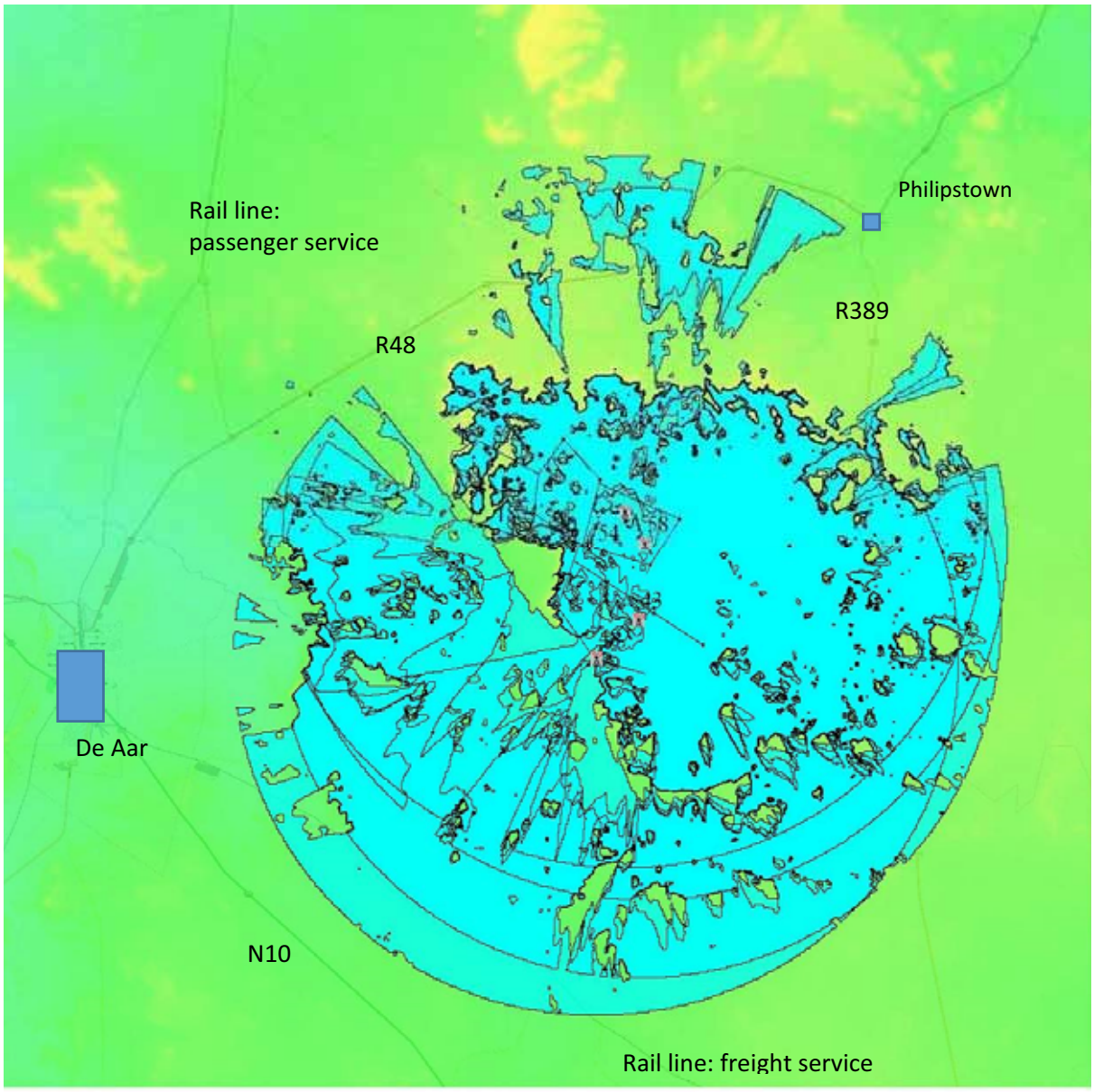


Figure 2.6 image generated by digital terrain mapping to assess the overall visibility of the turbines in the 'east' group, (numbers 43, 48, 54 and 58). Lower ground is represented by the green colour, higher ground by orange. The viewshed for each turbine is shown in blue and they overlap with one another.

A representative sample of four turbines was identified based on the criterion of 'most likely to be visible to a population centre/sensitive receptor'. The geographic locations were fixed by their co-ordinates and the viewshed tool set to the full height of the turbines. Population centres, the Rail line, (passenger), and the N10, would be unaffected. Short lengths of the R48, R389, and the freight line would be visually impacted upon.

2.5.3 Localities from which the development would be seen are farmsteads and transport corridors:
These sensitive receptors would be in a similar spatial relationship with the proposed turbines in *the Authorised Option* and the *Proposed Amended Option*.

Local Farmsteads affected are unchanged from those impacted upon by the *Authorised Option*, viz., Slingershoek, Meyersfontein, Witput, Kranskop, and Vendusiekuil; but they would be visually aware of fewer turbines, at no greater proximity.

Transport corridors: R48, and R389, for travellers in either direction, the view would be brief and distant. Rail line, passenger and freight services are affected to the same degree as before.

2.5.4 Extent of actual turbine visibility against potential visibility
Metadata from the terrain analysis software gave visibility data for the individual turbines assessed as a representative sample. This expresses the area of land visually affected by each turbine as a percentage of the overall sampled area; so a low percentage means that the turbine would be visible to a smaller proportion of the locality. As the ground level height of the turbine also plays a part in the extent of its visibility, heights in metres asl are also given.

Table 2.2 Comparison of turbine visibility

Turbine	Ht asl	Percentage of possible area visually affected	Turbine group
1	1600m	73.3% most visible	West side
5	1545m	57.8% moderately visible, in comparison	West side
18	1483m	57.7% moderately visible, in comparison	West side
20	1520m	59.8% moderately visible, in comparison	West side
27	1543m	72.5% most visible	West side
43	1458m	61.1% moderately visible, in comparison	East side
48	1509m	78.2% most visible	East side
54	1526m	51.9% moderately visible, in comparison	East side
58	1509m	53.7% moderately visible, in comparison	East side

Of the two main population centres, De Aar is at 1250m asl, and Philipstown at 1360m asl and receptors would look up at the turbine locations; the turbines would be on hill land on average 120-300m higher.

2.5.5 Table 2.3: Comparison of remaining Impacts discussed in the original Report

Nature of Impacts	*Authorised Option*	*Proposed Amended Option*
Extent of the Visual Impact	Regional, beyond 10km	Sub regional
Visual Exposure	High	High
Zones of Visual Influence or Theoretical Visibility	Varied from low to high with proximity	Varied from low to high with proximity
Visual Absorption Capacity	Medium	Medium
Compatibility with Surrounding Landscape	Moderately appropriate	Moderately appropriate
Intensity or Magnitude	High reducing with distance	High reducing with distance
Duration of Impact	Long term	Long term
Significance of the Visual Impact	High	High
Potential Cumulative Visual Impacts	Limited by Capacity of Hydra	Limited by capacity of Hydra
Mitigation	As below	As below

2.6 Original Report Section 6 'Mitigation Measures'
No change to the original section content.

2.7 Impact Tables for Proposed Amended Option

Table 2.4 Construction Phase

Nature: Impact of initial site works, construction camps, site set up, laying services, ground works		
	Without mitigation	***With mitigation***
Extent	Local	Local
Duration	Short -term	short-term
Magnitude	Moderate	Medium-Low
Probability	Probable	Probable
Significance	Medium	Medium-Low
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be avoided, managed or mitigated?	Yes	
Mitigation: Establish screening structures to shield construction works from sensitive receptors; good traffic and site management. Keeping construction period as short as reasonable		
Cumulative impacts: None		
Residual Impacts: There could some limited ground contamination		

Table 2.5 Construction Phase

Nature: Impact of construction of access roads, hauling and delivery of construction materials		
	Without mitigation	***With mitigation***
Extent	Local	Local
Duration	Short -term	Short-term
Magnitude	Moderate	Medium-Low
Probability	Probable	Probable
Significance	Medium	Low
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be avoided, managed or mitigated?	Yes	
Mitigation: good traffic management		
Cumulative impacts: None		
Residual Impacts: None		

Table 2.6 Operation Phase

Nature: Impact on receptors living and working locally of the change in site character from rural upland to industry; impact on road users		
	Without mitigation	***With mitigation***
Extent	Local, regional	Local, regional
Duration	Long -term	Long-term
Magnitude	High	High
Probability	Probable	Probable
Significance	High	High
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be avoided, managed or mitigated?	To a limited degree	
Mitigation: good maintenance ensuring the WEF is always in use		
Cumulative impacts: Some possibility that the development could be extended in the future if additional substation capacity is developed		
Residual Impacts: From the concrete foundations		

Table 2.7 Operation Phase

Nature: Impact of the colours, finishes, heights of the infrastructure		
	Without mitigation	***With mitigation***
Extent	Local, regional	Local, regional
Duration	Long -term	Long-term
Magnitude	High	High
Probability	Probable	Probable
Significance	High	High
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be avoided, managed or mitigated?	To a limited degree	
Mitigation: reduce visual clutter, establish buildings in locations not visible to majority of receptors; consider probability of habituation to the visual impact from sensitive receptors.		
Cumulative impacts: None		
Residual Impacts: From the concrete foundations		

2.8 Original Report Section 7 'Conclusions and Recommendations'

Authorised Option was discussed as follows:

- The scheme as a whole was described as visually strong, complex and cluttered in the landscape
- The development was considered to be appropriate in terms of scale, viz. the scale of the hills is acceptably appropriate to ensure that the turbines can settle on to the land.
- Recommendations were that if mitigation measures were undertaken and an environmental management plan instituted, the development could proceed

3.0 CONCLUSIONS AND RECOMMENDATIONS FOR PROPOSED AMENDED OPTION

3.1 Change of Land Use and Landscape Character

The award of Environmental Authorisation in 2013 to the scheme referred to as *Authorised Option*, accepts the principle that a WEF of 103 WTG, 160m high, (mast height and rotor radius), may be established on this site. The change of land use and landscape character has been accepted. The landform setting is of a scale to absorb this development.

3.2 Proposed Amended Option

Proposed Amended Option offers 40% fewer turbines, 20% greater in scale, established in similar locations, along with similar infrastructure elements as before.

3.3 Comparison of Visual Components

Proposed Amended Option provides turbines that would be 20% more dominant in the landscape, because they have greater mass and would therefore be easier to see.

Proposed Amended Option offers a scheme where visual clutter has been reduced and the visual scale increased.

Proposed Amended Option provides a WEF with simpler forms, and could appear more high tech in appearance due to scale. The WEF would have a high significance rating, (which is a combination of intensity, extent and duration ratings), but the degree of that high rating would be lesser than for the previous scheme, (*Authorised Option*), due to less clutter.

3.4 Conclusion

Proposed Amended Option is acceptable from a visual standpoint.

3.5 Recommendation

The proposed amendments will result in a moderate **change to the significance of the impact**:

The proposed development would be visible over the same area and for the same predicted timespan; but the development would offer both greater clarity and less clutter. Therefore its visual significance would reduce.

Proposed Amended Option could proceed if mitigation measures would be undertaken and an environmental management plan instituted.

environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

DETAILS OF SPECIALIST AND DECLARATION OF INTEREST

	(For official use only)
File Reference Number:	12/12/20/ or 12/9/11/L
NEAS Reference Number:	DEA/EIA
Date Received:	

Application for integrated environmental authorisation and waste management licence in terms of the-

(1) National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended and the Environmental Impact Assessment Regulations, 2014; and

(2) National Environmental Management Act: Waste Act, 2008 (Act No. 59 of 2008) and Government Notice 921, 2013

PROJECT TITLE

PROPOSED WIND ENERGY FACILITY SITUATED ON THE EASTERN PLATEAU (SOUTH) NEAR DE AAR, NORTHERN CAPE PROVINCE: APPLICATION FOR AMENDMENT OF ENVIRONMENTAL AUTHORISATION

Specialist:	Karen Hansen Landscape Architect (KHLA)		
Contact person:	Karen Hansen		
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Telephone:	0218552997	Fax:	0218552997
E-mail:	hansentk@cybersmart.co.za		
Professional affiliation(s) (if any)			

Project Consultant:	Karen Hansen		
Contact person:	Karen Hansen		
Postal address:	Postnet Suite 15, P Bag 15, Somerset West		
Postal code:	7129	Cell:	0728408900
Telephone:	0218552997	Fax:	0218552997
E-mail:	hansentk@cybersmart.co.za		

4.2 The specialist appointed in terms of the Regulations_

I, Karen Hansen , declare that --

General declaration:

I act as the independent specialist in this application;
I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
I declare that there are no circumstances that may compromise my objectivity in performing such work;
I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
I will comply with the Act, Regulations and all other applicable legislation;
I have no, and will not engage in, conflicting interests in the undertaking of the activity;
I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
all the particulars furnished by me in this form are true and correct; and
I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

Signature of the specialist:

KHLA

Name of company (if applicable):

15 June 2015

Date:

KAREN HANSEN
LANDSCAPE ARCHITECT
VISUAL IMPACT ASSESSMENTS #

Curriculum Vitae: Karen Hansen, Principal, KHLA

Visual Assessment Specialist

Visual Assessments are generally required as an essential part of the ***Environmental Impact Assessment Process***. The proposed development is assessed to determine the particular areas of specialist expertise required, and many developments are considered to be visually significant.

I undertake Scoping Studies, Basic Assessments, Level 1, Level 2, and Level 3 studies, all in accord with the provisions of: 'Guideline for involving Visual and Aesthetic Specialists in EIA Processes'; *Provincial Government of the Western Cape Department of Environmental Affairs and Development Planning.*

Qualifications

Chartered Membership of the Landscape Institute, UK, in 1982, registered nr. 11994.

Strathclyde University, Scotland, 1995 course in Environmental Impact Assessment covering the legislative background to, and practice of, Environmental Impact Assessment, with particular reference to Visual Impact Studies.

Experience in South Africa

2010 onward: Independent Consultant Landscape Architect specialising in, *inter alia*, Visual Assessments, (Environmental Studies).

2006 to **2010**: Senior Landscape Architect with Viridian Consulting, (Pty) Ltd., Somerset West, undertaking a number of landscape design projects as well as environmental studies.

Experience in UK/AFRICA

2000 to **2006**: Landscape Architect and Team Leader with Glasgow City Council. Master planning, design, implementation of the Heritage Lottery funded urban parks and urban dual carriageways.

1992 to **2000**: Partner with Kirklee Landscape Architects, Glasgow, Scotland, undertaking a number of landscape design projects, especially transport networks, as well as environmental studies.

1985 to **1992**: Director of Landscape Architect practice based in Harare, Zimbabwe, undertaking strategic projects for the Ministry of Defence and Infrastructure projects for the Ministry of Public Housing and National Construction.

Environmental Studies: Visual Impact Assessments: Projects

Transport corridors

- The VIA was undertaken prior to the design and Implementation of landscape works for major new road, 'Western Distributor Road', Glenrothes, Fife, Scotland. (1996).
- East End Regeneration Route: visual impact assessment leading to strategy decisions for the optimum routing of this new dual carriageway whose construction would act as a driver for change in the East End of Glasgow. (2004).

Forestry/Greenbelt

- Study of landscape aspects of felling and restocking of several areas of existing coniferous woodlands and change to native woodland species in catchment area for West of Scotland Water at Loch Katrine, Strathclyde, Scotland. (1996).
- Environmental Study for Central Scotland Countryside Trust as part of the process to determine future access and tree planting policy in the Greenbelt surrounding Falkirk, Scotland. (1997).

Residential

- Study for a proposed coastal Links Golf Residential Estate, close to the airport at Prestwick, Scotland. (1998).
- A small residential development at L' Avenir Winery, on an exposed and elevated site, Stellenbosch, W Cape. (2007).
- A proposed residential development with open space over 3,460ha at St Helena Bay, W Cape, a core project of the St Helena SDI, with Denis Moss Partnership and D J Environmental Consultants. (2008).
- Phase 2 of De Zalze Residential Golf Estate, for Spier, Stellenbosch with Denis Moss Partnership and D J Environmental Consultants. (2009).
- A proposed security estate in a long established residential suburb, Somerset West, W Cape with Viridian Consulting. (2013).
- Second phase of middle income housing at Haasendal II, Kuilsriver, W Cape with Braaf Environmental Practitioners. (2013).
- Weltevreden Hills, a proposed residential development directly adjacent to the Weltevreden Historic Farm, Stellenbosch with Denis Moss Partnership, Stellenbosch. (2014).
- Farm 85, Patrys Valley, Stellenbosch, a proposed residential development close to Welgevonden and to a building of heritage significance with Denis Moss Partnership, Stellenbosch. (2014).

Mixed uses/Retail

- Mixed Use Development at Mandalay, Khayelitsha, Cape Town. Predominately housing, with some commercial and institutional uses, opposite the railway station; with Braaf Environmental Practitioners. (2009).
- Mixed Use Development, Crammix Brickworks, Cape Town. Change of use to predominately housing, with some commercial and institutional uses, and integrated open space with Denis Moss Partnership and D J Environmental Consultants. (2009).
- A new Retail Mall with car parking, Philippi, Cape Town on a green-field site and close to a major traffic intersection with Power Construction and D J Environmental Consultants. (2011).
- Suider-Paarl Business Park, Paarl, W Cape. Located on the R101 just south of Paarl, and focussing on motor car showrooms with Praktiplan, Paarl. (2013).
- Commercial Development on Farm Welgemoed, Atlantis, W Cape. At the junction of the R304 and Bloembosch Road, outside of the urban edge with Enviro Dinamik. (2013).

Transmission Lines

- Eskom 400kV Transmission lines, servitude and screening issues, for De Wijnlanden Residential Estate, Stellenbosch, W Cape with the Residents Association and Eskom. (2009).
- 132kV Transmission Lines to evacuate power generated from a WEF to the south-west of De Aar at Maanhaarberg, direct to Eskom Hydra substation with Aurecon Group. (2011).
- 132kV Transmission Lines to evacuate power generated from a WEF north-east of De Aar at the Eastern Plateau, direct to Bushbuck substation with Aurecon Group. (2011).
- 132kV Transmission Lines to evacuate power generated from a WEF to the north-east of De Aar at the Eastern Plateau, direct to Eskom Hydra substation with Aurecon Group. (2013).

Industry

- Scrap Metal Yard at Blackheath, Cape Town; yard extension and screening concerns with Braaf Environmental Practitioners. (2009).
- Meerlust Wine Estate, Proposed Bottling Plant in an agricultural area with Ron Martin Heritage. (2009).
- A proposed industrial estate off the R101 between Paarl and Klapmuts for Agri-Industrial uses with Braaf Environmental Practitioners. (2009).

Value Logistics Warehouse Signage, Kraaifontein, with FJC Consulting, Cape Town and Goldcoast Management, Wilderness. (2014)

- Geodetic Observatory, Matjiesfontein, with Ecosense, Stellenbosch (2015)

Education

- University of Cape Town Middle Campus, Rondebosch, for Urbanscapes, MLH Architects and UCT; to assess impacts derived from change of use of multi-level piazza to new lecture theatre and administration buildings. (2009).

Tourism

- Visual baseline study for tourism development at Kogel Bay Tourist Resort, Western Cape as part of the Development Framework Policy document, for the City of Cape Town. (2009).
- New Airport Hotel, Edinburgh Airport, Scotland, assessment of relationship with other built form on the land-side. (1997).
- Berg River Mouth Development; Vacation Apartments, Laaiplek Harbour, W Cape, with Dudley Janeke Environmental Consultants, Somerset West. (2014)

Heritage

- Groote Schuur Estate, Rondebosch, Cape Town, Visual and Heritage Study for the Department of Public Works (2009).
- Worcester Transport Interchange, W Cape, a proposed transport hub in the old centre with Jakupa Architects and Urban Designers, and Cape Winelands Municipality. (2013).
- Bakkerskloof, house dated from 1792, Somerset West, W Cape, an assessment of development works adjacent to an historic building with Herman Heunis Family Trust and Heritage Architects. (2013).

Alternative Energy

- Scoping Study for Wind Turbines and Wind Measuring Masts in a number of sites around the N and W Cape with D J Environmental Consultants. (2010).
- Wind Measuring Masts in Vredendal, Worcester, and De Aar with D J Environmental Consultants. (2010).
- Wind Farms, Photovoltaic installations and Concentrating Solar Power Installations in six centres in the Western and the Northern Cape, (De Aar, Vredendal, Worcester, Bitterfontein/Namaqualand, Springbok, Copperton/Prieska) with D J Environmental Consultants. (2010).
- Photovoltaic Installation in Vredendal, W Cape with D J Environmental Consultants. (2010).
- Wind Farm near Koekenaap, W Cape with Aurecon Group. (2011).
- Wind Farm at Copperton, N Cape with Aurecon Group. (2011).
- Matzikamma Solar Park, Vredendal, W Cape with D J Environmental Consultants. (2011).
- Visual Scoping Study, Photovoltaic Installation, Aggeneys, N Cape with D J Environmental Consultants. (2011).
- Two Wind Farms, Eastern Plateau, De Aar, N Cape with Aurecon Group. (2012).
- Three Photovoltaic Installations, at Paarde Valley, Badenhorst Dam Farm, Annex du Plessis Farm, at De Aar, N Cape with Aurecon Group. (2011).
- Photo-voltaic installation, Hoekplaas Farm, Copperton, N Cape with Aurecon Group. (2012).
- Photo-voltaic installation, Klipgats Pan Farm, Copperton, N Cape with Aurecon Group. (2012).
- Photo-voltaic installation, Struisbult Farm, Copperton, N Cape with Aurecon Group. (2012).
- Wind Farm at Gouda, W Cape with Aurecon Group. (2011).
- Photo-voltaic installation, Stella, NW Province with Savannah Environmental (Pty) Ltd. (2013).
- Photo-voltaic installation, Wolmaransstad, NW Province with Savannah Environmental (Pty) Ltd. (2013).
- Photo-voltaic installation, Boshof, Free State, with Savannah Environmental (Pty) Ltd. (2013).
- Photo-voltaic installation, Hibernia, NW Province, with Savannah Environmental (Pty) Ltd. (2013).
- Photo-voltaic installation, Boundary, Kimberley, Free State, with Savannah Environmental (Pty) Ltd. (2013).

- Photo-voltaic installation, Blackwood, Kimberley, Free State, with Savannah Environmental (Pty) Ltd. (2013).
- Wind Farm at Springbok, N Cape with Holland Environmental. (2015).

Mining

- Palmiet Quarry Extension, Grabouw, W Cape with Site Plan Consulting, Strand, W Cape. (2011).
- Abandoned open cast coal mines for British Coal Opencast, at Knockshinnoch Nature Reserve, Ayrshire, Scotland, and other locations, for recreational uses. (1998)
- Elandsfontein Minerals and Mining, Hopefield W Cape with Braaf Environmental Practitioners. (2013-14).

Environmental Studies: Visual Impact Assessments: Client List

Aurecon Group
Savannah Environmental
Dudley Janeke
Ecosense
Denis Moss Partnership
Viridian Consulting
EnviroDinamik
Jakupa Architects

Karen Hansen has no business, financial, personal or other interest other than fair remuneration for work performed in connection with these studies and there are no circumstances that may compromise her objectivity in pursuing and serving the interests of the public.

Contact Details

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w: www.visual-la.co.za

Other Information
BEE Certification nr E15C00160: Level 4, Exempt Micro Enterprise.
Software: Global Mapper Terrain Analysis; Adobe Photoshop, CAD, all Microsoft programs
VAT nr: 4100261926

Banking: Capitec Bank, savings a/c; bank code: 470010; bank a/c: 1305323260, a/c name: KHLA.

May 2015

KAREN HANSEN
LANDSCAPE ARCHITECT
VISUAL IMPACT ASSESSMENTS

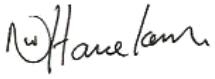
Appendix C7:
Addendum to Agricultural Impact Assessment

MULILO RENEWABLE PROJECT DEVELOPMENTS

The proposed De Aar Wind Energy Facilities on the Eastern Plateau (South) near De Aar, Northern Cape (DEA Ref. No.: 12/12/20/2463/AM3)

Soil and Agricultural Assessment Addendum Report

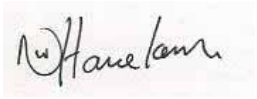
Issue Date: 23 July 2015
Revision No.: 1.3
Project No.: 13422

Date:	23 July 2015
Document Title:	Soil and Agricultural Assessment Addendum Report for the proposed De Aar Wind Energy Facilities on the Eastern Plateau (South) near De Aar, Northern Cape (DEA Ref. No.: 12/12/20/2463/AM3)
Authors:	Michael Wright (*Cand.Sci.Nat.*)
Revision Number:	# 1.3
Checked by:	Nicolaas Hanekom (*Pr.Sci.Nat.*)
Approved:	Nicolaas Hanekom (*Pr.Sci.Nat.*)
Signature:	
For:	Mulilo Renewable Project Developments

Declaration

I, Nicolaas Hanekom, declare that I –

- act as an independent specialist consultant in the field of Soil Science and Agricultural Potential for the **Soil and Agricultural Assessment Report for De Aar 2 South Wind Energy Facility: Addendum to the proposed De Aar 2 South Wind Energy Facilities on the Eastern Plateau near De Aar, Northern Cape Province**;
- do not have and will not have any financial interest in the undertaking of the activity, other than remuneration for work performed in terms of the Environmental Impact Assessment Regulations, 2014;
- have and will not have any vested interest in the proposed activity proceeding;
- have no, and will not engage in, conflicting interests in the undertaking of the activity;
- undertake to disclose, to the competent authority, any material information that have or may have the potential to influence the decision of the competent authority or the objectivity of any report, plan or document required in terms of the Environmental Impact Assessment Regulations, 2014; and
- will provide the competent authority with access to all information at our disposal regarding the application, whether such information is favourable to the applicant or not.



Mr. Nicolaas Hanekom *Pr.Sci.Nat.* (Ecology)
Director
Eco Impact Legal Consulting (Pty) Ltd

MULILO RENEWABLE PROJECT DEVELOPMENTS

THE PROPOSED DE AAR WIND ENERGY FACILITIES ON THE EASTERN PLATEAU (SOUTH) NEAR DE AAR, NORTHERN CAPE (DEA REF. NO.: 12/12/20/2463/AM3)

SOIL AND AGRICULTURAL ASSESSMENT ADDENDUM REPORT

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1 INTRODUCTION AND TERMS OF REFERENCE

Holland & Associates Environmental Consultants (Holland) on behalf of **Mulilo Renewable Project Developments (Pty) Ltd (Mulilo)** requested an addendum report to the baseline assessment of the soil, land use and agricultural characteristics for the area affected by the proposed De Aar Wind Energy Facilities on the Eastern Plateau, near De Aar in the Northern Cape Province of South Africa. The initial report, entitled "Proposed Wind Energy Facilities on the Eastern Plateau near De Aar: Draft Soil and Agricultural Assessment Report", and dated February 2012, pertained to both the North and South sections of the project. This Addendum Report pertains only to the De Aar Wind Energy Facilities (South), a sub-project of the original proposed project.

The primary objective of this assessment is to provide specialist soil and agricultural input into the overarching Amendment Application Report. In order to achieve this objective, the original study of the climate, soils, terrain, land capability, geology, current agricultural practices and agricultural potential that was carried out, is still valid. In order to avoid duplication of information, only new information pertinent to the revised project will be included, and the balance of the original report is still relevant. This report serves to summarise such a study and present the relevant results as well as outline the predicted impacts of the proposed activities on local soil and agricultural resources.

1.1 Brief Description of the Project and Study Area

The study area remains the same, as identified in **Figure 1**. The amended layout of the South site is depicted in **Figure 2**.

Mulilo Renewable Energy (Pty) Ltd applied for Environmental Authorisation from the Department of Environmental Affairs (DEA) in 2011 to establish a Wind Energy Facility (WEF) and associated infrastructure on the eastern plateau of De Aar (approximately 20 km to the east of the town), and referred to herein as the "De Aar 2 South WEF". The authorised development site is approximately 12,832ha in extent and consists of 8 portions of 4 farms. The proposed WEF would comprise approximately 103 turbines, each with a generation capacity of 1.5-2.5MW. The potential generation capacity of the WEF has now been limited to 140MW in accordance to the Department of Energy's cap on maximum megawatts, although 258MW was authorised.

The EIA process for the proposed project was completed by Aurecon South Africa (Pty) Ltd in 2012 and Environmental Authorisation for the proposed project was granted by DEA on 1 March 2013. The EIA listed activities for which environmental authorisation has been granted includes the Items 10, 11 and 18 of GN R.544, Item 1 of GN R. 545 and Item 14 of GN R.546 published in terms of NEMA.

The infrastructure associated with this WEF, as described in the DEA EA dated 1 March 2013, includes the following:

- "The construction of approximately 103 wind turbines with a potential capacity of 155 - 258 MW.
- A permanent hard standing made of compacted gravel and approximately 20 50 m x 40 m would be constructed adjacent to each turbine location for the crane.

- A total of three construction laydowns in the south would be required with each having a footprint of approximately 200 x 400m.
- Gravel surface access roads of approximately 4m wide would also be required between each turbine.
- Cables connecting each turbine would interconnect with overhead transmission lines that will follow the route of the access roads. Each turbine would have a transformer that steps up the voltage from 690 Volt to 22kilovolt (kV). This transformer is housed within each turbine tower or immediately outside the turbine.
- The cabling between the turbines would traverse the site to the three substations, where the power from all the turbines would be metered.
- The proposed substations and associated control buildings would have a footprint of approximately 200 x 100m.
- The electricity distribution infrastructure comprises of three existing distribution lines (1 x 132kV, 2 x 400kV and 2 x 220kV) traversing the site. The transmission lines terminate at Eskom's Hydra Substation located 9.Skm to the north east of De Aar".

An Application for Amendment of the EA was submitted by the Applicant to DEA in May 2013 to change the Special Purpose Vehicle (SPV) name from "Mulilo Renewable Energy (Pty) Ltd" to "Longyuan Mulilo De Aar 2 South (Pty) Ltd". This amendment of the EA was granted by DEA on 21 May 2013. On the 10 July 2014, the Applicant submitted an Application for Amendment of the Environmental Authorisation to DEA for the following amendments: Amendment to extend the validity period; amendment to the property descriptions of the EA; and amendments to Conditions 43, 44 and 45. The amendment of the EA was granted by DEA on 14 August 2014.

Longyuan Mulilo De Aar 2 South (Pty) Ltd (hereafter referred to as the Applicant) proposes to amend the project description of the proposed WEF as outlined in Section 2 below. The proposed amendments will require re-assessment of the potential impacts associated with the proposed project, and will therefore require an update to the specialist studies undertaken.

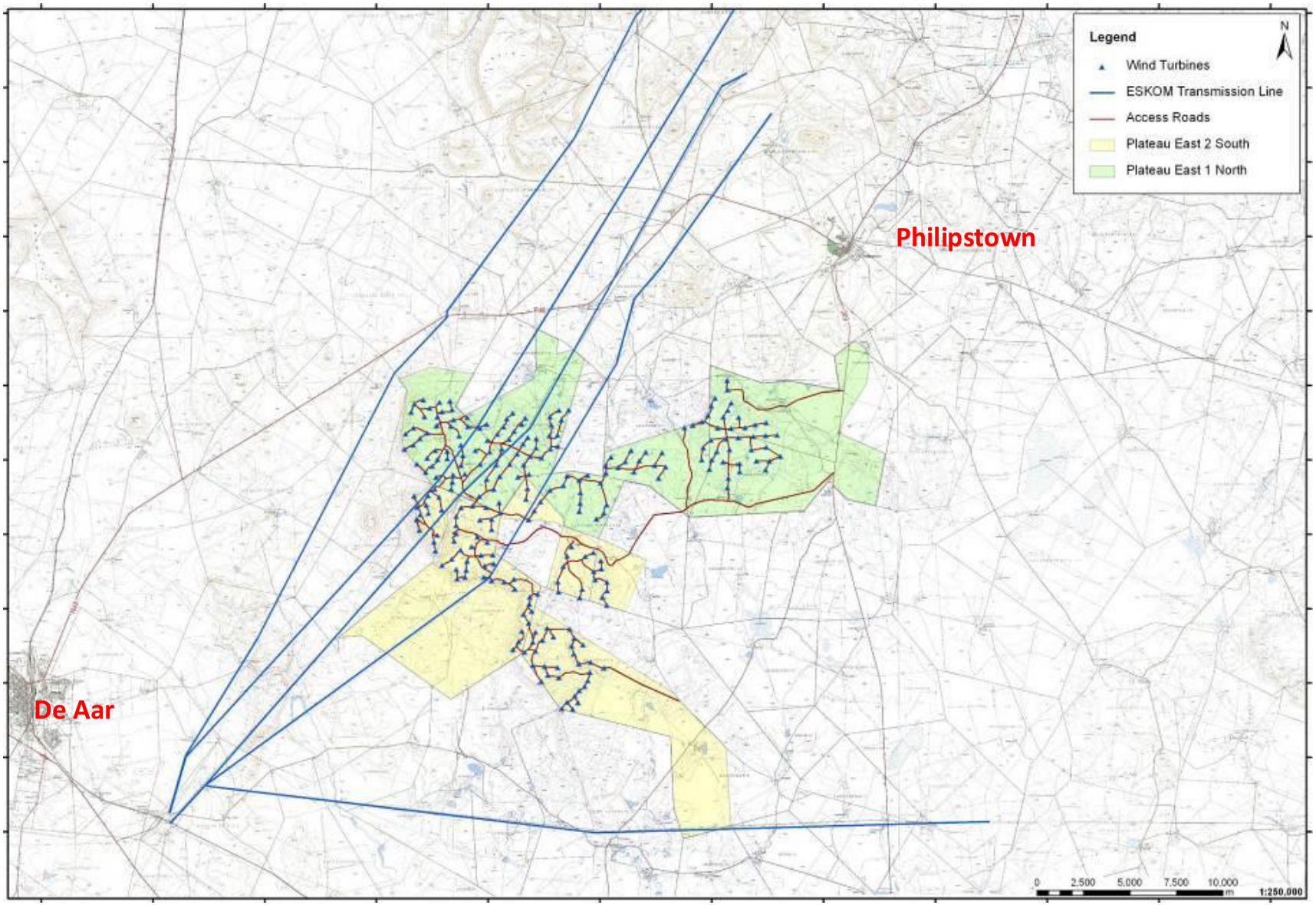

Figure 1: Location of the proposed wind energy facilities (Northern and Southern) (**Aurecon, 2011**)

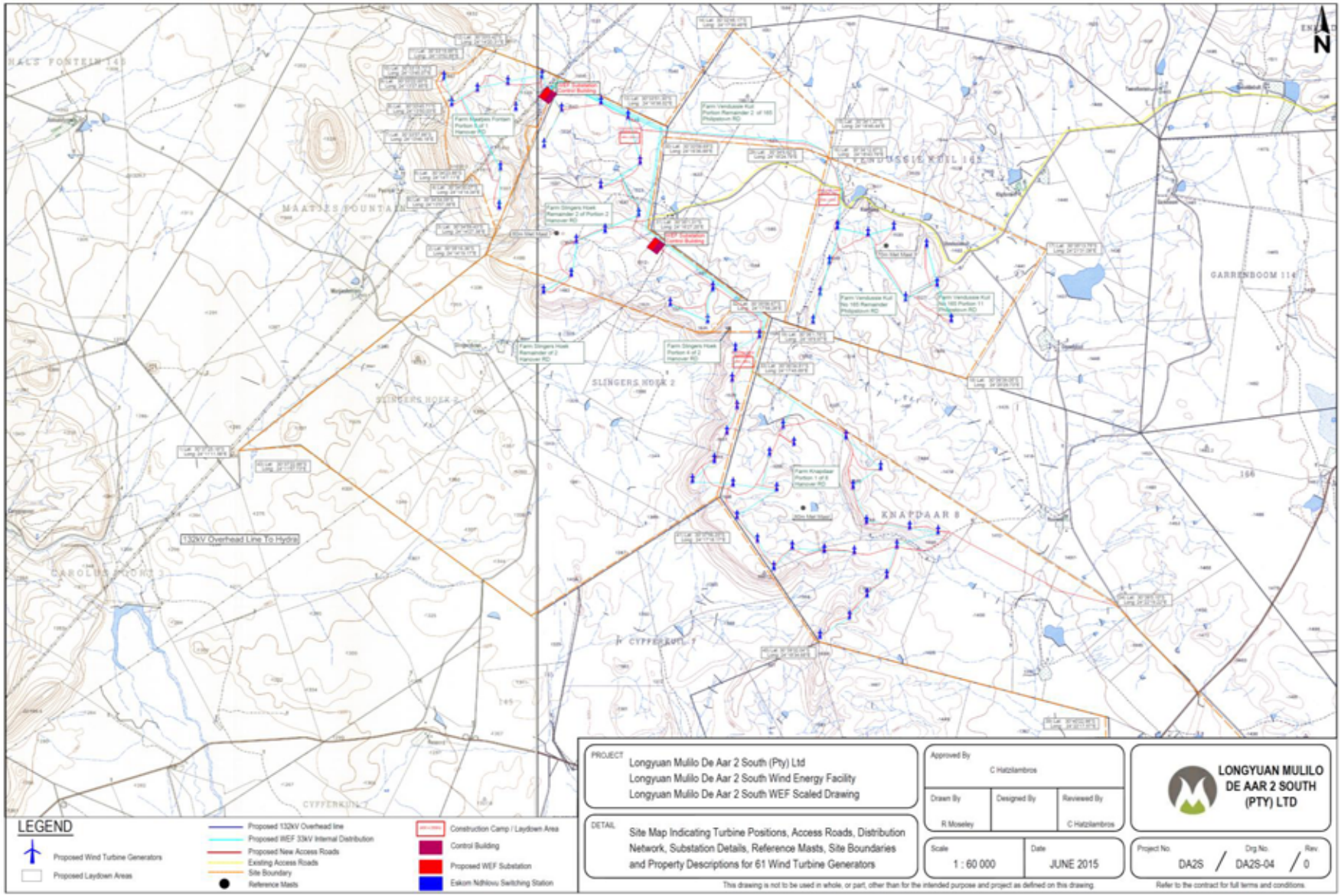

Figure 2: Southern Site Overview (**Mulilo**, 2015)

1.2 Description of Proposed Activities and Technical Details

The technical details provided in this Section are primarily extracted from the Terms of Reference produced by **Holland** (2015). The De Aar 2 South Wind Energy Facilities (WEF) wishes to increase the generating size of the wind turbine generators (WTG) in order to align to current international WTG models, and keeping the number of WTG on the WEF the same. The following changes to the WTG parameters are proposed:

- Increasing hub heights from 100m to 120m
- Increasing blade lengths from 60m to 80m
- Increasing WTG generation size from 2.3MW to 4.0MW

The generation capacity of the WEF would be a maximum of 140MW (in accordance with the Department of Energy's cap on maximum megawatts).

Table 1: WEF Statistics – Approved versus Proposed Amendment

Component	Approved	Proposed amendment
Number of turbines	103	61 Turbines @ 2.3MW per turbine (to 30 Turbines @ 4MW per turbine). The maximum of 61 will be applied for.
Generation capacity per turbine	1.5-2.5MW	2.3MW – 4.0MW
Generation capacity of the WEF	155-258MW	140 MW
Rotor / blade diameters	120m	(max) 160m
Hub height	100m	(max) 120m
Permanent construction pad	40 x 50m	40 x 50m
Permanent affected area (foundation size)	16 x 16m and 2 m deep	18,4m diameter, that narrows up to 10,6m at the surface (the visible portion) once the foundation is completed. Depth : 3,5m

(Note: The Application for amendment of the EA will assess the "worst case scenario" of 61 turbines @ 2.3MW per turbine with the understanding that should the Applicant use 4MW turbines (which will be the same dimensions as the 2.3MW turbines) then the Applicant would reduce the number of turbines to 30. It is furthermore noted that the generation capacity of the WEF is limited to 140MW. Even though 61 turbines of 2.3MW = 145MW, the Applicant will be limited to 140MW).

These changes would result in an increase of the turbine tower base diameter from 15m to 20m and the permanent construction pad would remain at 40 x 50m.

It must be understood that these are the upper limits of possible future WTG sizing, and if the De Aar 2 South WEF is to be constructed in the next few years, the actual WTG sizing will be in the middle range. The general benefits of using larger sized turbines, compared to older generation turbines are:

- Improved grid code compliance and voltage regulation, providing a more secured energy supply;
- Improved warranted power and noise curves;
- Decrease in WTG load fatigue, maintenance costs and downtime;
- Decrease in the road area coverage per installed capacity;
- More efficiently yielding the wind energy resource, and reducing the need for further WEF development to increase the total installed capacity.

The proposed location for the De Aar 2 South WEF is adequately positioned for a WEF, due to the following attributes:

- Excellent consistent wind resource;
- Eskom substation positioned close to the WEF, with minimal distance required for the transmission lines to be built;
- Most accessible positions have been chosen, with the least impact on the environment and construction costs; and
- The WEF is located in a central position in the Northern Cape/ Eskom Grid, thereby being able to offset any electrical loses that occur due to transmitting electricity to the region.

(**Mulilo Renewable Project Developments**, May 2015)

Refinements to the WEF layout have also been made and are to be considered and assessed in the re-assessment of your potential impact(s). Refer to attached kmz for the updated layout (**Holland**, 2015).

Holland & Associates Environmental Consultants has been appointed by the Applicant to undertake the requisite application for amendment of the Environmental Authorisation (EA) for the proposed project, in accordance with the National Environmental Management Act (NEMA) (No. 107 of 1998) EIA Regulations (2014). The application for amendment of the EA will require a re-assessment of potential agricultural impacts associated with the proposed changes to the project description.

2 METHODOLOGY

The following methodology was followed in order to outline the predicted impacts resulting from the proposed development and activities in the Proposed Development Area (PDA).

2.1 Impact Assessment

The impact assessment utilises the findings of the soil survey and agricultural potential assessment in order to determine reference conditions of the soil and agricultural resources. Potential soil and agricultural impacts, as a result of the proposed activities, are described in this section and any major impacts/fatal flaws will be identified for consideration by the pertinent authorities.

2.2 Determination of Significance of Impacts

Significance is determined through a synthesis of impact characteristics which include the context and the intensity of an impact. Context refers to the geographical scale (i.e. site, local, national or global), whereas Intensity is defined by the severity of the impact (e.g. the magnitude of deviation from background or baseline conditions, the size of the area affected, the duration of the impact and the overall probability of occurrence). Significance is calculated as per the example shown in **Table 2**.

Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. The total number of points scored for each impact indicates the level of significance of the impact.

2.3 Impact Rating Methodology

Impact assessments must take account of the nature, scale and duration of effects on the environment whether such effects are positive (beneficial) or negative (detrimental).

2.3.1 Rating System Used To Classify Impacts

The rating system (**Table 2** below) is applied to the potential impact on the receiving environment and includes an objective evaluation of the mitigation of the impact. Impacts have been consolidated into one rating. In assessing the significance of each issue, the following criteria (including an allocated point system) is used:

Table 2: Impact Rating System

NATURE		
Include a brief description of the impact of environmental parameter being assessed in the context of the project. This criterion includes a brief written statement of the environmental aspect being impacted upon by a particular action or activity.		
GEOGRAPHICAL EXTENT		
This is defined as the area over which the impact will be expressed. Typically, the severity and significance of an impact have different scales and as such bracketing ranges are often required. This is often useful during the detailed assessment of a project in terms of further defining the determined.		
1	Site	The impact will only affect the site.
2	Local/district	Will affect the local area or district.
3	Province/region	Will affect the entire province or region.
4	International and National	Will affect the entire country.
PROBABILITY		
This describes the chance of occurrence of an impact		
1	Unlikely	The chance of the impact occurring is extremely low (Less than a 25% chance of occurrence).
2	Possible	The impact may occur (Between a 25% to 50% chance of occurrence).

3	Probable	The impact will likely occur (Between a 50% to 75% chance of occurrence).
4	Definite	Impact will certainly occur (Greater than a 75% chance of occurrence).
REVERSIBILITY		
This describes the degree to which an impact on an environmental parameter can be successfully reversed upon completion of the proposed activity.		
1	Completely reversible	The impact is reversible with implementation of minor mitigation measures.
2	Partly reversible	The impact is partly reversible but more intense mitigation measures are required.
3	Barely reversible	The impact is unlikely to be reversed even with intense mitigation measures.
4	Irreversible	The impact is irreversible and no mitigation measures exist.
IRREPLACEABLE LOSS OF RESOURCES		
This describes the degree to which resources will be irreplaceably lost as a result of a proposed activity.		
1	No loss of resource.	The impact will not result in the loss of any resources.
2	Marginal loss of resource	The impact will result in marginal loss of resources.
3	Significant loss of resources	The impact will result in significant loss of resources.
4	Complete loss of resources	The impact is result in a complete loss of all resources.
DURATION		
This describes the duration of the impacts on the environmental parameter. Duration indicates the lifetime of the impact as a result of the proposed activity		
1	Short term	The impact and its effects will either disappear with mitigation or will be mitigated through natural process in a span shorter than the construction phase (0 – 1 years), or the impact and its effects will last for the period of a relatively short construction period and a limited recovery time after construction, thereafter it will be entirely negated (0 – 2 years).
2	Medium term	The impact and its effects will continue or last for some time after the construction phase but will be mitigated by direct human action or by natural processes thereafter (2 – 10 years).
3	Long term	The impact and its effects will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter (10 – 50 years).
4	Permanent	The only class of impact that will be non-transitory. Mitigation either by man or natural process will not occur in such a way or such a time span that the impact can be considered transient (Indefinite).
CUMULATIVE EFFECT		

This describes the cumulative effect of the impacts on the environmental parameter. A cumulative effect/impact is an effect which in itself may not be significant but may become significant if added to other existing or potential impacts emanating from other similar or diverse activities as a result of the project activity in question.		
1	Negligible Cumulative Impact	The impact would result in negligible to no cumulative effects
2	Low Cumulative Impact	The impact would result in insignificant cumulative effects
3	Medium Cumulative impact	The impact would result in minor cumulative effects
4	High Cumulative Impact	The impact would result in significant cumulative effects
INTENSITY / MAGNITUDE		
Describes the severity of an impact		
1	Low	Impact affects the quality, use and integrity of the system/component in a way that is barely perceptible.
2	Medium	Impact alters the quality, use and integrity of the system/component but system/ component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).
3	High	Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component is severely impaired and may temporarily cease. High costs of rehabilitation and remediation.
4	Very high	Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component permanently ceases and is irreversibly impaired (system collapse). Rehabilitation and remediation often impossible. If possible rehabilitation and remediation often unfeasible due to extremely high costs of rehabilitation and remediation.
SIGNIFICANCE		
Significance is determined through a synthesis of impact characteristics. Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. This describes the significance of the impact on the environmental parameter. The calculation of the significance of an impact uses the following formula: **(Extent + probability + reversibility + irreplaceability + duration + cumulative effect) x magnitude/intensity.** The summation of the different criteria will produce a non-weighted value. By multiplying this value with the magnitude/intensity, the resultant value acquires a weighted characteristic which can be measured and assigned a significance rating.		
Points	**Impact Significance Rating**	**Description**

6 to 28	Negative Low impact	The anticipated impact will have negligible negative effects and will require little to no mitigation.
6 to 28	Positive Low impact	The anticipated impact will have minor positive effects.
29 to 50	Negative Medium impact	The anticipated impact will have moderate negative effects and will require moderate mitigation measures.
29 to 50	Positive Medium impact	The anticipated impact will have moderate positive effects.
51 to 73	Negative High impact	The anticipated impact will have significant effects and will require significant mitigation measures to achieve an acceptable level of impact.
51 to 73	Positive High impact	The anticipated impact will have significant positive effects.
74 to 96	Negative Very high impact	The anticipated impact will have highly significant effects and are unlikely to be able to be mitigated adequately. These impacts could be considered "fatal flaws".
74 to 96	Positive Very high impact	The anticipated impact will have highly significant positive effects.

3 AGRICULTURAL IMPACT ASSESSMENT

From an agricultural perspective the loss of high-value farmland and / or food security production, as a result of the proposed activities, is the primary concern of this assessment. In South Africa there is a scarcity of high potential agricultural land, with less than 14% of the total area being suitable for dry land crop production (**Smith**, 2006).

Consequently, areas which can sustainably accommodate dry land production need to be protected from non-agricultural land uses. The desktop assessment, field verification and agricultural potential assessment has already shown that the study area is unsuitable for crop production and is dominated by unimproved grazing land.

The proposed development's primary impact on agricultural activities will involve the construction of the wind turbines and associated infrastructure. The construction of these turbines will only influence a small area of the total farm portion (**Figure 2**).

The construction entails the clearing of vegetation around the footprint of the turbine and the crane hardstand, as well as creating service roads. Normal grazing (the dominant agricultural activity) will be permitted around the turbines. The Southern site is dominated by grazing land and this activity is considered non-sensitive when assessed within the context of the proposed development. Consequently, the impact of the proposed development on the study area's agricultural potential will be extremely low, with the loss of agricultural land being attributed to the creation of the service roads and around the turbine foundations. The total loss of grazing land will be less than 1 % of the total study area. We re-iterate that this loss is considered inconsequential within the context of this assessment.

There are no centre pivots, irrigation schemes or active agricultural fields, which will be influenced by the proposed development. Therefore, from an agricultural perspective, there are no problematic or fatal flaw areas for either of the sites.

Due to minimum wind speed requirements and to optimise power generation the various wind turbines have been positioned on top of the plateau and kopjes'. The onsite soil survey indicates that these areas are dominated by rocky and shallow soils with an inherently low agricultural potential. Thus the direct impact of the wind turbines on soil resources will be negligible. The proposed development is not expected to have any cumulative impact due to minor loss of agricultural land.

3.1.1 Impact Summary

Once rated, the impacts (**Table 3**) are summarised and a comparison made between pre- and post-mitigation phases. The rating of environmental issues associated with different parameters prior to, and post, mitigation of a proposed activity will be averaged. A comparison is then made to determine the effectiveness of the proposed mitigation measures and identify critical issues related to the environmental parameters.

a) Planning Phase

Loss of agricultural land and / or production is not envisioned during this phase of the project.

b) Construction and Operational Phases: Wind Turbine and associated Infrastructure

Due to the nature of the development, the construction and operational phases have been combined for this particular impact.

Table 3: Impact rating table for construction and operation of wind turbines and associated infrastructure.

IMPACT TABLE: Wind Turbines and associated Infrastructure		
Environmental Parameter	***Soil and agricultural potential***	
Issue/Impact/Environmental Effect/Nature	***Loss of agricultural land and / or production as a result of the proposed construction of the Wind Turbines and associated Infrastructure***	
Extent	***Local / District****:* Will affect the local area or district	
Probability	***Definite****: Due to infrastructure construction a small loss of grazing land will definitely occur.*	
Reversibility	***Completely Reversible****: The majority of the land can be returned to grazing after construction is complete.*	
Irreplaceable loss of resources	***Marginal Loss****: The construction of the towers and associated infrastructure will result in a very marginal loss of agricultural land.*	
Duration	***Long Term****: The impact and its effects will continue or last for the entire operational life of the development.*	
Cumulative effect	**Negligible Cumulative Impact**	
Intensity/magnitude	***Low***	
Significance Rating	**The anticipated impact will have negligible negative effects and will require little to no mitigation.**	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	2	2
Probability	4	4

Reversibility	1	1
Irreplaceable loss	2	2
Duration	3	3
Cumulative effect	1	1
Intensity/magnitude	1	1
Significance rating	-13 (**low negative**)	-13 (**low negative**)
Mitigation measures	▪ Due to the overarching site characteristics, and the nature of the proposed development, viable mitigation measures are limited and will most likely revolve around erosion control: ➢ Clearing activities should be kept to a minimum. ➢ In the unlikely event that heavy rains are expected, activities should be put on hold to reduce the risk of erosion. Should erosion occur, appropriate soil retention interventions must be implemented. ➢ If additional earthworks are required, any steep or large embankments that are expected to be exposed during the 'rainy' or 'windy' months should be armoured with fascine like structures. A fascine structure usually consists of a natural wood material and is used for the strengthening of earthen structures or embankments. ▪ If earthworks are required then storm-water control and wind screening should be undertaken to prevent soil erosion. ▪ Interact with landowners to discuss where they would ideally like to see the wind turbines and associated infrastructure to be situated on their property. ▪ Invasive alien plant species monitoring must take place, and should these occur, they must be removed and monitored for 3 years. ▪ No structures are to be placed within drainage lines and their 10 meter buffer areas.	

c) Decommissioning phase

Loss of agricultural land and / or production is not envisioned during this phase of the project.

3.2 Agricultural Impact Summary

An agricultural impact summary is provided in **Table 4**. If the recommended mitigation measures are implemented, the predicted impacts, as a result of the proposed activities, will be low.

Table 4: Agricultural Impact Summary Table

Environmental parameter	Issues	Rating prior to mitigation	Average	Rating post mitigation	Average
Soil and agricultural potential	*Loss of agricultural land and / or production as a result of the proposed construction of the 132kV transmission lines*	13		13	
			- 13		**-13**
			Low Negative Impact		Low Negative Impact

The impact severity falls within the same category (Low) as the original proposed project, however, the scale of its impact due to the reduced overall footprint, will in reality be even less than previously proposed. Hence, the amended project scope leads to a preferable degree of impact.

4 SUMMARY AND RECOMMENDATIONS

Originally, **Aurecon**, on behalf of **Mulilo**, requested a baseline assessment of the soil, land use and agricultural characteristics for the area affected by the proposed De Aar Wind Energy Facilities on the Eastern Plateau near De Aar.

Subsequently, **Holland**, on behalf of **Mulilo**, requested an amended report pertaining to a revised project scope on the southern sub-project site of the original project footprint.

The primary objective of this assessment is to provide specialist soil and agricultural input into an Amendment Application to the Environmental Authorisation (DEA Ref. No.: 12/12/20/2463/AM3). **Mulilo** proposes to construct a 140 MegaWatt (MW) wind energy facility on the eastern plateau, which is approximately 20 km east of De Aar. The southern site is approximately 12,832 ha in extent and consists of eight portions of four farms. The study area is dominated by unimproved veld, which is predominantly utilized as grazing land for sheep.

The study area has a semi-arid to arid continental climate with a summer rainfall regime i.e. most of the rainfall is confined to summer and early autumn. Mean Annual Precipitation (MAP) is approximately 300 mm per year. The combination of low rainfall and severe moisture deficient means that sustainable arable agriculture cannot take place on the farm without some form of irrigation. Rocky kopjes are commonplace and the steep cliffs, which form an arrow-head shape towards the north-western corner of the study area are the most prominent topographical feature. These areas s are certainly limiting to agricultural activities. Away from these cliffs the land is generally flat with an average gradient of less than 10%, these flatter areas have however been precluded from the proposed turbine layout and will thus remain unaffected.

Shallow lithic soils (Mispah and Glenrosa Forms) cover approximately 80% of the total survey area. Most soils had a layer that was limiting to plant growth and are very susceptible to erosion and

effective soil depth rarely extended below 50cm. These soils exhibit high soil erosion hazard ratings thus soil conservation practices such as minimum tillage and trash blankets should be employed.

The site is not classified as high potential nor is it a unique dry land agricultural resource. Most of the study area has been classified as having an extremely low potential for crop production due to an arid climate and highly restrictive soil characteristics. The Southern Site is considered to have a moderately low value as grazing land, its current use.

The proposed development's primary impact on agricultural activities will involve the construction of the wind turbines and associated infrastructure. The positioning of the proposed wind turbines is currently atop of the various kopjes and the plateau. The onsite soil survey indicates that these areas are dominated by rocky and shallow soil with a low agricultural potential. Therefore, the direct impact of the wind turbines on soil resources will be negligible. Normal grazing (the dominant agricultural activity) will be permitted around the turbines. The total loss of grazing land will be less than 1 % of the total study area. We re-iterate that this loss is considered inconsequential within the context of this assessment. The proposed development is not expected to have any cumulative impacts and will cause minimal disruptions to general farm management. There are no centre pivots, irrigation schemes or active agricultural fields, which will be influenced by the proposed development. Therefore, from an agricultural perspective, there are no problematic or fatal flaw areas for the site.

5 REFERENCES

SiVEST. (2012). Draft Soil and Agricultural Assessment Report: *Proposed Wind Energy Facilities on the Eastern Plateau near De Aar.*

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environmental affairs
Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

DETAILS OF SPECIALIST AND DECLARATION OF INTEREST

	(For official use only)
File Reference Number:	12/12/20/ or 12/9/11/L
NEAS Reference Number:	DEA/EIA
Date Received:	

Application for integrated environmental authorisation and waste management licence in terms of the-

(1) National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended and the Environmental Impact Assessment Regulations, 2014; and

(2) National Environmental Management Act: Waste Act, 2008 (Act No. 59 of 2008) and Government Notice 921, 2013

PROJECT TITLE

PROPOSED WIND ENERGY FACILITY SITUATED ON THE EASTERN PLATEAU (SOUTH) NEAR DE AAR, NORTHERN CAPE PROVINCE: APPLICATION FOR AMENDMENT OF ENVIRONMENTAL AUTHORISATION

Specialist:	Eco Impact Legal Consulting (Pty) Ltd		
Contact person:	Nicolaas Hanekom		
Postal address:	PO Box 45070, Claremont		
Postal code:	7735	Cell:	0769636450
Telephone:	(021) 6711660	Fax:	(088) 021 6711660
E-mail:	nicolaas@ecoimpact.co.za		
Professional affiliation(s) (if any)	SACNASP Pri.Sci.Nat (Ecological Science) 400274/11.		

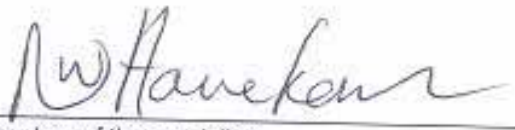
Project Consultant:	HOLLAND & ASSOCIATES ENVIRONMENTAL		
Contact person:	Barry Wiesner		
Postal address:	P.O. Box 31108, Tokai		
Postal code:	7966	Cell:	082 463 6221
Telephone:	+27 (0)72 601 0803	Fax:	086 653 1765
E-mail:	barrywiesner@mweb.co.za		

4.2 The specialist appointed in terms of the Regulations_

I, **Nicolaas Willem Hanekom** declare that –

General declaration:

I act as the independent specialist in this application;
I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
I declare that there are no circumstances that may compromise my objectivity in performing such work;
I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
I will comply with the Act, Regulations and all other applicable legislation;
I have no, and will not engage in, conflicting interests in the undertaking of the activity;
I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
all the particulars furnished by me in this form are true and correct; and
I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.



Signature of the specialist:

Eco Impact Legal Consulting (Pty) Ltd

Name of company (if applicable):

27/07/2015

Date:

CURRICULUM VITAE – NICOLAAS HANEKOM (JUL 2015)

Name of organisation: Eco Impact Legal Consulting (Pty) Ltd
Profession: Practising Scientist and Environmental Assessment Practitioner
Position in Firm: Director**,** Environmental Management
Date of Birth: 02/02/21967
Years with Firm: 5

BIOGRAPHICAL SKETCH

Nicolaas Hanekom holds a Masters Technologiae, Nature Conservation ("Vegetation Ecology and Biodiversity Assessment") degree from the Cape Peninsula University of Technology. Nicolaas is certified in terms of section 20(3)(a) of the Natural Scientific Professions Act, 2003 (Act 27 of 2003), as a Professional Natural Scientist (Ecological Science) Registration Number: 4008274/11. He further qualified in Environmental Management Systems ISO 14001:2004, at the Centre for Environmental Management, North-West University, as well as Environmental Management Systems ISO 14001:2004 Audit: Internal Auditors Course to ISO 19011:2003 level, from the Centre for Environmental Management, North-West University qualifying him to execute audits to ISO/SANS environmental compliance and EMS standards.

Hanekom as the son of an Overberg farmer, grew up on the farm and studied at Grootfontein Agricultural College with subjects Soil Science, Botany, Crop Production, Agricultural Engineering, Animal Breeding, Animal Nutrition, Small Stock Production, Animal Health, Large Stock Production and Agricultural Management.

In his capacity as an independent consultant, Mr Hanekom has conducted numerous Agricultural Impact Assessments since 2006 for urban and rural developments, proposed solar and wind energy farm projects, and solar parks.

TERTIARY EDUCATION

- National Diploma, Nature Conservation (Cape Technikon)
- B. Tech Degree in Nature Conservation (Cape Technikon)
- M.Tech in Nature Conservation (Cape Peninsula University of Technology)
- Completed various Environmental Management Courses
- Qualified Environmental Management Systems ISO 14001: 2004 Audit: Internal Auditor Course Based on ISO 19011:2002 (Centre for Environmental Management North West University)
- Certificate in Integrated Protected Area Planning (Centre for Environmental Development, University of KwaZulu-Natal)
- Certificate in Project Management: Theory and Practical (CS Holdings)

PROFESSIONAL SOCIETIES/ APPROVALS

- South African Council for Natural Scientists Professions Pri.Sci.Nat (Ecological Science)
- South African Auditor and Training Certification Association (SAATCA)
- IAIA-SA member
- EAPASA founding member

KEY EXPERIENCE

- Several solar energy generation facility Agricultural Impact Assessments in Kenhardt, Saldanha, Darling/Malmesbury and Wind Energy facilities in De Aar. As well as several other Agricultural Impact Assessments for Residential and Rural developments since 2006.
- Extensive Health & Safety and Environmental consulting experience in multiple industry sectors.
- Director, Environmental Management and lead Environmental Assessment Practitioner at Eco Impact (Pty) Ltd (2010 – to date)

- Director, Environmental Management at Cape Lowlands Environmental Services (2006 – 2010)
- External Lecturer at Cape Peninsula University of Technology (2003 – 2006)
- Reserve Manager, Conservation Services Manager for Western Cape Nature Conservation Board (1998 – 2001)
- Assistant Reserve Manager at Gariep Dam Nature Reserve (1993 – 1998)

CERTIFICATION

I, the undersigned, certify that to the best of my knowledge and belief, these data correctly describe my qualifications, my experience, and me.

Nicolaas Willem Hanekom

CURRICULUM VITAE

Michael Standin Wright

Name	Michael Standin Wright
Profession	Environmental Scientist
Name of Firm	SiVEST SA (Pty) Ltd
Present Appointment	Tourism Specialist and Environmental Scientist – Environmental Division
Years with Firm	Joined 23 October 2012
Date of Birth	29 December 1979
ID No.	7912295129083
Nationality	South African

Education

Chelsea Drive Senior Primary School (1987 – 1992) – Head Boy, Captain of Sports Teams
Durban High School (1993 – 1997) – Prefect and Head of House, Captain of Sports Teams
University of Natal Pietermaritzburg (1998 – 2001) – Captain of Cricket

Professional Qualifications

Candidate Natural Scientist – Environmental Science (2014) – South African Council for Natural Science Professions (SACNASP) – Reg. No. 100082/14

BSc. Agriculture (Agribusiness & Wildlife Science) (2001) – University of KwaZulu-Natal Pietermaritzburg (1998 - 2001)

Academic Honours:
- Awarded the Agricultural Economics of South Africa (AESA) National Prize for the best Under-Graduate Thesis of 2001.
- Awarded the H.I. Berhmann Book Prize for the final year BScAgric, BAgricMgt (Hons) or BCom (Hons) candidate with the best performance in Agricultural Economics or Agribusiness.

Honours Thesis:
- Tariff Determination of South African Game Reserves using the Hedonic Pricing Method – 2001

Associations:
- Member of South African Council for Natural Science Professions (SACNASP) – Reg. No. 100082/14 – 2014
- Member of International Association for Impact Assessment (IAIAsa) – Reg. No. 3287 – 2012
- Member of The International Ecotourism Society (TIES) – 2012

Employment Record

Oct 2012 – present	SiVEST SA (Pty) Ltd – Environmental Division – Environmental Scientist and Tourism Specialist
Nov 2010	Malelane Safari Resort Investments (Pty) Ltd – Promoter, Owner, Director and Project Control Manager
Apr 2007 – Jan 2011	Dream Lifestyles (Pty) Ltd – Managing Director and Owner
Dec 2006	Shepherd's Tree Game Lodge (Pty) Ltd – Director (now resigned) and Owner through Santula Wildlife Destinations (Pty) Ltd
Apr 2004	Secprop Leisure (Secprop 118 Investments (Pty) Ltd) – Owner, Director, Tourism Hospitality and Leisure Consultant and Environmental Consultant

CURRICULUM VITAE

Michael Standin Wright

Oct 2002 – Jan 2004	Compassline Africa (a division of Afritourism Ltd) & Afritourism Ltd – Tour Host and Ecotourism Consultant
Dec 2001 – Apr 2002	Beaver Run Resort and Conference Centre (Premier Resorts) – Front Desk Clerk

Language Proficiency

LANGUAGE	SPEAK	READ	WRITE
English	Fluent	Fluent	Fluent
Afrikaans	Fair	Fair	Fair
isiZulu	Elementary	Elementary	Elementary

Key Experience

- Key skills include leadership, administration, analysis, research, project management, creativity.
- Acquired broad and significant skills and experience in business at shareholder, director, executive management and employee level in several companies over 13 years.
- Analytical, diligent, methodical, like results and to grow and develop things to fruition.
- Countries worked in include: South Africa, Botswana, Namibia, Zambia, Mozambique, and Lesotho

Michael's tourism consulting skills include:
- Tourism hospitality & leisure consulting
- Ecotourism and leisure property development planning and consulting
- Ecotourism activities and guiding
- Raising tourism funding
- Community Public Private Partnerships
- Hospitality operator contracts and selection
- Vacation ownership advice

Michael's environmental consulting skills include:
- Scoping Reports and Environmental Impact Assessment
- Environmental Monitoring
- Ecological rehabilitation recommendations
- Alien invasive identification and control measures
- Agricultural assessments
- Waste management plans
- Bird Identification
- Tree Identification
- Frog Identification
- Butterfly Identification
- Grass Identification

Computer Literate in:
- Microsoft Office – Word, Excel, Power Point, Outlook
- Creative Design programmes
- GenStat
- Google Earth
- Internet Research

Conferences Attended

- Animal Demography Unit Conference by University of Cape Town – 2015
- Hospitality Investment Conference for Africa (HICA) – 2007, 2013
- SADC Transfrontier Conservation Area Workshop – 2014
- Vacation Ownership Association of South Africa (VOASA) – 2010
- Indaba Tourism Show – 2003, 2004, 2007, 2009, 2010, 2013, 2014, 2015

CURRICULUM VITAE

Michael Standin Wright

Projects Experience

ECOTOURISM & GAME RESERVE PROJECTS

- Business Plan for Safari Lodge – Appointed by Ezemvelo KZN Wildlife to conduct an Eco-tourism Business Plan for the 42bed Bhambatha Lodge and other services on the 1,700ha Ngome Community Game Reserve near Greytown, KwaZulu-Natal (Oct 2014 – present).
- Business Plan for Safari Lodge – Appointed by Royal Thonga Safari Lodge (Pty) Ltd to conduct an Eco-tourism Business Plan for the 32bed Royal Thonga Safari Lodge adjoining the Tembe Elephant Park near Manguzi, Elephant Coast, KwaZulu-Natal (Jan 2014 – Mar 2014).
- Boundless Southern Africa / SADC / GIZ – Facilitated and presented at a 3-day Technical Workshop for SADC stakeholders on Investment and Concessioning Guidelines for Ecotourism Opportunities in Transfrontier Conservation Areas (TFCAs) (Aug 2014).
- EKZN Wildlife Eco-tourism Infrastructure – Appointed by KwaZulu-Natal Provincial Treasury (KZN Treasury) to project manage the Crack-team to undertake maintenance assessments of Ezemvelo KZN Wildlife's primary resort and reserve eco-tourism infrastructure in KwaZulu-Natal (Jun 2013 – Mar 2014).
- EIA for Beach Resort Development – Appointed by Industrial Development Corporation (IDC) to undertake an Environmental Impact Assessment (EIA) Report for the proposed Nonoti Beach Tourism Development near Blythedale, North Coast, KwaZulu-Natal (Oct 2012 – present).
- Country Cultural Lodge – Appointed by Tourism KZN and the Zulu Monarch to undertake an Environmental Pre-feasibility Study for the renovation and expansion of the Thokazi Royal Lodge near Nongoma, Zululand, KwaZulu-Natal (Nov 2012 – Apr 2013).
- Promotion, Business Plan and Project Co-ordination of the ZAR270M 240bed Radisson Blu Safari Resort, Kruger Park in a 30 year concession in the southern portion of the Kruger National Park, near Malelane Gate (Nov 2010 – Current).
- Development, Business Plan and Marketing of the ZAR60M 60bed Shepherd's Tree Game Lodge in a 45 year concession in an exclusive-use area within the western portion of the Pilanesberg Game Reserve (May 2009).
- Development Plan for the Botshabelo Game Lodge & Reserve together with the Botshabelo Community Trust in Middleburg, Mpumalanga, a Provincial Heritage Site (Mar 2009).
- Business Plan and finance raising for a contemporary cultural lodge, Basambilu Lodge & Tours, at Lulekani near Phalaborwa, on the Kruger National Park border (Mar 2007).
- Business Plan for the Islands in Africa Group, a safari lodge and operations company based in Johannesburg, with lodges in Namibia and Botswana (Jan 2005).
- Business Plan for the development of a safari lodge at Shongweni Dam & Game Reserve for Msinsi Resorts & Game Reserves (Nov 2004).
- Tour Host and Ecotourism Consultant (Oct 2002 – Jan 2004)
    - For Compassline Africa – Host of personalised luxury tours for local and international (inbound) guests. Development of ecotour itineraries and an Environmental Awareness Course for clients.
    - For Afritourism Ltd – Proposal for the acquisition of Khutse Kalahari Lodge. In partnership with BirdLife South Africa: Development of the avitourism market and the facilities and activities of numerous lodges for birding; and the co-ordination of the training of Bird Guides. Developed Safari Guides (information booklets for guests) for several lodges. Assisted in developing marketing brochures.
- Proposal for the acquisition of Khutse Kalahari Lodge for management contract by Afritourism Ltd.
- Tariff Determination of South African Game Reserves using the Hedonic Pricing Method.
- Consulted on a University of Natal Pietermaritzburg team to develop a management strategy for Bonamanzi Game Reserve.
- Consulted on a University of Natal Pietermaritzburg team to develop a soil survey and land evaluation for Opathe Game Reserve and the adjacent Sappi forest area.
- Developed Guest Experience Programmes, Safari Guides, Checklists and Information Folders for several safari lodges and resorts.

CURRICULUM VITAE

Michael Standin Wright

TOURISM CONSULTING (Jun 2013 – Current)

Tourism Business Plans

- Boutique Hotel – Appointed by Ed-Rose Group and Trade & Investment KZN (TIKZN) to develop a bankable business plan for the Kasito Boutique Hotel in Margate, South Coast, KwaZulu-Natal (Jan 2014 – present).

ENVIRONMENTAL CONSULTING (Oct 2012 – Current)

Strategic Environmental Assessment Reports

- Strategic Infrastructure Projects 2 (SIPs 2) – Appointed by SMEC, on behalf of KZN COGTA, to undertake a High-level Environmental Status Quo & Recommendations Report for the Strategic Corridor Plan – Strategic Infrastructure Projects 2: Durban – Free State – Gauteng Development Region (June 2014 – present).

Environmental Impact Assessment Reports

- Beach Resort Development – Appointed by Industrial Development Corporation (IDC) to undertake an Environmental Impact Assessment (EIA) Report for the proposed Nonoti Beach Tourism Development near Blythedale, North Coast, KwaZulu-Natal (Oct 2012 – May 2015).
- Mixed-use Luxury Residential Estate Development – Appointed by Barkomotive (Pty) Ltd, a wholly-owned subsidiary of Ellingham Estate (Pty) Ltd, to undertake an EIA Report for the proposed mixed-use Rorqual Estate Development near Park Rynie, South Coast, KwaZulu-Natal (Oct 2012 – present).
- Low-cost Housing Project – Appointed by eThekwini Municipality to undertake an EIA Report for the proposed Redcliffe Valley View Housing Project near Verulam, KwaZulu-Natal (Feb 2013 – May 2015).

Environmental Auditing

- Eco- and Golf-Estate Development – Appointed by IFA Hotels and Resorts (Pty) Ltd to undertake an environmental audit of Zimbali Lakes Golf Course Resort currently under development in Ballito, KwaZulu-Natal (Nov 2012 – Aug 2013).
- Office Block Development – Appointed by Chanter Property (Pty) Ltd to undertake an environmental audit of Ridge 5 Office Block currently under development in Ridgeside Office Park, Umhlanga Rocks, KwaZulu-Natal (Nov 2012 – May 2013).
- Low-cost Housing Project – Appointed by eThekwini Municipality Housing Department to undertake an environmental audit of the eTafuleni Housing Project in Phoenix, KwaZulu-Natal (Oct 2012 – Oct 2014).

Pre-feasibility Studies

- Dam Reconstruction – Appointed by Eden Rock Estates to undertake an Environmental Site Identification for a new teaching/learning of a estate dam on Eden Rock Estate in Pennington, KwaZulu-Natal (Jun 2015).
- Dam Reconstruction – Appointed by Eden Rock Estates to undertake an Environmental Pre-feasibility Study of a estate dam on Eden Rock Estate in Pennington, KwaZulu-Natal (Jun 2015).
- New Town Centre – Appointed by LDM Consulting to undertake an Environmental Pre-feasibility Study for the Cwaka New Town Centre in in Msinga Municipality, KwaZulu-Natal (Dec 2014).
- Avondale Forest Estate – Appointed by Trencon to undertake an Environmental Pre-feasibility Study for the Residential Eco-Estate adjacent Zimbali in Ballito, KwaZulu-Natal (Sep 2014).
- Low-cost Housing Project – Appointed by SIMSI Construction and Project Management to undertake an Environmental Pre-feasibility Study for the Shayamoya Low-cost Housing Development adjacent the town of Kokstad, KwaZulu-Natal (Mar 2013).
- Integrated Rural Housing Development – Appointed by SIMSI Construction and Project Management to undertake an Environmental Pre-feasibility Study for the in-situ Matheni Integrated Rural Housing Development just south of Nongoma adjacent to the Hluhluwe-Umfolozi Game Reserve, KwaZulu-Natal (Feb 2013).

Specialist Plans and Reports

- Bulk Sewer Line – Appointed by eThekwini Municipality to undertake a wetland rehabilitation plan and vegetation relocation plan for a new proposed bulk sewer main line and reticulation near Wirtz Rd and in the Paradise Valley Nature Conservancy, Queensburgh, KwaZulu-Natal (Jan 2013 – present).

Wetland Delineations and Functional Assessments

- Sugar Estate – Conducted a wetland delineation for the rehabilitation of several wetlands on the Zindophi Sugar Estate near Eshowe. Appointed by Tongaat Hulett Sugar (Feb 2013).
- Mixed-use Luxury Residential Estate Development – Assisted with the wetland delineation and functional assessment for the proposed mixed-use Rorqual Estate Development near Park Rynie, South Coast, KwaZulu-Natal. Appointed by Barkomotive (Pty) Ltd, a wholly-owned subsidiary of Ellingham Estate (Pty) Ltd (Jan 2013).
- Beach Resort Development – Assisted with the wetland delineation and functional assessment for the proposed Nonoti Beach Tourism Development near Blythedale, North Coast, KwaZulu-Natal. Appointed by the Industrial Development Corporation (IDC) (Jan 2013).
- Integrated Rapid Public Transport Network – Assisted with the wetland delineation and functional assessment for Corridor 9 (C9) and Corridor 1 (C1) of the proposed Integrated Rapid Public Transport Network (IRPTN) Development which runs through north Durban, KwaZulu-Natal. Appointed by eThekwini Municipality (Feb 2013).

Soil and Agricultural Impact Assessments

- Wind Energy Facility – Amended the soil and agricultural impact assessment for Mulilo Renewable Energy for the proposed transmission lines from Longyuan Mulilio De Aar Maanhaarberg and Longyuan Mulilio De Aar North Wind Energy Facility (WEF) projects, near De Aar in the Northern Cape, Appointed by Aurecon Group (Mar 2014)

Vegetation Surveys

- Petrol Filling Station – Conducted a vegetation survey of a new proposed petrol filling station and convenience store for Engen on a site in Mbazwana, Elephant Coast, KwaZulu-Natal. Appointed by Engen (Mar 2015).

Faunal Assessments

- Beach Resort Development – Assisted with the Black-headed Dwarf Chameleon (*Bradypodion melanocephalum*) assessment for the Industrial Development Corporation (IDC) for the proposed Nonoti Beach Tourism Development near Blythedale, North Coast, KwaZulu-Natal. Appointed by Grant Thornton (Jan 2013).

Tree Identification Assessments

- Luxury Residential Estate – Appointed by Tongaat Hulett to undertake several tree identifications for the Kindlewood Estate on Umhlanga Ridge, KwaZulu-Natal (Jul 2014)
- Integrated Rapid Public Transport Network (IRPTN) C3 – Appointed by MCA JV to undertake tree identification assessment along the entire C3 route from Pinetown to KwaMashu, KwaZulu-Natal (May 2014)
- Commercial Office Estate – Appointed by Tongaat Hulett to undertake an indigenous tree identification assessment, relocation and site restoration for stormwater pipeline feeding into Ridgeside Dam in the Ridgeside Office Park development in Umhlanga Rocks, KwaZulu-Natal (Feb 2013)
- Luxury Residential Estate – Appointed by Tongaat Hulett to undertake several tree identifications for the Izinga Ridge Estate on Umhlanga Ridge, KwaZulu-Natal (Jun 2013)

Integrated Waste Management Plan

- Local Municipality IWMP – Devised an Integrated Waste Management Plan for the Msinga Local Municipality in the Valley of a Thousand Hills, KwaZulu-Natal (Apr 2013)

CURRICULUM VITAE

Michael Standin Wright

TOURISM AND ENVIRONMENTAL CONSULTING PROJECTS (Apr 2004 – Oct 2012)

Consulting on environmental matters (including EIA co-ordination), guest experiences, market demand assessments and financial feasibility studies pertaining to the development and implementation of business plans for tourism and leisure projects. These roles pertain to three divisions, namely: Tourism Consulting, Ecotourism Property Development, Shared Vacation Ownership Consulting – primarily in wildlife areas. To assist with fund raising from local and international finance institutions, private equity firms and funding agents. Management contract negotiation. Pubic Private Partnership (PPP) Agreement and Concession Agreement review.

Assignments:

- Business Plan and finance raising for a contemporary cultural lodge, Basambilu Lodge & Tours, at Lulekani near Phalaborwa, on the Kruger National Park border (Mar 2007).
- Market Demand Survey of the Marshall's Property adjacent to the ICC Durban (Sep 2005).
- Business Plan for a luxury medi-tourism hotel in Centurion for Fahrenheit Resorts CC (Apr 2005).
- Business Plan for a luxury business hotel at Queen Elizabeth Park in Pietermaritzburg for Riel Associates (Pty) Ltd and Victoria Country Club Estates (Mar 2005).
- Development of a Project Profile for Non-Wildlife and Cultural Tourism in Botswana for the Botswana Development Corporation (Jan 2005).
- Development of a Project Profile for three arts & crafts projects at KwaMashu, Inanda and Ntuzuma on behalf of the Department of Environmental Affairs & Tourism (Nov 2004).
- Financial Feasibility Study for the business plan for Corby Hill Guest House near KwaDukuza for Thokozani Tourism Projects (Aug 2004).

Work Experience:

Promoter, Owner, Director and Project Control Manager (Nov 2010 – Current)

- Promoting the development and investment in the proposed ZAR273MM 240bed Radisson Blu Safari Lodge in Kruger National Park, near Malelane Gate. This is a 30year PPP Agreement with South African National Parks (SANParks). Prepared business plan, investment presentations, marketing collateral. Project Control Manager for planning and design by the full professional team, stakeholders and EIA consultants. Briefing, commenting on and reviewing reports of the EIA consultants, specialist study consultants and professional project team. Raising of funds from local and international finance institutions, private equity firms and funding agents. Management contract negotiation. PPP Agreement review.

Director and Owner (Dec 2006 – Jan 2011)

- Promoter and developer of the luxury ZAR60MM 60bed Shepherd's Tree Game Lodge in Pilanesberg Game Reserve, which commenced operating in June 2010. This is a 45year concession with NWP&TB. Project management of the EIA consultants and specialist study consultants, architect and investment marketing of the development. Development and design of investment prospectus, lodge website, and all investment marketing collateral. Raising of funds from local finance institution. Management contract negotiation. Concession Agreement review.

Managing Director and Owner (Apr 2007 – Jan 2011)

- Development of the new shared vacation ownership business and general management of the company. Sales, marketing, reservations and concierge services to investors in leisure property, especially the luxury 60bed Shepherd's Tree Game Lodge in Pilanesberg Game Reserve. Development of the leisure reward programme, company website, and all marketing and sales collateral and contracts. Managed all company administration and secretarial matters. Managed both an in-house and contracted investment sales team. Managed the concierge and reservations agents. Successfully sold ZAR12.7MM in investment subscriptions. Handed over a profitable business.

Tour Host and Ecotourism Consultant (Oct 2002 – Jan 2004)

- For Compassline Africa – Host of personalised luxury tours for local and international (inbound) guests. Development of ecotour itineraries and an Environmental Awareness Course for clients.

Additional Qualifications, Certificates and Training

- Project Management Foundation Course by SiVEST – ECSA accredited – Nov 2014
- Firearms Competency – Firearms Control Act, Rifle, Shotgun, Handgun, Self-loading Carbine – Apr 2009
- Estate Agency Affairs Board Exam – Nov 2007
- THETA – Regional Nature Guide – NQF Level 4 – KwaZulu-Natal and Mpumalanga – 2003
- Birdlife South Africa – Local Bird Guide – TG27 – 2003
- Professional Driving Permit (PDP) – Code 08 and Code 10 – 2002
- Field Guide Association of South Africa (FGASA) – Level 1 Theory Examination – Oct 2002
- South African Red Cross Society – Level 1 First Aid Course – May 2002
- Educational Institute of the American Hotel & Lodging Association – Spirit of Hospitality Programme – Aug 2002
- Beaver Run Resort and Conference Centre (Premier Resorts) – Spirit in Service Training Class – Dec 2001
- Temba Game Viewers (Pty) Ltd – 2 Week Safari Vehicle Mechanics Training – 2002
- Mondi Forest Inter-Schools Environmental Quiz – Third Prize in Finals – 1997

Appendix C8:
Addendum to Heritage Impact Assessment

ADDENDUM: PROPOSED WIND ENERGY FACILITY SITUATED ON THE EASTERN PLATEAU (SOUTH) NEAR DE AAR, NORTHERN CAPE PROVINCE

(Assessment conducted under Section 38 (8) of the National Heritage Resources Act as part of an EIA.)

Prepared for:

Holland & Associates Environmental Consultants

On behalf of:

Longyuan Mulilo De Aar 2 South (Pty) Ltd

June 2015

ACO Associates cc
Archaeology and Heritage Specialists

Prepared by:

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EXECUTIVE SUMMARY

ACO Associates have been appointed by Holland & Associates Environmental Consultants on behalf of the client, Longyuan Mulilo Renewable Energy (Pty) Ltd (MRE), to provide an Addendum to their original Heritage Impact Assessment (dated December 2011) for the proposed wind energy facility (WEF) situated on the eastern plateau (South) near De Aar (also referred to as the De Aar 2 South WEF).

Environmental Authorisation for the proposed project was granted by DEA on 1 March 2013. The Authorised Option comprises 103 turbines, each with a generation capacity of 1.5MW – 2.5MW.

Longyuan Mulilo De Aar 2 South (Pty) Ltd proposes to increase the generating size of the wind turbine generators (WTG) with the following changes:

- Increasing the hub heights from 100m to 120m
- Increasing blade lengths from 60m to 80m
- Increasing WTG generation size to encompass a range of 2.3MW to 4.0MW

The generation capacity of the WEF would be a maximum of 140MW in accordance with the cap placed on maximum megawatts by the Department of Energy REIPPP Programme. This will result in a reduction of the total number of turbines on De Aar 2 South WEF from 103 turbines to a range of either 61 turbines @ 2.3MW per turbine to 30 turbines @ 4MW per turbine.

The maximum number of turbines, i.e. 61 will be applied for.

Heritage Indicators

The assessment by Webley & Orton (2011) identified the following heritage resources in the study area:

- There is a widespread distribution of Middle Stone Age (MSA) artefacts of patinated hornfels across the top of the plateau. In general the artefacts do not appear to represent *in situ* sites and are of Grade IIIC (low) significance. However, some concentrations of MSA artefacts occur on the farm Knapdaar and appear to be "factory sites" for the production of MSA artefacts. They are of Grade IIIB significance.

- There are a few discrete Later Stone Age (LSA) sites considered of Grade IIIA significance since they represent a pre-ceramic interior variant on the Wilton and/or Smithfield about which very little is known.

- There are a number of stone kraal complexes that may represent seasonal utilisation of the "winterveld" on top of the plateau during the late 19th and early 20th century. They are of Grade IIIB significance as this pattern of land use has not been previously recorded on the plateau.

- While most of the permanent farmsteads are located below the plateau, there are some farm buildings, including sheds, kraals, etc. on top of the plateau. They are generally older than 60 years and protected in terms of the NHRA and have a field rating of Grade IIIC.

- No cemeteries or graves were identified on the plateau. However, it is possible that graves associated with farm owners and workers may occur, generally in proximity to farmhouse complexes.

- The cultural landscape comprises typical Karoo landscape. It is recommended that the landscape on and around the wind farm be provisionally graded as Grade IIIB.

Methodology and Limitations

The "Authorised option", assessed by us in 2011 (GPS track paths and identified sites), was compared with the "Proposed amended option" (2015) in order to determine the proximity of heritage resources and the likely impact of the turbines, cabling, access roads, substations, etc.

This assessment was done as a desktop study using Google Earth. The limitations of Google Earth are that only substantial structures, such as farm complexes and large kraals can be identified. Smaller structures such as shepherd's structures or graves cannot be identified. Nor is it possible to identify scatters of Stone Age archaeological material. This is a significant limitation in terms of predicting impacts.

General Assessment of Impacts

- With respect the archaeology, impacts are generally considered to be low. However, significant sites have been found on the banks of dry streams and against the lower slopes of valleys, and these may be damaged or destroyed;
- Rock art sites, either paintings in small shelters, or engravings on boulders, may be difficult to identify, and may be damaged or destroyed;
- Colonial as well as pre-colonial stone kraals occur along the lower slopes of valleys and near rivers and springs and they may be damaged by turbines and access roads;
- Farmsteads and associated farm buildings older than 60 years, while generally avoided by the WEF layout, may be negatively impacted by the expansion of access roads;
- Farm graveyards as well as individual graves, including unmarked farm workers graves, may be damaged or destroyed.

General Recommendations

- Avoid constructing access roads along the lower slopes of valleys and along river banks to avoid impacting on significant sites and stone kraal complexes;
- Ensure access roads avoid passing in close proximity to farmsteads and associated farm buildings older than 60 years. In general a 400m buffer should be implemented around farmsteads particularly if the farm buildings are older than 60 years. This buffer can be reduced if the building contains no elements of heritage significance;
- Colonial kraals are generally highly visible and construction workers will be able to identify them. However, pre-colonial stone kraals will likely only be identified by a trained archaeologist – for this reason a walk down of the revised layout should be undertaken as part of the conditions of the EMP ;
- All farm cemeteries and individual graves should be avoided. A buffer of at least 15 m should be enforced around them. They are often difficult to identify, and for this reason a walk down of the revised layout should be undertaken as part of the conditions of the EMP;
- If any human remains are uncovered during the construction phase, work in that area should stop immediately and the South African Heritage Resources Association (SAHRA) must be notified;

- Guarantees for demolition of turbines after their useful life must be in place as a condition of approval.

Desktop Assessment of Proposed Amended Option and Specific Recommendations

There are at least four locations where the amended layout may impact negatively on heritage resources. They are:

- At the proposed 132 kV substation. The construction of the access road from WTG 10 to WTG 5 will cross the dry river bed in a rocky area with a possible cliff face. There is a possibility that there may be small rock shelters/caves with archaeological deposit and/or rock paintings in this rocky outcrop, making this river crossing sensitive. In addition, the access road will run in close proximity to a series of stone kraals identified in the 2011 survey.

It is recommended that a walk down is undertaken as part of the conditions of the EMP, to ensure that the proposed access road will not impact on potential heritage resources.

- While the Proposed Amended Option avoids the large MSA factory site on Knapdaar, aerial photographs (Google Earth) indicate circular features (kraals?) on the landscape in proximity to the access road connecting WTG47 with WTG46. These kraals vary between 30m and 90m from the stone kraals.

It is not possible to verify whether these stone "circles" reflect pre-colonial stone kraals without a field survey. It is possible that they may be natural phenomena.

It is recommended that a walk down is undertaken as part of the conditions of the EMP, to ensure that the proposed access road will not impact on potential heritage resources.

- The access road for the Proposed Amended Option connecting WTG45 with WTG37 will run within 90m of a series of at least three (3) kraals. The kraals may be associated with a farm building but the scale does not permit this to be determined. The kraal is located some 120 m to the south-west of WTG37.

It is not possible from the aerial photography to determine whether these are modern kraals with wire fencing, or older stone kraals. The age of the kraals can only be determined from a field assessment.

It is recommended that the proposed access road is acceptable but if there is any reason to move the access road any closer to the kraals, then a walk down is undertaken as part of the conditions of the EMP.

- The access road for the Proposed Amended Option linking WTG21 with WTG 60 runs 200m from a square kraal, overlooking a dry river. The kraal (?) falls outside the boundaries of the WEF.

The age of the kraal can only be determined from a field assessment.

It is recommended that the proposed access road is acceptable but if there is any reason to move the access road any closer to the kraals, then a walk down is undertaken as part of the conditions of the EMP.

Conclusions

After consideration of the significance of the heritage resources (identified during the 2010 survey), it is concluded that the reduction in the number of WTG is generally positive from a heritage perspective.

If the above recommendations are implemented, then the Proposed Amended Option is supported.

Declaration of Consultants Independence

I, Lita Ethel Webley, author of the De Aar Wind Energy Facility specialist heritage report, hereby declare that I am an independent consultant appointed by Holland & Associates Environmental Consultants to provide specialist input on the Longyuan Mulilo De Aar 2 South (Pty) Ltd. I hereby confirm that I have no business, financial, personal or other interest in the activity, application or appeal in respect of which I have been appointed other than fair remuneration for work performed in connection with the activity and application. All opinions expressed in my specialist report are my own.

SIGNATURE

NAME: Lita Ethel Webley

June 2015

Lita Webley is an independent specialist consultants who are in no way connected with the proponent, other than delivery of consulting services.

Lita Webley (PhD) is an archaeologist with 19 years of working experience in heritage throughout southern Africa and joined the Archaeology Contracts Office in 2008. She is accredited with Principal Investigator status (Stone Age, Colonial Archaeology and Shell Midden Archaeology) with the Association of Professional Archaeologists of Southern Africa.

ACO Associates cc have considerable experience in assessing the impacts of renewable energy projects on heritage, having completed the specialist studies in excess of 30 renewable energy projects in the Eastern, Northern and Western Cape.

GLOSSARY

Archaeology: *Remains resulting from human activity which is in a state of disuse and are in or on land and which are older than 100 years, including artefacts, human and hominid remains and artificial features and structures.*

Early Stone Age: *The archaeology of the Stone Age between 700 000 and 2 500 000 years ago***.**

Fossil: *Mineralised bones of animals, shellfish, plants and marine animals. A trace fossil is the track or footprint of a fossil animal that is preserved in stone or consolidated sediment.*

Heritage: *That which is inherited and forms part of the National Estate (Historical places, objects, fossils as defined by the National Heritage Resources Act 25 of 1999.*

Holocene: *The most recent geological time period which commenced 10 000 years ago.*

Hornfels: A type of indurated shale used in the production of stone tools in the Karoo.

Late Stone Age: *The archaeology of the last 20 000 years associated with fully modern people.*

Middle Stone Age: *The archaeology of the Stone Age between 20 000-300 000 years ago associated with early modern humans.*

National Estate: *The collective heritage assets of the Nation.*

Palaeontology: *Any fossilised remains or fossil trace of animals or plants which lived in the geological past, other than fossil fuels or fossiliferous rock intended for industrial use, and any site which contains such fossilised remains or trace.*

Pleistocene: *A geological time period (of 3 million – 10 000 years ago).*

SAHRA: *South African Heritage Resources Agency – the compliance authority which protects national heritage.*

Smithfield: *This term was coined in 1929 for a number of interior stone tools assemblages, made on indurated shale, and dating to the last 2000 years of the Later Stone Age. Various variants have been identified in different parts of the country but the term has not been clearly defined.*

Structure (historic): *Any building, works, device or other facility made by people and which is fixed to land, and includes any fixtures, fittings and equipment associated therewith. Protected structures are those which are over 60 years old.*

Wilton: *A Late Stone Age microlithic industry dating to between 6000 and 4000 years ago.*

Acronyms

DEA	Department of Environmental Affairs
ESA	Early Stone Age
ECO	Environmental Control Officer
GPS	Global Positioning System
HIA	Heritage Impact Assessment
LSA	Late Stone Age
MSA	Middle Stone Age
NHRA	National Heritage Resources Act
SAHRA	South African Heritage Resources Agency
WEF	Wind Energy Facility
WTG	Wind Turbine Generators

TABLE OF CONTENTS

1 INTRODUCTION AND BACKGROUND

ACO Associates have been appointed by Holland & Associates Environmental Consultants on behalf of the client, Longyuan Mulilo Renewable Energy (Pty) Ltd (MRE), to provide an Addendum to their original Heritage Impact Assessment, dated December 2011.

In the original assessment, Mulilo Renewable Energy (Pty) Ltd, applied for Environmental Authorisation from the Department of Environmental Affairs (DEA) to establish a Wind Energy Facility (WEF) on a plateau some 20 km to the east of De Aar, Northern Cape. The name of the project is the "De Aar 2 South WEF".

The Authorised Option comprised 103 turbines, each with a generation capacity of 1.5MW – 2.5MW.

The HIA (Webley & Orton 2011) formed part of EIA completed in 2012 and Environmental Authorisation for the proposed project was granted by DEA on 1 March 2013.

1.1 Revised Development Proposals

An application for Amendment of the EA was submitted to DEA in May 2013 to change the SPV name from Mulilo Renewable Energy (Pty) Ltd to Longyuan Mulilo De Aar 2 South (Pty) Ltd. This was granted by DEA.

In July 2014 a further Application was made to DEA for an Amendment of the Environmental Authorisation. The amendment of the EA was granted by DEA.

Longyuan Mulilo De Aar 2 South (Pty) Ltd (the applicant) proposes to amend the project description of the proposed WEF. Holland & Associates Environmental Consultants have been appointed by the applicant to undertake the application for amendment of the Environmental Authorisation.

The De Aar 2 South WEF propose to increase the generating size of the wind turbine generators (WTG) in order to align with current international WTG models while reducing the number of WTG on the WEF. The following changes will be made to the WTG parameters:

- Increasing the hub heights from 100m to 120m
- Increasing blade lengths from 60m to 80m
- Increasing WTG generation size from 2.3MW to 4.0MW

The generation capacity of the WEF would be a maximum of 140MW in accordance with the cap placed on maximum megawatts by the Department of Energy.

This will result in reduction of the total number of turbines on De Aar 2 South WEF from 103 turbines to 61 turbines @ 2.3MW per turbine to 30 turbines @ 4MW per turbine.

The maximum number of turbines, i.e. 61 will be applied for.

These changes will result in an increase of the turbine tower base diameter from 15m to 20m and an increase in foundation depth from 2m to 3.5m. The construction hardstand pad would remain at 40 x 50m (adjacent to each turbine).

The changes to the WEF layout, the "Proposed Amended Option", are considered at a desktop level below.

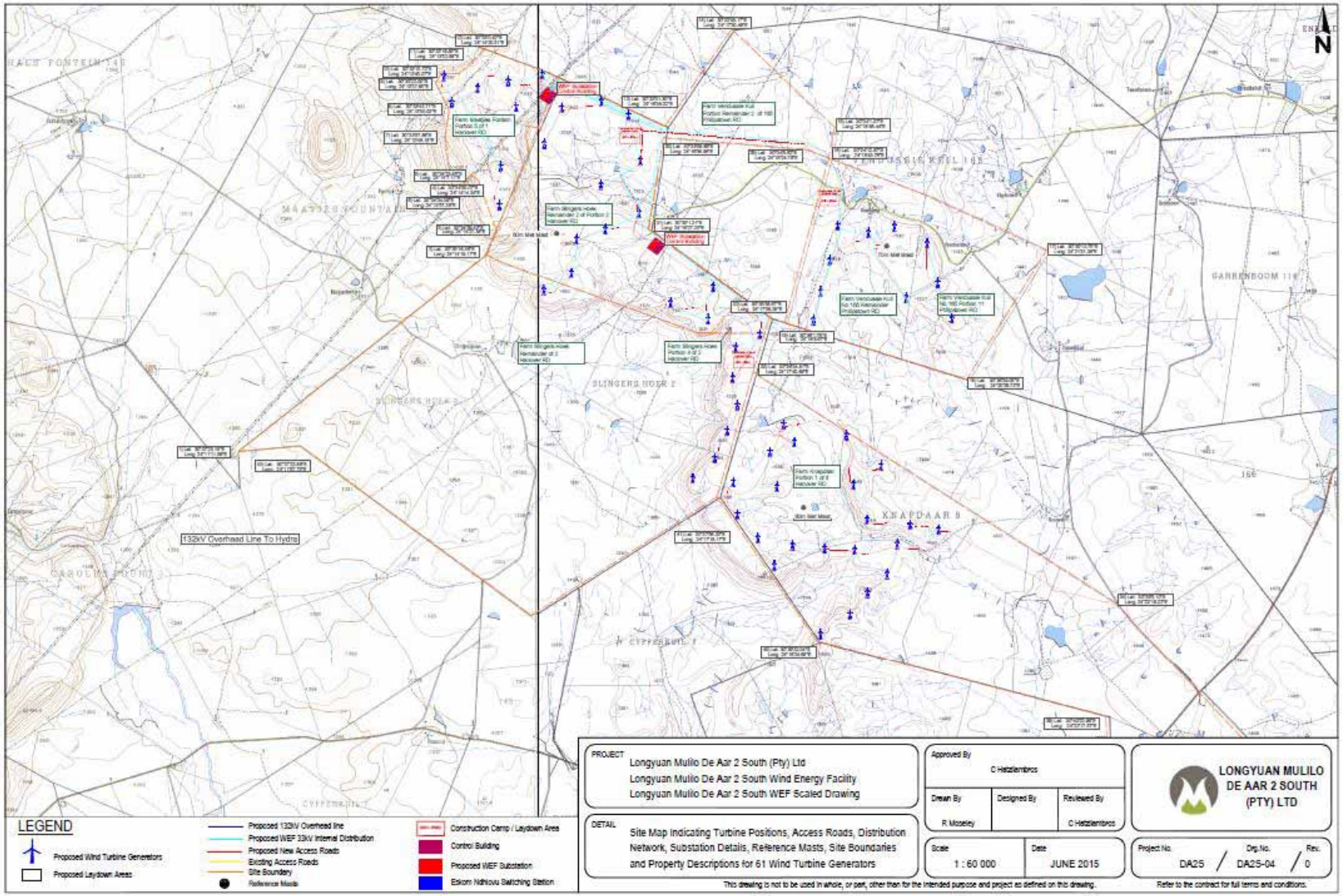

Figure 1: View of the Proposed Amended Option on the Southern Plateau (map supplied by client).

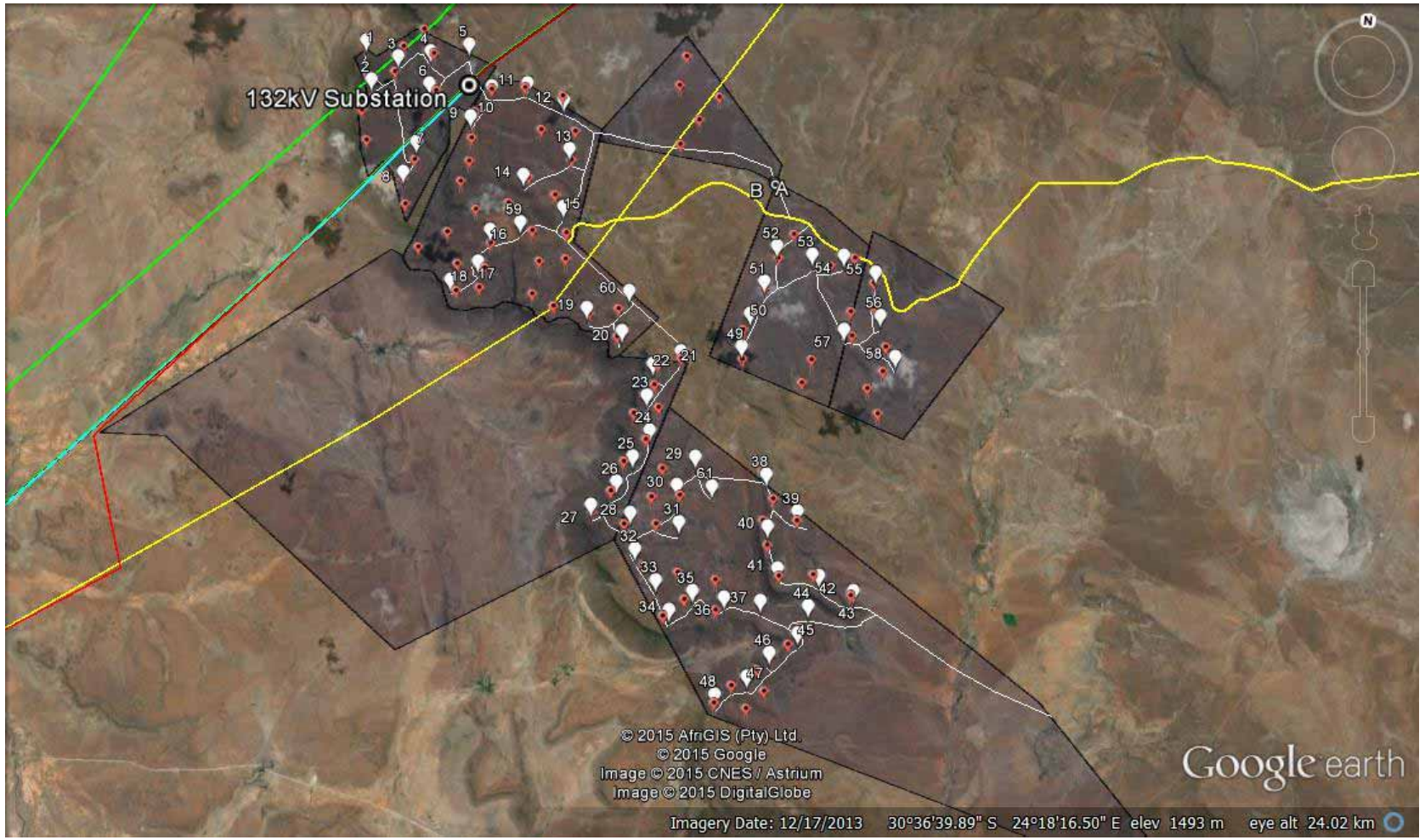

Figure 2: View of the Proposed Amended Option on the South Plateau (map supplied by client). The red icons indicate the approved WTG, while the white icons are the proposed amended WTG locations. The existing road is indicated in yellow and the new access roads in white.

The no-go alternative consists of maintaining the status quo.

2 TERMS OF REFERENCE

ACO Associates cc has been instructed to compile an addendum to the specialist heritage report addressing the following:

- The implications of the proposed amendments in terms of the potential impact(s);
- A re-assessment of the significance (before and after mitigation) of the identified impact(s) in light of the proposed amendments (as required in terms of the 2014 EIA Regulations), for the construction and operational phases, including consideration of the following:
    - Cumulative impacts;
    - The nature, significance and consequence of the impact;
    - The extent and duration of the impact;
    - The probability of the impact occurring;
    - The degree to which the impact can be reversed;
    - The degree to which the impact may cause irreplaceable loss of resources;
    - The degree to which the impact can be avoided, managed or mitigated;
- The addendum to your report must include an impact summary table outlining the findings of the re-assessment in terms of the abovementioned assessment criteria;
- A statement as to whether the proposed amendments will result in a change to the significance of the impact assessed in the original EIA for the proposed project (and if so, how the significance would change). The advantages and disadvantages associated with the proposed change;
- A detailed description of measure to ensure avoidance, management and mitigation of impacts associated with the proposed changes;
- The re-assessment must take into must take account and address public comments received during the Public Participation Process (PPP) relating to your area of expertise.

3 LEGISLATION

The National Heritage Resources Act (No 25 of 1999) provides protection for the following categories of heritage resources:

- Buildings or structures older than 60 years (Section 34);
- Archaeological Sites, palaeontological material and meteorites (Section 35);
- Human remains older than 60 years and located outside of a formal cemetery administered by a local authority (Section 36);
- Public monuments and memorials (Section 37);
- Living heritage (defined in the Act as including cultural tradition, oral history, performance, ritual, popular memory, skills and techniques, indigenous knowledge systems and the holistic approach to nature, society and social relationships) (Section 2 (d) (xxi));
- Landscapes with cultural significance are also protected under the definition of the National Estate (Section 3 (3.2d)).

Since the project is subject to an Environmental Impact Assessment, the South African Heritage Resources Agency (SAHRA) has provided comment on the proposed project in order to facilitate final decision making by the Department of Environmental Affairs (DEA).

This Addendum to the HIA considers: Archaeology, the Built Environment, Graves and the Cultural Landscape. The palaeontology of the area forms part of a separate study.

3.1 Heritage Grading

The NHRA makes provision for a three-tier system for grading heritage resources, namely Grades I, II and III. However experience has shown that most heritage resources fall into Grade III. In the context of an EIA process, heritage resources are graded following the system established by Winter & Baumann (2005) in the guidelines for involving heritage practitioners in EIA's (Table 1).

Table 1: Grading of heritage resources (Source: Baumann & Winter 2005: Box 5).

Grade	Level of significance	Description
1	National	Of high intrinsic, associational and contextual heritage value within a national context, i.e. formally declared or potential Grade 1 heritage resources.
2	Provincial	Of high intrinsic, associational and contextual heritage value within a provincial context, i.e. formally declared or potential Grade 2 heritage resources.
3A	Local	Of high intrinsic, associational and contextual heritage value within a local context, i.e. formally declared or potential Grade 3A heritage resources.
3B	Local	Of moderate to high intrinsic, associational and contextual value within a local context, i.e. potential Grade 3B heritage resources.
3C	Local	Of medium to low intrinsic, associational or contextual heritage value within a national, provincial and local context, i.e. potential Grade 3C heritage resources.

Heritage specialists use the grading system to express the relative significance of a heritage resource. This is known as a field grading or a recommended grading. Official grading is done by a special committee of the relevant heritage authority, however heritage authorities rely extensively on field gradings in terms of decision making.

4 METHODOLOGY

4.1 Literature survey

The source of information utilised in this Addendum is primarily based on the original field survey undertaken by Webley & Orton (2011). However, published archaeological reports and unpublished Archaeological, Heritage and Palaeontological Impact Assessments for the general area provide an important supplement to this report. The SAHRA Report Mapping Project (2009) and the South African Heritage Resources Information Systems (SAHRIS) database was consulted for Cultural Resource Management (CRM) reports from the De Aar area.

4.2 Field survey

A physical survey of the project area, based on a 2011 layout, was undertaken by Lita Webley and Jayson Orton in November 2011. The positions of the turbines and access roads were loaded onto hand-held GPS receivers (on the WGS84 datum) which enabled us to target the relevant areas. Data collection also took place in the field as landowners were

consulted regarding the whereabouts of heritage on their property (old buildings, cemeteries, settlement, San (bushman) engravings and archaeological sites). Farm buildings were visited and assessed for heritage significance; archaeological sites were recorded, mapped and photographed. The list of heritage resources identified in the initial field survey is provided in the original HIA compiled by Webley & Orton (2011).

4.3 Desktop assessment

The "Authorised option", assessed by us in 2011 (GPS track paths and identified sites), was compared with the "Proposed amended option" (2015) in order to determine the proximity of heritage resources and the likely impact of the turbines, cabling, access roads, substations, etc. This assessment was done as a desktop study using Google Earth.

4.4 Assumptions and Limitations

This desktop assessment of the "Proposed amended option" relies on the initial November 2011 field survey.

Only a small percentage of actual turbine positions were reached during the initial survey. The reasons for this are:

- The terrain is mountainous and the majority of the areas were only accessible by four wheel drive. There are very few roads on the escarpment and some farms, such as Matjiesfontein, could only be reached with great difficulty. A thorough survey would require several weeks, and this was not feasible in terms of the budget allocation;
- The field assessment took the form of targeted searches of particular locations with a view towards maximising our understanding of the heritage landscape and enhancing our chances of correctly assessing the impacts of the proposed facilities on the heritage resources.

The limitations of Google Earth in assessing the presence of heritage resources, is that only substantial structures, such as farm complexes and large kraals can be identified. Smaller structures such as shepherd's structures or graves cannot be identified. Nor is it possible to identify scatters of Stone Age archaeological material. This is a significant limitation in terms of predicting impacts.

5 DESCRIPTION OF THE AFFECTED ENVIRONMENT

The farms that have been selected for the proposed wind energy facility are sited on an elevated plateau to the east of De Aar with views across the surrounding plains of the central Karoo. The plateau rises at least 100 m above the surrounding plains.

The landscape is covered in Karoo shrub and grasses and dominated by open, rolling hills with interspersed high steep hills and mountains. The open, hilly plateaus are crossed by ephemeral streams and dry water courses resulting in deeply incised valleys. Viewpoints on the higher elevations provide long, open vistas with high hills and mountains as distant backdrops.

Traditionally, the landscape has been used for small stock farming. Only a few patches of land are under cultivation and are usually near farm buildings where there is permanent water. There are a few isolated farm settlements lying in secluded valleys. The farm complexes are generally surrounded by stands of exotic trees such as poplars, and some of the farm buildings, retain late 19th century elements that in addition to sheds and kraals,

provide a rural charm to the landscape. There is evidence of earlier occupation at higher altitude marked by abandoned farmsteads and stockposts. Farming infrastructure includes stock camp fences, tracks, windmills and reservoirs.

6 DESKTOP ASSESSMENT OF "PROPOSED AMENDED OPTION"

The Webley & Orton (2011) assessment identified the following heritage resources in the study area:

- There is a widespread distribution of Middle Stone Age (MSA) artefacts of patinated hornfels across the top of the plateau. They are spread across the open plateau, in slight depressions or pans and on the lower slopes of hills. In general the artefacts do not appear to represent *in situ* sites and are of Grade IIIC (low) significance. However, some concentrations of MSA artefacts occur in association with the flaking of bedrock outcrops on the farm Knapdaar (Figure 5). These sites appear to be "factory sites" for the production of MSA artefacts and they are of Grade IIIB significance.

- There are a few discrete Later Stone Age (LSA) sites of Grade IIIA significance since they represent a pre-ceramic interior variant on the Wilton and/or Smithfield about which very little is known. They occur in the valleys, often on the banks of dry water courses. The aggregation of material along the river bed on Knapdaar includes "freshly" flaked hornfels duckbill and end scrapers, as well as grindstones and ostrich eggshell pieces.

- There are a number of stone kraal complexes that may represent seasonal utilisation of the "winterveld" on top of the plateau during the late 19th and early 20th century. They are of Grade IIIB significance as this pattern of land use has not been previously recorded on the plateau. The stone kraals are often found against the lower slopes of valleys and dry river courses but there are some which are situated on the exposed plateau.

- While most of the permanent farmsteads are located below the plateau, there are some farm buildings, including sheds, kraals, etc. on top of the plateau. They are generally older than 60 years and protected in terms of the NHRA and have a field rating of Grade IIIC. They are often located near springs or dry water courses.

- No cemeteries or graves were identified on the plateau. However, it is possible that graves associated with farm owners and workers may occur, generally in proximity to farmhouse complexes.

- The cultural landscape comprises typical Karoo landscape which has been slightly modified by its use for agricultural purposes. Taking into consideration the comments above, and the proximity of other wind and solar facilities, it is recommended that the landscape on and around the wind farm be provisionally graded as Grade IIIB.

6.1 Potential impacts to heritage resources

As indicated under Section 4.3, large areas of the southern plateau could not be reached during the 2011 survey.

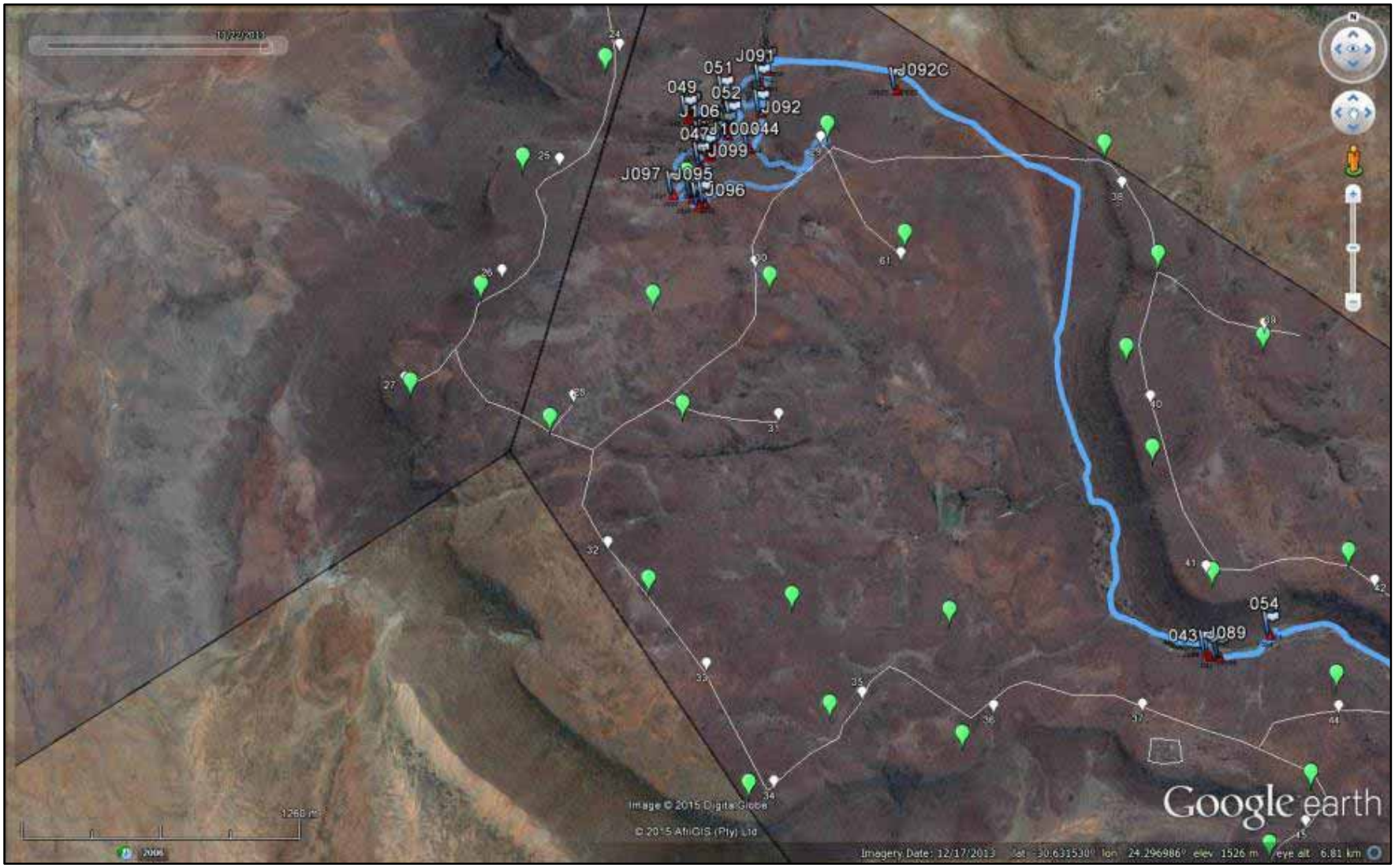

Figure 3: Map illustrative of the coverage achieved during the 2011 survey, with the green icons indicating the WTG of the Authorised Option and the blue line the GPS survey tracks. The white icons and white lines indicate the WTG and roads of the Proposed Amended Option.

132 kV substation

The proposed 132 kV substation is located in proximity to an abandoned settlement described in Webley & Orton (2011) as a "complex of stone ruins on the farm Matjiesfontein". The complex is close to a dry river bed. Immediately across river, and around the hill from the settlement, is another complex of stone kraals which have been negatively impacted by the construction of the current powerlines (Figure 4).

The construction of the access road from WTG 10 to WTG 5 will cross the dry river bed in a rocky area with a possible cliff face (see yellow circle in Figure 4). There is a possibility that there may be small rock shelters/caves with archaeological deposit and/or rock paintings in this rocky outcrop, making this river crossing sensitive.

In addition, the access road will run in close proximity (pale green circle in Figure 4) to a series of stone kraals identified in the 2011 survey.

Without a foot survey, it would be impossible to determine whether the proposed access road will impact on potential heritage resources.

If the access road is re-aligned southwards, crossing the dry river bed to the south of the proposed 132 kV substation (dark green arrow in Figure 4), then potential impacts may be avoided. While it is possible that heritage resources may also occur in this area as well, it appears to be of less sensitivity than the Proposed Amended Option.

Recommendations:

- **A walk down of the access roads must be undertaken as part of the condition of the EMP, to identify any constraints and to propose alternative options.**

Kraals 1 – 3 on Knapdaar

The 2011 survey of the Authorised Option identified a large MSA factory site with signs of more recent LSA flaking on the top of a hill overlooking the plains on the farm Knapdaar. This site was graded of medium to high significance (a provisional Grade IIIB grading) and it was recommended that the site be either avoided or mitigated. Nearby, are the remains of a stone kraal (Figure 5).

The Proposed Amended Option (Figure 5) avoids these heritage resources, as WTG46-48 is located further to the north-west. However, aerial photographs (Google Earth) indicate circular features (kraals?) on the landscape in proximity to the access road connecting these turbines. Those within the yellow circle (Figure 5) are 90m to the south-west, while those within the green circle (Figure 5) are 30m to the south-west of the road.

It is not possible to verify whether these stone "circles" reflect pre-colonial stone kraals without a field survey. It is possible that they may be natural phenomena.

If the access road linking WTG47 with WTG46 is moved some 50 m to the north-west, it will avoid potential impacts to stone features.

Recommendations:

- **A walk down of the access roads must be undertaken as part of the condition of the EMP, to identify any constraints and to propose alternative options.**

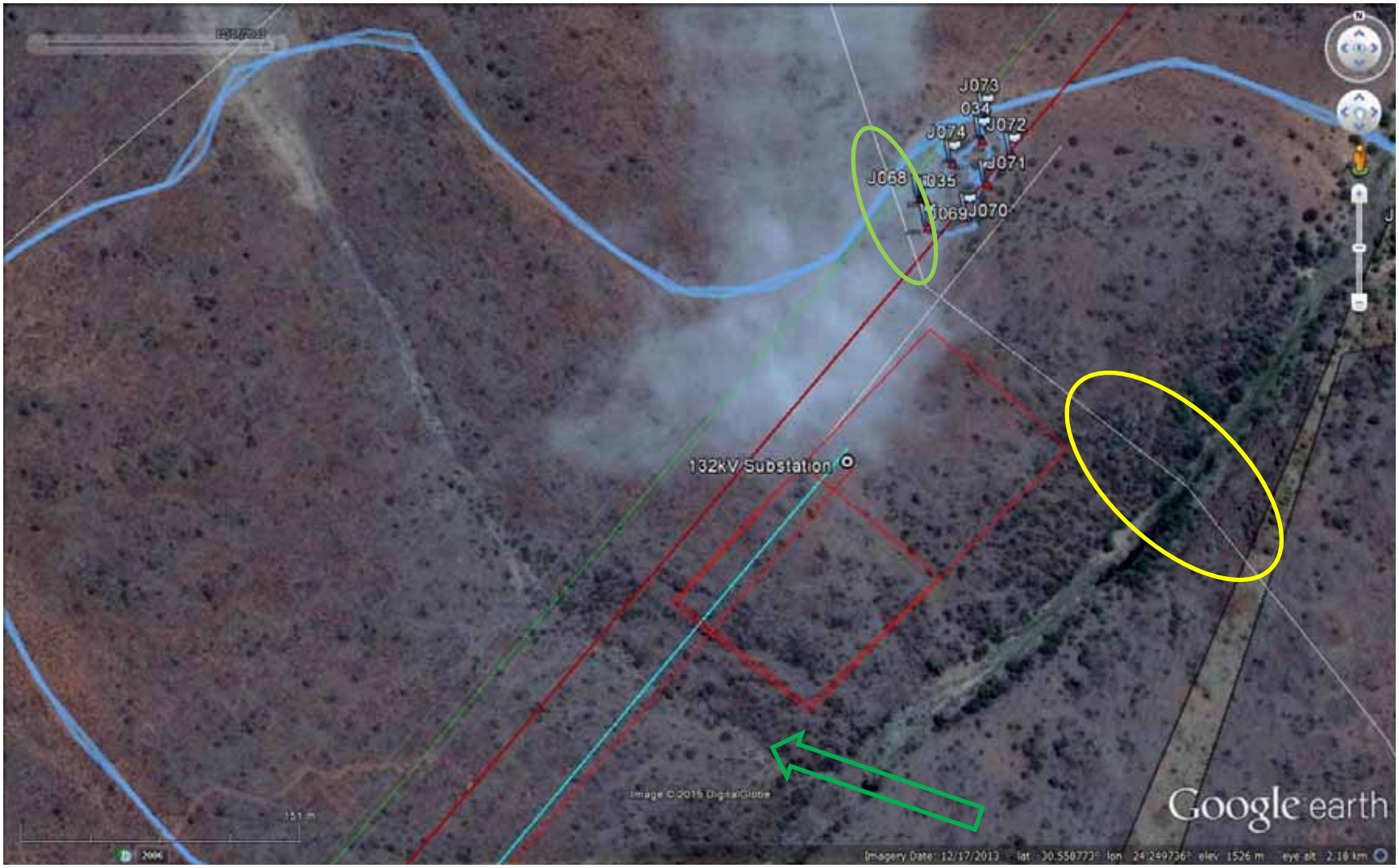

Figure 4: The proposed 132 kV substation is shown as a red rectangle. The existing powerline is a red diagonal line. The proposed access road is indicated as a white line. The GPS tracks from the 2011 survey are shown in blue. Areas of potential concern are indicated in the yellow and pale green circles. The dark green arrow shows the preferred position for the river crossing.

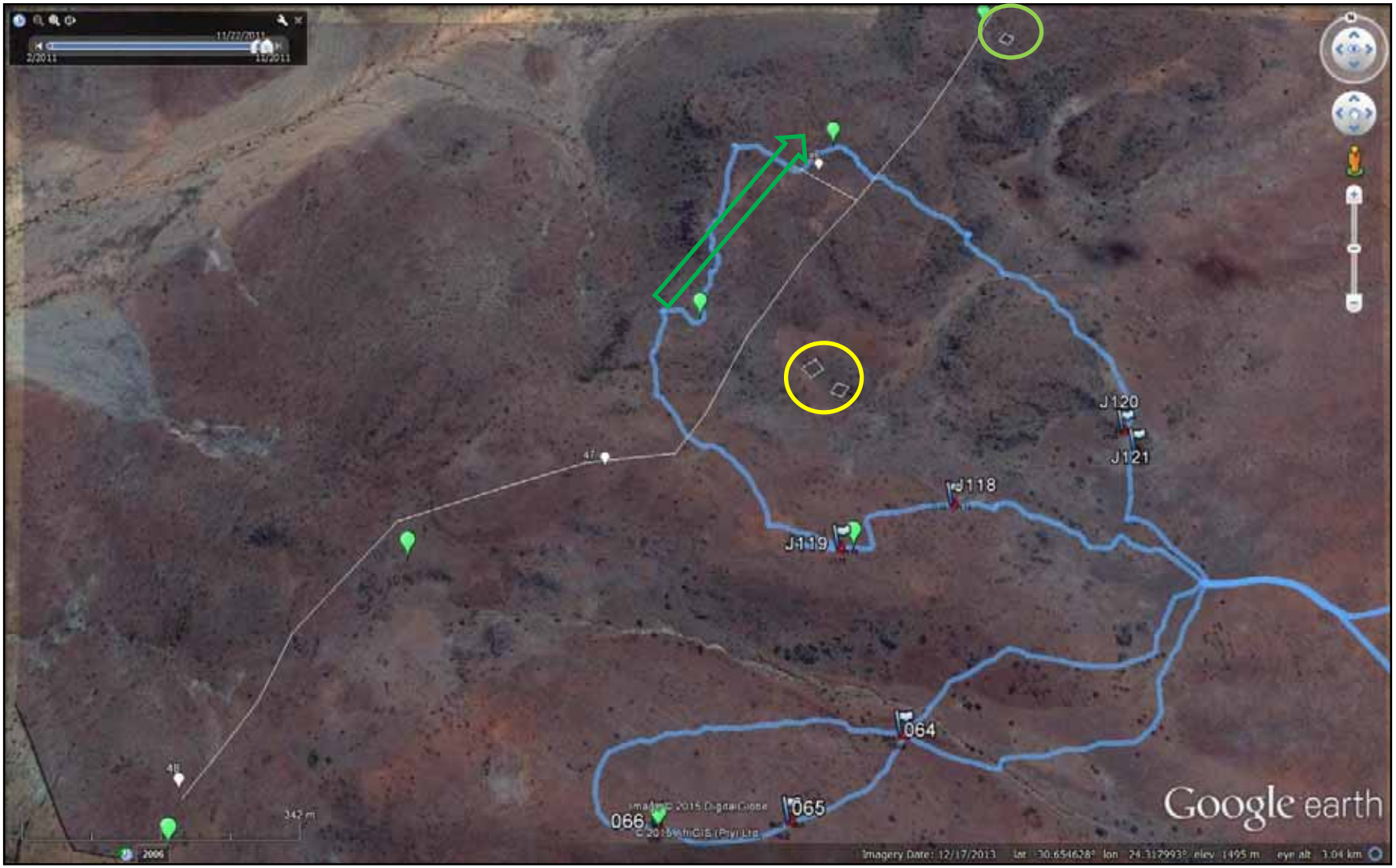

Figure 5: The 2011 survey (shown as a blue line) identified an MSA factory site (064-066) as well as some stone walling (J120 – J121) along the Authorised Option. The Proposed Amended Option avoids these sites but there may be further stone kraals/features in this area on the farm Knapdaar (inside green and yellow circles). The green arrow indicates the preferred route of the access road linking WTG47 and WTG46.

Stockpost/kraal near Turbine 37

The access road for the Proposed Amended Option connecting WTG45 with WTG37 runs along the edge of the escarpment. The road will run within 90m of a series of at least three (3) kraals (Figure 6). It is not possible from the aerial photography to determine whether they are modern kraals with wire fencing, or older stone kraals. The kraals may be associated with a stockpost but the scale does not permit this to be determined. The kraal is located some 120 m to the south-west of WTG37.

The age of the kraals can only be determined from a field assessment.

Recommendations:

- That the proposed access road is acceptable but if there is any reason to move the access road any closer to the kraals, then a walk down of the revised layout will be required.

Kraal near Access Road connecting WTG21 and WTG60

The access road for the Proposed Amended Option linking WTG21 with WTG 60 runs along the escarpment and crosses over a small, dry river course (Figure 7). There is a square kraal some 200m from the proposed access road, overlooking the river.

The kraal and the road are outside of the land which forms part of the WEF.

The age of the kraal can only be determined from a field assessment.

Recommendations:

- That the proposed access road is acceptable but if there is any reason to move the access road any closer to the kraal, then a walk down of the revised layout will be required.

Figure 6: The access road for the Proposed Amended Option connecting WTG45 with WTG37 runs along the edge of the escarpment, some 90m from a series of at least three (3) kraals outlined in white.

Figure 7: The access road linking WTG21 with WTG 60 crosses over a small, dry river course some 200m from a square kraal.

7 ASSESSMENT OF IMPACTS

7.1 General impacts expected during the construction phase of the WEF

During the construction phase the following physical impacts to the landscape and any heritage that lies on it can be expected:

- Bulldozing of roads to turbines sites with a possibility of cut and fill operations in places;
- Upgrading of existing farm tracks;
- Creation of working and lay-down areas close to each turbine site;
- Excavation of foundations for each tower;
- Excavation of many kilometers of linear trenches for cables;
- Erection of a 132 kV power line (pole design not finalized);
- Construction of electrical infra-structure in the form of one or more sub-stations.

7.2 General impacts expected during the operation of the WEF

During the operational life of the wind farm, it is expected that physical impacts to heritage will diminish or cease. Impacts to intangible heritage are expected to occur. Such impacts relate to changes to the feel, atmosphere and identity of a place or landscape. Such changes are evoked by visual intrusion, noise, changes in land use and population density. In the case of this project, impacts to remote and rural landscape and wilderness qualities are possibly of greatest concern. Cultural landscapes are highly sensitive to accumulative impacts and large scale development activities that change the character and public memory of a place. The construction of a large facility can result in profound changes to the overall sense of place of a locality, if not a region.

7.3 Nature and extent of Impacts to Heritage Resources

In terms of impacts to heritage resources, archaeological sites which are highly context sensitive are most vulnerable to the alteration of the land surface. The main cause of impacts to archaeological sites is physical disturbance of the material itself and its context. The heritage and scientific potential of an archaeological site is highly dependent on its geological and spatial context. This means that even though, for example a deep excavation may expose archaeological artefacts, the artefacts are relatively meaningless once removed from the area in which they were found. In the case of the proposed activity the main source of impact is likely to be the construction of access roads, lay-down areas and excavation of the footings the turbines.

It is expected that impacts will be limited (local). There is a chance that the deep excavations for bases could potentially impact buried archaeological material, similarly excavation of cable trenches and clearing of access roads could impact material that lies buried in the surface sand. The 2011 survey of the study area has shown that the extent of impacts is likely to be localised with no regional implications for heritage of this kind.

Impacts to the Built Environment can include the destruction of farm buildings (in particular ruined buildings), kraals, etc. which are not identifiable from a desktop aerial survey. Similarly, the adaptive re-use of existing farm buildings as part of the proposed WEF, may result in alterations to the structure which may have negative impacts on the heritage resource.

Historic structures are sensitive to physical damage such as demolition as well as neglect. They are also context sensitive, in that changes to the surrounding landscape will affect their significance.

Farm cemeteries as well as isolated graves have not been identified on the plateau. However, they may occur and may be damaged during construction of the WEF.

7.4 Duration of Impacts and extent to which impact can be reversed

Archaeological sites are by their very nature, non-renewable. This means that once they are destroyed, they cannot be renewed. Similarly, when historic buildings are destroyed, they may be re-built but they will not be an authentic structure again. Cemeteries and graves are particularly vulnerable, as the exhumation of human remains and destruction of graves is considered by many societies to be sacrilegious. In other words, impacts to tangible heritage resources cannot be reversed and impacts are therefore permanent.

There is no indication from the field assessments conducted on the plateau to the east of De Aar (Webley & Orton 2011; van der Walt 2014) that the construction of either the "Authorised Option" or the "Proposed Amended Option" will result in an irreplaceable loss of resources.

7.5 The significance and probability of impacts occurring

The significance of the various heritage resources identified during the 2011 survey have already been discussed but is briefly repeated here.

No heritage resources of Grade 1 (national) or Grade II (Provincial) significance were identified.

The archaeological resources on the plateau have been graded as low to medium local significance (i.e. Grade IIIC and Grade IIIB). MSA material is widespread but ephemeral and not in primary context. This reduces the information that it provides the archaeologist and therefore its significance (Ungraded and Grade IIIC). However, some of the MSA sites on Knapdaar are considered "factory sites" for the production of material and they are considered of Grade IIIB significance. It is likely that some scatters of MSA artefacts will be destroyed because of their widespread distribution.

The concentration of small amounts of LSA material, which appear to represent a variant on the interior Wilton and/or Smithfield, along some of the river valleys on Knapdaar are sufficiently scarce to be graded as Grade IIIA. They are archaeological interest. For this reason, river valleys should be avoided during construction if this is at all possible.

In terms of buried archaeological material (including graves), one can never be sure of what lies below the ground surface, however indications are that this is extremely sparse and that impacts caused by the construction of footings and other ground disturbance is likely to be low if the appropriate mitigation measures are employed.

The abandoned and ruined stone kraal complexes on the top of the plateau represent a seasonal utilisation of the "winterveld" on top of the plateau during the late 19th and early 20th century. They are of Grade IIIB significance as this pattern of land use has not been previously recorded on the plateau.

While most of the permanent farmsteads are located below the plateau, there are a few farm buildings, including sheds, kraals, etc. on top of the plateau. They are generally older than 60 years and protected in terms of the NHRA and have a field rating of Grade IIIC. It is

unlikely that the Built Environment (such as farmhouses, sheds, etc) will be destroyed if the Proposed Amended Option is followed.

The possibility exists that the construction of the WEF may result in the destruction of colonial, but particularly pre-colonial stone kraals. Colonial kraals are generally highly visible and construction workers will be able to identify them. However, pre-colonial stone kraals will likely only be identified by a trained archaeologist.

The Webley & Orton (2011) survey did not identify any cemeteries or graves on the plateau. However, it is possible that graves associated with farm owners and workers may occur, generally in proximity to farmhouse complexes. They are considered of high local significance.

The 2011 survey also noted the cultural landscape comprising a typical Karoo landscape which has been modified by its use for agricultural purposes. It is recommended that the landscape on and around the wind farm be provisionally graded as Grade IIIB.

7.6 The degree to which impact can be avoided, managed to mitigated

The best way to manage impacts to archaeological material is to avoid impacting them. This means micro-adjusting turbine positions where feasible, or routing access roads around sensitive areas.

The MSA factory sites on Knapdaar and the important LSA sites along the dry river bed on Knapdaar have been avoided in the Proposed Amended Option (Figure 5).

Table 2: Summary of impacts to archaeological material

NATURE OF IMPACT: Impacts to archaeological material (including stone artefacts, rock engravings and paintings and pre-colonial kraals) could involve localised displacement of material at turbine footings, access roads, etc.		
	Without mitigation	**With Mitigation**
Extent	Local	Site specific
Duration	Permanent (archaeological sites are non-renewable)	No impact
Magnitude	Medium	Zero
Probability	Probable	Unlikely
Significance	Medium	Low
Status (positive or negative)	Negative	Neutral
Reversibility	No, once archaeological sites are destroyed, they cannot be replaced.	
Irreplaceable loss of resources?	Yes, once archaeological sites are destroyed, they cannot be replaced.	
Can impacts be mitigated?	Yes, impacts can be mitigated.	
Mitigation: The Proposed Amended Option avoids the most significant archaeological sites identified in the 2011 survey. No further mitigation is required.		
Cumulative Impacts: The cumulative impact of a number of wind energy facilities on the plateau may result in the loss of MSA archaeological scatters of low significance.		
Residual Impacts: Once the turbines are removed and the access roads are re-vegetated, there will be no further impacts on the archaeological landscape		

Table 3: Summary of impacts to Built Environment

NATURE OF IMPACT: The construction of access roads in close proximity to aspects of the Built Environment, such as sheds, workers' cottages, etc. could result in accidental damage and/or vandalism.		
	Without mitigation	**With Mitigation**
Extent	Site specific	Site specific
Duration	Permanent (heritage sites are non renewable)	No impact
Magnitude	Moderate	Very Low
Probability	Probable	Unlikely
Significance	Medium (buildings of Grade IIIC significance)	Low
Status (positive or negative)	Negative	Neutral
Reversibility	No, once buildings are destroyed, they cannot be replaced.	
Irreplaceable loss of resources?	Yes, once buildings are destroyed, they cannot be replaced.	
Can impacts be mitigated?	Yes, impacts can be mitigated	
Mitigation: Turbines should be placed at least 500m from heritage sites, i.e. buildings older than 60 years. Old buildings should be fenced off during construction to avoid vandalism. If buildings are re-used during the construction of the WEF, they should be assessed and a permit from SAHRA may be necessary if they are renovated.		
Cumulative Impacts: The cumulative impact of a number of wind energy facilities on the plateau may result in a loss of the built environment.		
Residual Impacts: Once the turbines are removed and the access roads are re-vegetated, there will be no further impacts on the built environment.		

Suggestions for the avoidance of stone kraals (identified on Google Earth) have been presented in Figures 4, 5, 6 and 7.

In the absence of clearly established guidelines in the Northern Cape for the minimum distance between turbines and buildings/structures older than 60 years, this report supports the guidelines of the Western Cape Provincial Government. They recommend that turbines are placed at least 500m from heritage sites. This would presumably include buildings which are older than 60 years and protected by the NHRA. An appropriate buffer should be established between the infrastructure of the wind energy facility and both occupied and abandoned homesteads. In the case of the North Plateau, no farm buildings are threatened by the present distribution of turbines.

The farm buildings within the De Aar 2 south WEF will not be demolished. If there are any intentions to renovate any of these structures so that they may be utilised as offices or staff quarters for the WEF, then an assessment of the heritage significance of the structures will be required. A permit may be required from SAHRA if the renovations include changes to the external façade.

Table 4: Summary of impacts to Cemeteries and Graves

NATURE OF IMPACT: The excavation of turbine footings, access roads, etc may result in the destruction of cemeteries and graves which are not clearly marked.		
	Without mitigation	**With Mitigation**

Extent	Regional	Local (severity can be mitigated)
Duration	Permanent	Permanent (even with mitigation, graves uncovered accidentally are still likely to be destroyed).
Magnitude	High	Very Low
Probability	Probable	Unlikely
Significance	High	Moderate
Status (positive or negative)	Negative	Neutral
Reversibility	No, no graves have been destroyed, they cannot be replaced.	
Irreplaceable loss of resources?	Yes, once graves are destroyed, they cannot be replaced.	
Can impacts be mitigated?	No, difficult to mitigate in advance, as locations of graves cannot be predicted in advance. Only mitigation is to ensure proper procedures are followed when graves uncovered.	

Mitigation: If graves are uncovered, work must stop in that area immediately and the SAHRA Burials Unit notified. An archaeologist will be asked to investigate, and various procedures may be proposed, including covering up the human remains and moving the turbines, etc. elsewhere. If exhumation is approved, this may be a lengthy process and costs will be for the developer.

Cumulative Impacts: The cumulative impact of several wind farms in the area enhances the likelihood of uncovering human remains.

If any human remains (including cemeteries or isolated graves) are encountered during the construction of the WEF, then work should stop in that area immediately and the ECO should contact SAHRA immediately.

Table 5: Summary of impacts to the Cultural Landscape

NATURE OF IMPACT: The construction of turbines, substations and overhead transmission lines may have a negative visual impact on the cultural landscape.		
	Without mitigation	**With Mitigation**
Extent	Local	Site specific
Duration	Long-term	Construction period
Magnitude	Medium	Low
Probability	Probable	Unlikely
Significance	Medium	Low
Status (positive or negative)	Negative	Neutral
Reversibility	Yes, once the turbines are removed after 25 years, the landscape will return to its approximate earlier state.	
Irreplaceable loss of resources?	No, once the turbines are removed, the landscape qualities will return to their earlier condition.	
Can impacts be mitigated?	Yes.	

Mitigation: The Proposed Amended Option includes 61 WTG, which is a substantial reduction from the 103 WTG in the Authorised Option. This reduction will have a positive impact on the visual impacts of the WEF on the Cultural Landscape.

Cumulative Impacts: The cumulative impact of several wind farms in the area will increase the visual impact on the cultural landscape of the Karoo. **Residual Impacts:** None.

The reduction of the number of WTG from 103 to 61, will result in a positive impact on the Cultural Landscape of the area.

8 CUMULATIVE IMPACTS

To all intents and purposes the Karoo has the qualities of an intact natural area but indications are that this situation is changing rapidly. There are numerous proposals for the establishment of renewable energy facilities around De Aar (both solar and wind) which will have a significant impact in terms of industrialisation of the landscape. According to the DEA webpage on Renewable Energy Applications (dea.maps.arcgis.com), there at least two proposed wind energy facilities to the north-east of De Aar, including the Longyuan Mulilo De Aar 2 North WEF (which has received approval) and the Castle WEF (to the east of the plateau) as well as at least one wind energy facility which has received EA to the south-west. There are also at least 8 solar energy facilities located to the north-east of De Aar.

These projects have received Environmental Authorisation and have either proceeded into the construction phase, or are expected to be constructed in the future. If all these projects proceed, then the De Aar 2 South WEF will be built in a landscape where wind turbines and solar facilities will be common features on the landscape.

Given that the visual impacts of the turbines and associated infrastructure cannot be effectively mitigated, the cumulative impact on a regional level will be considerable. While normal stock farming may be able to continue, the increased industrialisation of the landscape may stifle development that derives value from the wilderness experience i.e. hunting-related tourism, and may impede the development of the hospitality industry and sterilise any prospects of developing new wilderness areas/conservation areas or parks on any land with a radius of 10 km from any of the WEFs.

However, the positive outcome of this amendment has been the reduction in the number of turbines initially authorised for the project.

9 CONCLUSION

It is important to note the limitations of this desktop study. Namely that only substantial structures, such as farm complexes and large kraals, can be identified on Google Earth. Smaller structures such as shepherd's structures or graves cannot be identified. Nor is it possible to identify scatters of Stone Age archaeological material.

This is a significant limitation in terms of predicting impacts.

However, after consideration of the significance of the heritage resources (identified during the 2010 survey), it is concluded that the reduction in the number of WTG is generally positive from a heritage perspective.

General Recommendations

- Avoid constructing access roads along the lower slopes of valleys and along river banks to avoid impacting on significant sites and stone kraal complexes;

- Ensure access roads avoid passing in close proximity to farmsteads and associated farm buildings older than 60 years. In general a 400m buffer should be implemented around farmsteads particularly if the farm buildings are older than 60 years. This buffer can be reduced if the building contains no elements of heritage significance;
- Colonial kraals are generally highly visible and construction workers will be able to identify them. However, pre-colonial stone kraals will likely only be identified by a trained archaeologist – for this reason a walk down of the revised layout should be undertaken as part of the conditions of the EMP ;
- All farm cemeteries and individual graves should be avoided. A buffer of at least 15 m should be enforced around them. They are often difficult to identify, and for this reason a walk down of the revised layout should be undertaken as part of the conditions of the EMP;
- If any human remains are uncovered during the construction phase, work in that area should stop immediately and the South African Heritage Resources Association (SAHRA) must be notified;
- Guarantees for demolition of turbines after their useful life must be in place as a condition of approval.

Desktop Assessment of Proposed Amended Option and Specific Recommendations

There are at least four locations where the amended layout may impact negatively on heritage resources. They are:

- At the proposed 132 kV substation. The construction of the access road from WTG 10 to WTG 5 will cross the dry river bed in a rocky area with a possible cliff face. There is a possibility that there may be small rock shelters/caves with archaeological deposit and/or rock paintings in this rocky outcrop, making this river crossing sensitive. In addition, the access road will run in close proximity to a series of stone kraals identified in the 2011 survey.

It is recommended that a walk down is undertaken as part of the conditions of the EMP, to ensure that the proposed access road will not impact on potential heritage resources.

- While the Proposed Amended Option avoids the large MSA factory site on Knapdaar, aerial photographs (Google Earth) indicate circular features (kraals?) on the landscape in proximity to the access road connecting WTG47 with WTG46. These kraals vary between 30m and 90m from the stone kraals.

It is not possible to verify whether these stone “circles” reflect pre-colonial stone kraals without a field survey. It is possible that they may be natural phenomena.

It is recommended that a walk down is undertaken as part of the conditions of the EMP, to ensure that the proposed access road will not impact on potential heritage resources.

- The access road for the Proposed Amended Option connecting WTG45 with WTG37 will run within 90m of a series of at least three (3) kraals. The kraals may be associated with a farm building but the scale does not permit this to be determined. The kraal is located some 120 m to the south-west of WTG37.

It is not possible from the aerial photography to determine whether these are modern kraals with wire fencing, or older stone kraals. The age of the kraals can only be determined from a field assessment.

It is recommended that the proposed access road is acceptable but if there is any reason to move the access road any closer to the kraals, then a walk down is undertaken as part of the conditions of the EMP.

- The access road for the Proposed Amended Option linking WTG21 with WTG 60 runs 200m from a square kraal, overlooking a dry river. The kraal (?) falls outside the boundaries of the WEF.

The age of the kraal can only be determined from a field assessment.

It is recommended that the proposed access road is acceptable but if there is any reason to move the access road any closer to the kraals, then a walk down is undertaken as part of the conditions of the EMP.

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environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

DETAILS OF SPECIALIST AND DECLARATION OF INTEREST

	(For official use only)
File Reference Number:	12/12/20/ or 12/9/11/L
NEAS Reference Number:	DEA/EIA
Date Received:	

Application for integrated environmental authorisation and waste management licence in terms of the-

(1) National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended and the Environmental Impact Assessment Regulations, 2014; and

(2) National Environmental Management Act: Waste Act, 2008 (Act No. 59 of 2008) and Government Notice 921, 2013

PROJECT TITLE

PROPOSED WIND ENERGY FACILITY SITUATED ON THE EASTERN PLATEAU (SOUTH) NEAR DE AAR, NORTHERN CAPE PROVINCE: APPLICATION FOR AMENDMENT OF ENVIRONMENTAL AUTHORISATION

Specialist:	Lita Webley		
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Project Consultant:			
Contact person:			
Postal address:			
Postal code:		Cell:	
Telephone:		Fax:	
E-mail:			

4.2 The specialist appointed in terms of the Regulations_

I, LITA WEBLEY , declare that --

General declaration:

I act as the independent specialist in this application;
I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
I declare that there are no circumstances that may compromise my objectivity in performing such work;
I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
I will comply with the Act, Regulations and all other applicable legislation;
I have no, and will not engage in, conflicting interests in the undertaking of the activity;
I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
all the particulars furnished by me in this form are true and correct; and
I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

L. E. Webley

Signature of the specialist:

ACO ASSOCIATES CC

Name of company (if applicable):

24 July 2015

Date:

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ACADEMIC QUALIFICATIONS:

- Matriculated: 1974, Kloof High School, Kwa-Zulu Natal, South Africa
- BA (Hons) Archaeology, 1978, University of Stellenbosch
- MA (cum laude) Archaeology, 1984, University of Stellenbosch
- PhD Archaeology, 1992, University of Cape Town

PROFESSIONAL CAREER:

- 1979-1980: Junior lecturer, Semitic Languages, University of South Africa
- 1981: Junior Lecturer, Archaeology, University of Stellenbosch
- 1982-1983: Research Assistant, Anthropology, University of Stellenbosch
- 1984: Temporary Lecturer, Archaeology, University of Fort Hare
- 1985-1986: Teaching Assistant, Archaeology, University of Cape Town
- 1988-1990: Archaeologist, Natal Museum Services, Pietermaritzberg
- 1990-1997: Archaeologist, Albany Museum, Grahamstown
- 1997-1998: Assistant Director, Albany Museum, Grahamstown
- 1999-2005: Acting Head (Acting Deputy Director), Albany Museum, Grahamstown.
- 2005-2008: Director: Albany Museum
- 2008-to present: Principle Investigator, ACO Associates cc

FIELDS OF SPECIALITY AND COMPETENCE:

- Heritage and Archaeological Impact Assessments in Western Cape, Eastern Cape and Northern Cape;
- Accredited as Principal Investigator for Stone Age Archaeology, Shell Midden Archaeology, Colonial Period Archaeology, and as Field Director for Grave Relocations
- Ethno-archaeology (anthropology) and oral history in Northern and Eastern Cape
- Specialised in Archaeology of Northern Cape
- Presentation of Heritage Workshops to communities and government officials
- Excavations at over 50 archaeological sites
- Design and implementation of museum displays

CONSULTANCY WORK

- Completion of over 200 Heritage/Archaeological Impact Assessments since 1996;
- Heritage surveys/cultural mapping in: Richtersveld National Park, Addo National Park and Namaqua National Park;
- Heritage Surveys in Great Fish Nature Reserve, Fort Fordyce Nature Reserve, Karoo Nature and Mkambati Nature Reserve in the Eastern Cape Province.

PUBLICATIONS:

- Five chapters in books

- Total of 20 articles in refereed journals
- At least 20 popular articles
- Numerous conference presentations in South Africa and abroad (United States and Europe)

COURSES COMPLETED:

- GIS Course at Rhodes University in 2004
- Architectural and Urban Conservation Course (Skills Development) presented by Dr S Townsend in the Faculty of Engineering and the Built Environment, University of Cape Town, 2008.

PROFESSIONAL STATUS:

- Association of Southern African Professional Archaeologists
- Accredited Principle Investigator for CRM (Stone Age, Coastal Shell Middens and Colonial Archaeology) and Field Director (Burials and Exhumations)

HERITAGE COMMITTEES:

- 1994: Heritage sub-committee responsible for drafting new legislation for the Eastern Cape
- 1997-2001: Member of the transitional Eastern Cape Regional Committee of the National Monuments Council.
- 2003-2008: Executive member of Makana Heritage Forum (Makana Municipality) Grahamstown
- 2012 – to present: Member permits committee of the Eastern Cape Provincial Heritage resources Council (ECPHRA)
- 2013 – to present: Member of permits committee (APM) of Heritage Western Cape
- 2013 – to present: Member of the Council of Heritage Western Cape
- 2015 – to present: Member of the IACom committee of Heritage Western Cape

SKILLS BASE AND CORE COMPETENCIES

Managerial skills
Excavation skills (excavated over 50 archaeological sites)
Publication/report writing skills (published 25 peer-reviewed articles and chapters in books)
Editorial skills (served on 3 editorial boards)
Museum Display skills (involved in 8 Museum exhibitions)
Heritage management skills (served on various heritage bodies in Eastern & Western Cape)
Heritage training skills (presented 8 heritage training workshops to local communities and government officials)

Appendix C9:
Addendum to Palaeontological Impact Assessment

PALAEONTOLOGICAL SPECIALIST STUDY: ADDENDUM

Proposed application for amendment of the Environmental Authorisation for the proposed Wind Energy Facility situated on the Eastern Plateau (South) near De Aar, Northern Cape Province (DEA Ref No: 12/12/20/2463/AM3): Addendum to Specialist Paleontological Impact Assessment

John E. Almond PhD (Cantab.)
***Natura Viva* cc, PO Box 12410 Mill Street,**
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July 2015

EXECUTIVE SUMMARY

The Proposed Amended Option for the Longyuan Mulilo De Aar 2 South Wind Energy Facility is of similar LOW impact significance as far as palaeontological heritage resources are concerned to the original Authorized Option. Indeed, anticipated negative impacts on fossils preserved at or beneath the surface of the ground are probably significantly *lower* in the case of the Proposed Amended Option, given the substantially smaller number of wind turbines involved, and hence smaller volume of potentially fossiliferous bedrock that will be excavated during construction. The conclusions and recommendations of the original palaeontological heritage assessment report for the proposed wind energy facilities on the plateau near De Aar (Almond 2012) still stand.

1. BACKGROUND

The following background information for the De Aar 2 South Wind Energy Facility (WEF) has been abstracted from an account provided by Holland and Associates Environmental Consultants, Tokai (dated 8 June 2015):

> Mulilo Renewable Energy (Pty) Ltd applied for Environmental Authorisation from the Department of Environmental Affairs (DEA) in 2011 to establish a Wind Energy Facility (WEF) and associated infrastructure on the eastern plateau of De Aar (approximately 20 km to the east of the town) (referred to herein as the "De Aar 2 South WEF"). The proposed development site is approximately 12,832ha in extent and consists of 8 portions of 4 farms. The original proposed WEF comprised approximately 103 turbines, each with a generation capacity of 1.5 - 2.5MW. (Note that the potential generation capacity of the WEF has subsequently been limited to 140MW in accordance with the Department of Energy's cap on maximum megawatts, although 258MW was authorised).
>
> The EIA process for the proposed project was completed by Aurecon South Africa (Pty) Ltd in 2012 and Environmental Authorisation for the proposed project was granted by DEA on 1 March 2013.
>
> An Application for Amendment of the EA was submitted by the Applicant to DEA in May 2013 to change the Special Purpose Vehicle (SPV) name from "Mulilo Renewable Energy (Pty) Ltd" to "Longyuan Mulilo De Aar 2 South (Pty) Ltd". This amendment of the EA was granted

by DEA on 21 May 2013. On the 10 July 2014, the Applicant submitted an Application for Amendment of the Environmental Authorisation to DEA for the following amendments: Amendment to extend the validity period; amendment to the property descriptions of the EA; and amendments to Conditions 43, 44 and 45. The amendment of the EA was granted by DEA on 14 August 2014.

Longyuan Mulilo De Aar 2 South (Pty) Ltd (hereafter referred to as the Applicant) proposes to amend the project description of the proposed WEF (See summary in Table 1 below). The De Aar 2 South WEF wishes to increase the generating size of the wind turbine generators (WTG) in order to align to current international WTG models while reducing the number of WTG on the WEF (See satellite image Figure 1). The following changes to the WTG parameters are proposed:

- Increasing hub heights from 100 m to 120m;
- Increasing blade lengths from 60 m to 80m;
- Increasing WTG generation size from 2.3MW to 4.0MW.

The generation capacity of the WEF would be a maximum of 140MW (in accordance with the Department of Energy's cap on maximum megawatts). These changes would result in an increase of the turbine tower base diameter from 15 m to 20 m and the construction pad would remain 40 m x 50 m.

Holland & Associates - Environmental Consultants (Contact details: Ms Nicole Holland/ Mr Barry Wiesner: Holland & Associates. P O Box 31108, Tokai, 7966, South Africa. Mobile 082 463 6221. Fax 086 7626126. E-mail: info@hollandandassociates.net. Web: www.hollandandassociates.net) has been appointed by the Applicant to undertake the requisite application for amendment of the Environmental Authorisation (EA) for the proposed project, in accordance with the National Environmental Management Act (NEMA) (No. 107 of 1998) EIA Regulations (2014).

The application for amendment of the EA requires a re-assessment of potential paleontological impacts associated with the proposed changes to the project description. A combined desktop and field-based palaeontological heritage assessment of the Authorized Option for the De Aar 2 South WEF was originally submitted by the present author (Almond 2012a). The present palaeontological heritage assessment of the Proposed Amended Option, as outlined in Table 1 and in Figure 1, has been commissioned by Holland & Associates and is presented as an Addendum to the original report.

Table 1: Comparison of wind turbine generator data for the Authorised and Proposed Amended Options for the De Aar 2 South WEF

Component	Authorised option	Proposed amended option
Number of turbines	103	61 Turbines @ 2.3MW per turbine (to 30 Turbines @ 4MW per turbine). The maximum of 61 will be applied for.
Generation capacity per turbine	1.5 - 2.5MW	2.3MW – 4.0MW
Generation capacity of the WEF	155 - 258MW	140 MW
Rotor / blade diameters	120m	(min) 100m (max) 160m (Note: The maximum of 160m is being applied for)
Hub height	100m	(min) 90m (max) 120m (Note: The maximum of 120m is being applied for)
Turbine tower-base diameter	15 m	20 m
Construction Hardstand Pad	40m x 50m (adjacent to each turbine)	40m x 50m (adjacent to each turbine)
Permanent affected area (foundation size)	16 x 16m and 2m deep	18,4m diameter, that narrows up to 10,6m at the surface (the visible portion) once the foundation is completed. Depth : 3,5m

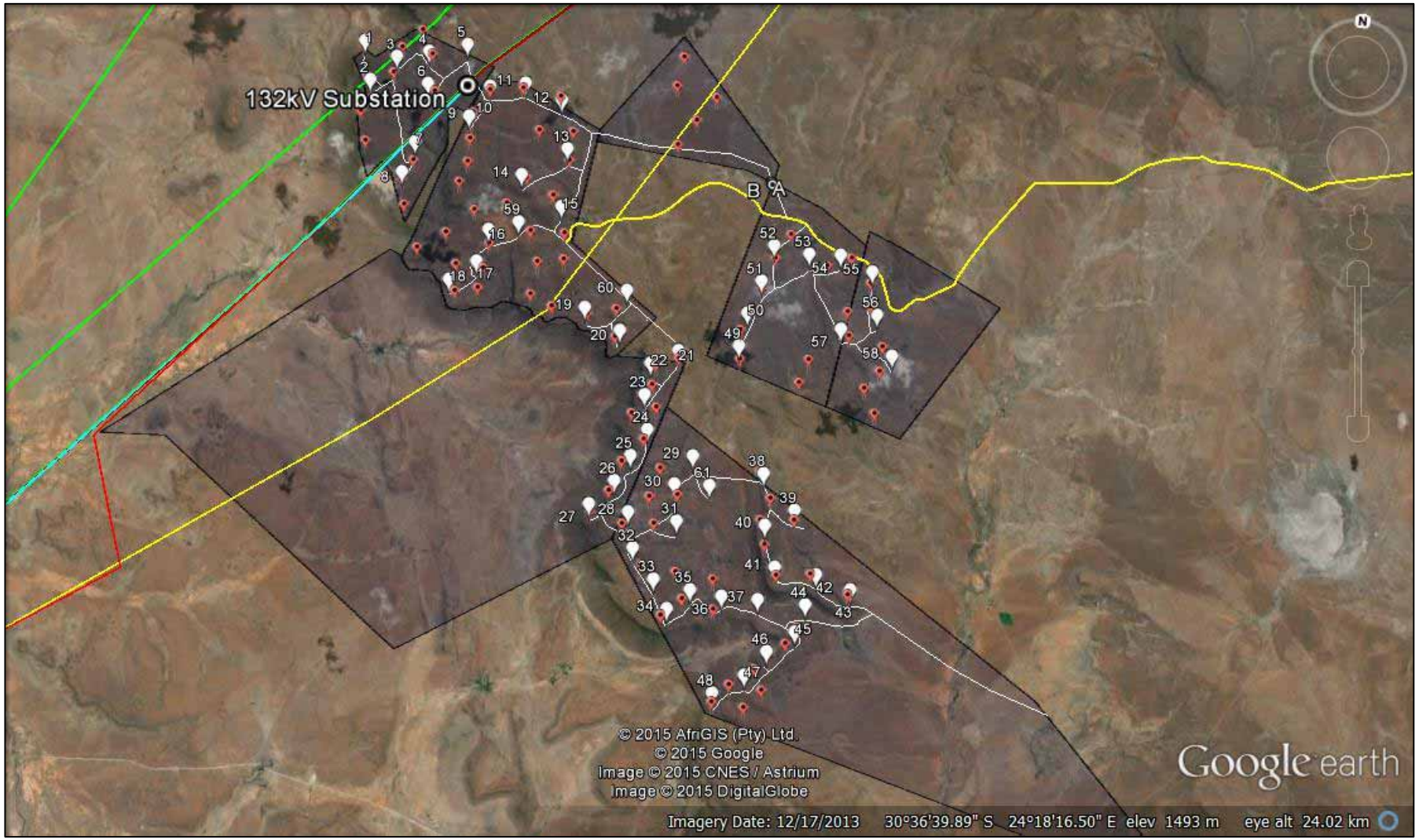

Figure 1. Google earth© satellite image showing the study area for the proposed De Aar 2 South WEF located on the plateau *c.* 20 km east of De Aar (shaded polygons). Red markers indicate WTG locations for the Authorized Option, while white markers show the WTG locations for the Proposed Amended Option (Image kindly supplied by Holland & Associates, Tokai).

2. PALAEONTOLOGICAL HERITAGE ASSESSMENT OF THE PROPOSED AMENDED OPTION

The proposed De Aar 2 South WEF project on the plateau near De Aar is located in an area of the Karoo that is underlain by potentially fossiliferous sedimentary rocks of Palaeozoic and younger, probably Quaternary age, notably the Karoo Supergroup (Almond 2012a). The construction phase of this renewable energy development will entail numerous, but mostly shallow, excavations into the superficial sediment cover and in some areas into the underlying bedrock as well. These include, for example, excavations for the wind turbine foundations, underground cables, new electricity transmission lines and substations, as well as new gravel access roads and any control / administrative buildings. In addition, substantial areas of bedrock will be sealed-in or sterilized by infrastructure such as lay-down and standing areas for the wind turbines as well as new access roads. All these developments may adversely affect fossil heritage within the development footprint by destroying, disturbing or permanently sealing-in fossils at or below the ground surface that are then no longer available for scientific research or other public good. All fossil heritage in the RSA is protected by the South African Heritage Resources Act (Act No. 25 of 1999) which states that no person may destroy, damage, excavate, alter, deface or otherwise disturb any palaeontological site without a permit issued by the responsible heritage resources authority.

The increased size of the WTG foundations will entail the disturbance of a larger volume of bedrock for each WTG location in the Proposed Amended Option compared to the Authorised Option (Table 1). However, this is more than compensated by the greatly reduced number of WTG (from 103 down to 61) in the Proposed Amended Option. Anticipated impacts on fossil heritage resources at the surface or underground are therefore significantly *lower* in the case of the Proposed Amended Option.

As outlined in the original palaeontological assessment report (Almond 2012a), the majority of proposed WTG locations are underlain by unfossiliferous dolerite or superficial deposits (soil / colluvium / alluvium *etc*) or low palaeontological sensitivity. This applies equally to the layout in the Proposed Amended Option (Figure 1).

A brief assessment of the impact significance (before and after mitigation) of the Proposed Amended Option for the De Aar 2 South WEF in terms of palaeontological heritage resources is given in Table 2 below, as required in terms of the 2014 EIA Regulations. Only the construction phase is considered here since further significant impacts are *not* anticipated during the operational and decommissioning phases. It is concluded that the impact significance of the proposed development, both before and after mitigation, is LOW, and associated cumulative impacts are likewise probably LOW.

3. CONCLUSIONS

The Proposed Amended Option for the De Aar 2 South WEF is of similar LOW impact significance as far as palaeontological heritage resources are concerned to the original Authorized Option. Indeed, anticipated negative impacts on fossils preserved at or beneath the surface of the ground are probably significantly *lower* in the case of the Proposed Amended Option, given the substantially smaller number of wind turbines involved, and hence smaller volume of potentially fossiliferous bedrock that will be excavated during construction.

The original conclusions regarding the impact significance of the proposed WEF situated on the plateau (south) near De Aar therefore apply equally to the Authorised Option and to the Proposed Amended Option, *viz*:

> Given the low overall palaeontological sensitivity of the Eastern Plateau region near De Aar, and the widespread occurrence elsewhere in the Great Karoo of most of the fossils so far recorded there, the successive or concurrent development here of the two wind energy

facilities that have been proposed by Longyuan Mulilo De Aar 2 South (Pty) Ltd and Longyuan Mulilo De Aar 2 North (Pty) Ltd does not pose a significant cumulative impact on local fossil heritage.

In view of the overall low [impact] significance of the proposed developments on palaeontological heritage resources, it is concluded that no further palaeontological heritage studies or specialist mitigation are required for these WEF projects, pending the exposure of any substantial fossil remains (*e.g.* vertebrate bones and teeth, large blocks of petrified wood, vertebrate trackways) during the construction phase. The ECO responsible for these developments should be alerted to the possibility of fossil remains being found on the surface or exposed by fresh excavations during construction. Should substantial fossil remains be discovered during construction, these should be safeguarded (preferably *in situ*) and the ECO should alert SAHRA so that appropriate mitigation (*e.g.* recording, sampling or collection) can be taken by a professional palaeontologist.

Table 2: Assessment of impacts of the proposed De Aar 2 South WEF (Proposed Amended Option) on fossil heritage resources during the construction phase of the development (*N.B.* Significant impacts are *not* anticipated during the operational and decommissioning phases).

Nature of impact: Disturbance, damage, destruction or sealing-in of scientifically valuable fossil remains preserved at or beneath the ground surface within the development area, most notably by surface clearance and bedrock excavations during the construction phase (*e.g.* WTG foundations)		
	Without mitigation	**With mitigation**
Extent	Local (restricted to development footprint)	Local (restricted to development footprint)
Duration	Impacts occur only during construction phase but are permanent in effect	Impacts occur only during construction phase but are permanent in effect
Magnitude	Low	Low
Probability	Low	Low
Significance	**LOW**	**LOW**
Status	Negative	Negative (loss of fossils) & positive (improved fossil database following mitigation)
Reversibility	Irreversible	Irreversible
Irreplaceable loss of resources	Possible, but the limited fossil resources concerned may well also be represented outside the development area (*i.e.* not unique)	Possible, but the limited fossil resources concerned may well also be represented outside the development area (*i.e.* not unique)
Can impacts be mitigated?	Yes	Yes.
Mitigation: Monitoring of all substantial bedrock excavations for fossil remains by ECO, with reporting of substantial new palaeontological finds (notably fossil vertebrate bones & teeth) to SAHRA for possible specialist mitigation.		
Cumulative impacts: Unknown (Insufficient data on local alternative energy and other developments available) but probably LOW given rarity of fossil reports from the region and high levels of dolerite intrusion in the De Aar plateau region.		
Residual impacts: Negative impacts due to loss of local fossil heritage will be partially offset by *positive* impacts resulting from mitigation (*i.e.* improved palaeontological database).		

REFERENCES

ALMOND, J.E. 2010a. Proposed windfarm at Maanhaarberg near De Aar, Northern Cape Province. Palaeontological impact assessment: desktop study, 21 pp. Natura Viva cc, Cape Town.

ALMOND, J.E. 2010b. Proposed photovoltaic power generation facility at De Aar, Northern Cape Province. Palaeontological impact assessment: desktop study, 17 pp. Natura Viva cc, Cape Town.

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ALMOND, J.E. 2012a. Two wind energy facilities on the Eastern Plateau near De Aar, Northern Cape Province, proposed by Mulilo Renewable Energy (Pty) Ltd. Palaeontological specialist study: combined desktop and field-based assessments, 55 pp. Natura Viva cc, Cape Town.

ALMOND, J.E. 2012b. Proposed Mulilo Renewable Energy PV2, PV3 and PV4 photovoltaic energy facilities on Farms Paarde Valley, Badenhorst Dam and Annex Du Plessis Dam near De Aar, Northern Cape Province. Palaeontological specialist study: combined desktop and field-based assessments, 45 pp. Natura Viva cc, Cape Town.

ALMOND, J.E. 2012c. Proposed solar power generation facilities on the remaining extent of the farm Vetlaagte No. 4, De Aar, Northern Cape Province. Palaeontological specialist study: combined desktop and field-based assessments, 32 pp. Natura Viva cc, Cape Town.

environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

DETAILS OF SPECIALIST AND DECLARATION OF INTEREST

	(For official use only)
File Reference Number:	12/12/20/ or 12/9/11/L
NEAS Reference Number:	DEA/EIA
Date Received:	

Application for integrated environmental authorisation and waste management licence in terms of the-

(1) National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended and the Environmental Impact Assessment Regulations, 2014; and

(2) National Environmental Management Act: Waste Act, 2008 (Act No. 59 of 2008) and Government Notice 921, 2013

PROJECT TITLE

PROPOSED WIND ENERGY FACILITY SITUATED ON THE EASTERN PLATEAU (SOUTH) NEAR DE AAR, NORTHERN CAPE PROVINCE: APPLICATION FOR AMENDMENT OF ENVIRONMENTAL AUTHORISATION

Specialist:	Dr John E. Almond		
Contact person:	As above		
Postal address:	PO Box 12410 Mill Street, CAPE TOWN, RSA		
Postal code:	8010	Cell:	071 947 0577
Telephone:	021 462 3622	Fax:	n/a
E-mail:	almond@universe.co.za		
Professional affiliation(s) (if any)	Palaeontological Society of Southern Africa, Geological Society of SA, Association of Professional Heritage Practitioners		

Project Consultant:	Holland and Associates		
Contact person:	Barry Wiesner		
Postal address:	P.O. Box 31108, Tokai, RSA		
Postal code:	7966	Cell:	082 463 6221
Telephone:		Fax:	
E-mail:	barry@hollandandassociates.net		

4.2 The specialist appointed in terms of the Regulations_

I, **Dr John Edward Almond**, declare that: ___

I act as the independent specialist in this application;
I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
I declare that there are no circumstances that may compromise my objectivity in performing such work;
I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
I will comply with the Act, Regulations and all other applicable legislation;
I have no, and will not engage in, conflicting interests in the undertaking of the activity;
I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
all the particulars furnished by me in this form are true and correct; and
I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

Signature of the specialist:

John E Almond

Name of company (if applicable):

Natura Viva cc

Date:

5 July 2015

Curriculum Vitae

JOHN E. ALMOND Ph.D. (Cantab)

***Natura Viva* cc, PO Box 12410 Mill Street, CAPE TOWN 8010, RSA**
tel: (021) 462 3622 e-mail: naturaviva@universe.co.za

- **Honours Degree in Natural Sciences (Zoology)**, University of Cambridge, UK (1980).

- **PhD in Earth Sciences (Palaeontology)**, University of Cambridge, UK (1986).

- **Post-doctoral Research Fellowships** at University of Cambridge, UK and Tübingen University, Germany (Humboldt Research Fellow).

- **Visiting Scientist** at various research institutions in Europe, North America, South Africa and fieldwork experience in all these areas, as well as in North Africa.

- **Scientific Officer, Council for Geoscience, RSA** (1990-1998) – palaeontological research and fieldwork – especially in western RSA and Namibia.

- **Managing Member, *Natura Viva* cc** – a Cape Town-based company specialising in broad-based natural history education, tourism and research – especially in the Arid West of Southern Africa (2000 onwards). *Natura Viva* cc produces **technical reports** on palaeontology, geology, botany and other aspects of natural history for public and private nature reserves.

- **Current palaeontological research** focuses on fossil record of the Precambrian / Cambrian boundary (especially trace fossils), and the Cape Supergroup of South Africa.

- **Registered Field Guide** for **South Africa** and **Namibia**

- **Member of the A-team, Botanical Society of SA** (Kirstenbosch Branch) – involved in teaching and training leaders for botanical excursions. Invited leader of annual Botanical Society excursions (Kirstenbosch Branch) to Little Karoo, Cederberg, Namaqualand and other areas since 2005.

- **Professional training of Western and Eastern Cape Field Guides** (FGASA Level 1 & 2, in conjunction with *The Gloriosa Nature Company*) and of Tourist Guides in various aspects of natural history.

- Involved in **extra-mural teaching in natural history** since the early 1980s. Extensive experience in **public lecturing**, running **intensive courses** and leading **field excursions for professional academics as well as enthusiastic amateurs** (*e.g.* Geological Society / Archaeological Society / Friends of the SA Museum / Cape Natural History Club / Mineral Club / Botanical Society of South Africa / SA Museum Summer & Winter School Programmes / UCT Summer School)

- **Development of palaeontological teaching materials** (textbooks, teachers guides, palaeontological displays) and **teacher training** for the new school science curriculum (GET, FET).

- Former long-standing member of **Archaeology, Palaeontology and Meteorites Committee for Heritage Western Cape (HWC)**. Advisor on palaeontological conservation and management issues for the Palaeontological Society of South Africa (PSSA), HWC and SAHRA (including APM Permit Committee at HWC). Compilation of **technical reports on provincial palaeontological heritage of Western, Northern and Eastern Cape** for SAHRA and HWC. Accredited member of PSSA and APHP (Association of Professional Heritage Practitioners, Western Cape).

- **Palaeontological impact assessments for developments in the Western Cape, Eastern Cape, Northern Cape, Free State, Northwest Province, Mpumulanga, Gauteng.** Several hundred desktop

studies and field assessments completed over the past few years. Examples of recent larger projects include:

(1) Several major alternative energy projects (wind / solar) in the Prieska, De Aar and Cookhouse / Middleton areas (N. Cape, E. Cape)

(2) Palaeontological heritage survey of the Coega IDZ (E. Cape)

(3) On-going survey of borrow pits in the Western Cape

(4) On-going palaeontological heritage assessments for the Transnet 16 mtpa railway development, Hotazel to Coega IDZ (N. Cape, E. Cape)

(5) Eskom transmission line developments such as Gamma-Omega and Gamma Perseus projects (N. Cape, W. Cape, Free State)

(6) Mining exploration studies on the Great Karoo

- **Reviews of fossil records** relating to new 1: 250 000 geological maps published by the Council for Geoscience (Geological Survey of SA) – *e.g.* Clanwilliam, Loeriesfontein, Alexander Bay sheets.

APPENDIX D:

Details of EAP and Declaration of Interest

environmental affairs
Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

DETAILS OF EAP AND DECLARATION OF INTEREST

	(For official use only)
File Reference Number:	12/12/20/ or 12/9/11/L
NEAS Reference Number:	DEA/EIA
Date Received:	

Application for Amendment of the Environmental Authorisation ~~integrated environmental authorisation and waste management licence~~ in terms of the-

(1) National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended and the Environmental Impact Assessment Regulations, 2014; ~~and~~

(2) ~~National Environmental Management Act: Waste Act, 2008 (Act No. 59 of 2008) and Government Notice 921, 2013~~

PROJECT TITLE

PROPOSED WIND ENERGY FACILITY SITUATED ON THE EASTERN PLATEAU (SOUTH) NEAR DE AAR, NORTHERN CAPE PROVINCE: APPLICATION FOR AMENDMENT OF ENVIRONMENTAL AUTHORISATION

Environmental Assessment Practitioner (EAP):	Nicole Holland (t/a Holland & Associates Environmental Consultants		
Contact person:	Nicole Holland		
Postal address:	PO Box 31108, Tokai		
Postal code:	7966	Cell:	083 4645246
Telephone:	083 4645246	Fax:	086 7626126
E-mail:	nicole@hollandandassociates.net		
Professional affiliation(s) (if any)	Registered with the South African Council for Natural Scientific Professions (Reg No. : 400306\06). Member of IAIAsa (International Association for Impact Assessment (Western Cape branch)		
Project Consultant:	Longyuan Mulilo De Aar 2 South (Pty) Ltd		
Contact person:	Mrs Karen Low		
Postal address:	PO Box 50, Cape Town International Airport,		
Postal code:	7525	Cell:	
Telephone:	(021) 934 5278	Fax:	(021) 935 0505
E-mail:	karen@mulilo.com		

4.2 The Environmental Assessment Practitioner

I, **Nicole Holland** , declare that –

General declaration:

I act as the independent environmental practitioner in this application;
I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
I declare that there are no circumstances that may compromise my objectivity in performing such work;
I have expertise in conducting environmental impact assessments, including knowledge of the Act, regulations and any guidelines that have relevance to the proposed activity;
I will comply with the Act, Regulations and all other applicable legislation;
I will take into account, to the extent possible, the matters listed in regulation **8** of the Regulations when preparing the application and any report relating to the application;
I have no, and will not engage in, conflicting interests in the undertaking of the activity;
I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
I will ensure that information containing all relevant facts in respect of the application is distributed or made available to interested and affected parties and the public and that participation by interested and affected parties is facilitated in such a manner that all interested and affected parties will be provided with a reasonable opportunity to participate and to provide comments on documents that are produced to support the application;
I will ensure that the comments of all interested and affected parties are considered and recorded in reports that are submitted to the competent authority in respect of the application, provided that comments that are made by interested and affected parties in respect of a final report that will be submitted to the competent authority may be attached to the report without further amendment to the report;
I will keep a register of all interested and affected parties that participated in a public participation process;
I will provide the competent authority with access to all information at my disposal regarding the application, whether such information is favourable to the applicant or not;
all the particulars furnished by me in this form are true and correct;
will perform all other obligations as expected from an environmental assessment practitioner in terms of the Regulations; and
I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

Disclosure of Vested Interest (delete whichever is not applicable)

I do not have and will not have any vested interest (either business, financial, personal or other) in the proposed activity proceeding other than remuneration for work performed in terms of the Environmental Impact Assessment Regulations, 2014;

~~I have a vested interest in the proposed activity proceeding, such vested interest being:~~

_____

_____

_____

_____

Signature of the environmental assessment practitioner:

Holland & Associates Environmental Consultants (trading name)

Name of company:

30/07/2015

Date:

N L HOLLAND

CURRICULUM VITAE

Name	**:**	Nicole Lisa Holland
Profession	**:**	Environmental Assessment Practitioner
Year of Birth	**:**	1976
Nationality	**:**	South African
Contact Details	**:**	P.O. Box 31108, Tokai, 7966 Cell: 083 4645246 Fax: 086 7626126 (S.A only) Email: Nicole@hollandandassociates.net

MEMBERSHIP IN PROFESSIONAL ASSOCIATIONS:

- Professional Environmental Scientist: South African Council for Natural Scientific Professions (Registration Number: 400306/06)
- Member: South African affiliate of International Association for Impact Assessment (IAIAsa)
- Founding member: Environmental Assessment Practitioners Association of South Africa

KEY QUALIFICATIONS:

Nicole Holland has a Bachelor of Science (Hons) in Environmental and Geographical Science from the University of Cape Town, specializing in Environmental Management. She has thirteen years of experience in the environmental management field and has compiled and managed numerous environmental investigations including Environmental Impact Assessments, Environmental Management Plans/Programmes (EMP), waste management license application processes, as well as applications for amendments of environmental authorizations.

Nicole has played a leading role in the development of a number of strategic environmental policies and programmes including the development of an Integrated Environmental Programme for the West Coast District; the compilation of a water resource protection sub-strategy for the Olifants Doring Catchment Management Strategy; as well as the development of an information document on environmental legislation and its associated implications for the Drakenstein Municipality's Civil Engineering Services Department.

Nicole has extensive experience in managing Environmental Impact Assessments including, amongst others, water supply schemes and dams, wastewater treatment works, wind energy facilities, housing and resort developments, cemeteries, road upgrades, pipelines, waste sites, and a cement manufacturing plant. Nicole has also undertaken the independent review of a number of Basic Assessment and Scoping and Environmental Impact Reports and has been involved in a broad spectrum of other environmental work including Environmental Auditing, the drafting of Environmental Management Programs, and Environmental Control Officer work.

EXPERIENCE RECORD

1) Regulatory processes and Environmental Impact Assessments

2014	Environmental Assessment Practitioner	**Proposed Wind Energy Facility situated on the Eastern Plateau (South) near De Aar, Northern Cape Province** Appointed by Mulilo Renewable Project Developments to undertake the Application for Amendment of the Environmental Authorisation for the abovementioned project, as well as the requisite public participation process.
2014	Environmental Assessment Practitioner	**Proposed Wind Energy Facility near Springbok, Northern Cape Province** Appointed by Mulilo Renewable Project Developments to undertake the public participation process for the Application for Amendment of the Environmental Authorisation.
2014	Environmental Assessment Practitioner	**Proposed 50MW Wind Energy Generation Facility in Namaqualand, Western Cape Province** Appointed by Mulilo Renewable Project Developments to undertake the public participation process for the Application for Amendment of the Environmental Authorisation.
2014	Environmental Assessment Practitioner	**The independent review of Basic Assessment Reports for proposed borrow pits for the supply of materials for the re-gravelling and maintenance of various roads in the Western Cape** Appointed by Aurecon (Pty) Ltd to undertake the independent (peer) review of the Final Basic Assessment Reports for the above mentioned project within the Western Cape.
2014	Project Manager & Environmental Assessment Practitioner	**Proposed upgrade and relocation of the CCA and TBTN treatment Plants at Somerset Timbers, Strand, Western Cape** Appointed by Somerset Timbers (The Keith Wetmore Family Trust) to undertake the application process for the adoption/definition of an ad-hoc setback line for the proposed upgrade and relocation of their CCA and TBTN timber treatment plants at their premises in Strand. The project included preparation of the setback line application to the Department of Environmental Affairs and Development Planning as well as a public participation process.

2013-date	Project Manager & Environmental Assessment Practitioner	**Proposed upgrading of a road leading to the Mossgas Quay, Port of Saldanha, Western Cape** Appointed by Element Consulting Engineers, on behalf of Transnet National Ports Authority, to undertake the Basic Assessment Process for the upgrading of a road leading to the Mossgas Quay in the Port of Saldanha. The project will include the compilation of a Basic Assessment Report, Environmental Management Programme as well as undertaking the public participation process.
2013	Project Manager & Environmental Assessment Practitioner	**Proposed Stormwater Channels and water supply pipeline for the construction of the Mouton Citrus Pack House, Citrusdal, Western Cape** Appointed by Mouton Citrus Pty Ltd to undertake the application process for the adoption/definition of an ad-hoc setback line for the proposed development on Portion 2 of the Farm Groot Valley No. 451 (Gelukwaard), Clanwilliam. The project included preparation of the setback line application to the Department of Environmental Affairs and Development Planning as well as a public participation process.
2012 – 2013	Project Manager & Environmental Assessment Practitioner	**Proposed upgrading of the Paarl Mountain and Ysterbrug pumping mains, Paarl, Western Cape** Appointed by Aurecon South Africa (Pty) Ltd, on behalf of the Drakenstein Municipality, to undertake a Basic Assessment Process for the Paarl Mountain and Ysterbrug pumping main upgrades on Paarl Mountain (a declared Provincial Heritage Site) in Paarl. The project includes the compilation of a Basic Assessment Report, Environmental Management Programme as well as undertaking the public participation process.
2012 - date	Project Manager & Environmental Assessment Practitioner	**Proposed Kleinberg Dam Scheme, Hex Valley, Western Cape, South Africa** Appointed by the Hex Valley Water Users Association to undertake a Scoping and Environmental Impact Reporting process for the proposed off channel Kleinberg Dam, Boskloof Dam and pipe distribution networks in the Sandriftkloof of the Hex Valley. The project includes the compilation of a Scoping Report, Environmental Impact Assessment Report, Environmental Management Programme as well as undertaking the public participation process for the EIA process.

2012	Project Manager & Environmental Assessment Practitioner	**Raising of Keerom Dam near Worcester, Western Cape, South Africa** Appointed by the Nuy Irrigation Board to undertake a Basic Assessment Process for the raising of the Keerom Dam near Worcester. The project included the compilation of a Basic Assessment Report, Environmental Management Programme as well as undertaking the public participation process.
2011	Specialist Reviewer	**Environmental Advisor and specialist reviewer for Treasure the Karoo Action Group: Hydraulic Fracturing in the Karoo, South Africa:** Appointed by Havemann Inc on behalf of Treasure the Karoo Action Group for the provision of environmental advisory services and review of various petroleum companies Applications and Environmental Management Programme Reports in terms of the Minerals and Petroleum Resources Development Act.
2011	Specialist Reviewer	**Mothae Diamond Mine, North-Eastern Lesotho:** Appointed by Amathemba Environmental Management Consulting CC to undertake the external review of environmental reports associated with the application for environmental authorization to undertake the proposed development.
2011	Project Manager / Environmental Assessment Practitioner	**Paarl bulk sewer: Application for amendment of the environmental authorisation, Paarl, Western Cape:** Appointed by Lyners consulting engineers to undertake an application for amendment of the environmental authorisation for the new Paarl South gravity outfall sewer (Paarl Bulk sewer). The project is to include the completion of the necessary forms, site assessment, assessment of potential impacts and a public participation process.
2011	Project Manager	**Proposed AfriSam cement plant, limestone and clay quarries and associated infrastructure in Saldanha, Western Cape:** Appointed by AfriSam (South Africa) (Pty) Ltd to undertake a Scoping and Environmental Impact Assessment process (EIA) for the proposed construction of a cement plant, limestone and clay quarries and a transportation corridor (road/ conveyor) linking the quarries to the cement plant, in Saldanha, Western Cape. In addition to an application in terms of the NEMW EIA regulations, the project included an application for the requisite waste management license in terms of the National Environmental Management: Waste Act and Atmospheric Emissions Licence in terms of the National Environmental Management: Air Quality Act.

2011	Project Manager/ Environmental Assessment Practitioner	**Proposed wind energy facility near Gouda, Western Cape:** Appointed by iNca Energy to undertake a Scoping and Environmental Impact Assessment (EIA) for a proposed wind energy facility (30 MW) on Portion 1 of Farm 397 and Portion 2 of Farm 397 near Gouda in the Western Cape, including the construction of two 66kV overhead powerlines to connect into the ESKOM grid.
2011	Project Manager/ Environmental Assessment Practitioner	**Proposed wind energy facility near Vredenburg, Western Cape:** Appointed by iNca Energy to undertake a Scoping and Environmental Impact Assessment (EIA) for a proposed wind energy facility (30 MW) on Remainder of Farm 103, Waterklip, Portion 6 of Farm 103, Waterklip, Portion 3 of Farm 105, Zandfontein and Portion 5 of Farm 105, Zandfontein near Vredenburg in the Western Cape, including the construction of two 66kV overhead powerlines to connect into the ESKOM grid.
2011	Environmental Advisor	**Upgrading of Wellington Wastewater Treatment Works, Western Cape:** Provision of environmental advisory services to Aurecon's wastewater engineers and the appointed environmental consultants, including the drafting of specialists' terms of reference and review of specialist reports.
2009-2010	Project Manager/ Environmental Assessment Practitioner	**Application for amendment of Environmental Authorisation: Paarl South Gravity Outfall Sewer:** Appointed by Lyners Engineers to undertake an application for amendment of the Environmental Authorisation for the project, which included realignment of portions of the pipeline along the Berg River and additional pipeline river crossings.
2009 - 2010	Project Manager/ Environmental Assessment Practitioner	**Proposed upgrading of the Piketberg Wastewater Treatment Works, Western Cape, South Africa:** Appointed by Water & Wastewater Engineer to undertake a Scoping and Environmental Impact Assessment (EIA) for the proposed upgrading of the Piketberg Wastewater Treatment Works, including an application for the requisite waste management license in terms of the National Environmental Management: Waste Act.
2008 - 2009	Project Manager/ Environmental Assessment Practitioner	**Proposed construction of a disinfection plant at the Athlone Wastewater Treatment Works, Western Cape, South Africa:** Appointed by City of Cape Town (Wastewater Directorate) to undertake a Scoping and Environmental Impact Assessment for the proposed construction of a disinfection plant at the Athlone Wastewater Treatment Works (WWTW). The project entailed the compilation of a Scoping Report, Environmental Impact Report and undertaking a public participation process.

2008	Project Manager/ Environmental Assessment Practitioner	**Proposed flow diversion at Green Point Outfall Sewer, Green Point, Western Cape, South Africa:** Appointed by City of Cape Town (Wastewater Directorate) to undertake a Basic Assessment for the proposed flow diversion at the Green Point Outfall Sewer in Green Point, Cape Town. The project entailed the compilation of a Basic Assessment Report and undertaking a public participation process.
2007 - 2008	Project Manager/ Environmental Assessment Practitioner	**Upgrading of the Malmesbury Wastewater Treatment Works, Malmesbury, Western Cape, South Africa:** Appointed by the Swartland Municipality to undertake an EIA for the upgrading of the Malmesbury Wastewater Treatment Works. The project entailed the compilation of Application Form and Scoping Checklist, Background Information Document, Scoping Report and undertaking a public participation process.
2006 to 2009	Project Staff/ Environmental Assessment Practitioner	**Raising of Clanwilliam Dam in the Western Cape, South Africa:** The Department of Water Affairs and Forestry initiated a study to consider the feasibility of raising the Clanwilliam Dam whilst undertaking required remedial works. The study included a comprehensive options assessment to identify the preferred suite of development options within the Water Management Area (WMA). The study verified the technical, environmental, social, economic and financial viability of raising the Clanwilliam Dam and determined the optimal dam height. Alternatives for increasing supply volumes were investigated in relation to social development needs in the region. This study included an extensive public consultation and an EIA process.
2005 - 2008	Project Manager/ Environmental Assessment Practitioner	**Drakenstein Wastewater Treatment Strategy: Siting of Paarl South Wastewater Treatment Works, Paarl, Western Cape, South Africa.** Appointed by Drakenstein Municipality to undertake an EIA for the siting of the future Paarl South WWTW. The project entailed the compilation of Application Form and Scoping Checklist, Background Information Document, Scoping Report, Environmental Impact Report and undertaking a public participation process.
2005 - 2006	Project Staff/ Environmental Assessment Practitioner	**Drakenstein Wastewater Treatment Strategy: Upgrading of Paarl Wastewater Treatment Works and construction of the Paarl South outfall sewer, Paarl, Western Cape, South Africa.** Appointed by Community Engineering Services, on behalf of the Drakenstein Municipality, to undertake an EIA for the proposed projects. The project entailed the compilation of Application Form and Scoping Checklist, Background Information Document, Scoping Report, Environmental Impact Report and undertaking a public participation process.

2005 - 2007	Project Staff/ Environmental Assessment Practitioner	**Proposed Development of Portion 75 of Farm 205, Rugte Valley, Lake Pleasant, Southern Cape, South Africa:** Appointed by Craig Anderson to undertake an environmental evaluation of the site, to determine the opportunities and constraints of the property and compilation of an Application Form and Scoping Checklist.
2005 - 2006	Project Staff/ Environmental Assessment Practitioner	**Construction of Saxdowns Road between Hindle Road and Stellenbosch Arterial, Blue Downs, Western Cape, South Africa:** Appointed by Jeffares and Green for the City of Cape Town: Oostenberg Administration to undertake an EIA for the proposed construction of Saxdowns Road between Hindle Road and Stellenbosch Arterial. The project entailed the compilation of an Application Form and Scoping Checklist, Background Information Document and Scoping Report and included a public participation process.
2005	Project Staff/ Environmental Assessment Practitioner	**Proposed Upgrading of the Bonnievale Wastewater Treatment Works, Bonnievale, Western Cape, South Africa:** Appointed by the Breede River Winelands Municipality to undertake an EIA for the proposed upgrade of the Bonnievale Wastewater Treatment Works. The project entailed the compilation of an Application Form and Scoping Checklist, Background Information Document, Scoping Report and undertaking a public participation process.
2005	Project Staff/ Environmental Assessment Practitioner	**Proposed Construction of an effluent pipeline between the New Town Pump Station in Wellington and the Paarl Wastewater Treatment Works, Paarl, Western Cape, South Africa:** Appointed by Community Engineering Services, on behalf of the Drakenstein Municipality, to undertake an EIA for the proposed construction of an effluent pipeline between the New Town Pump Station in Wellington and the Paarl Wastewater Treatment Works. This involved the compilation of an Application Form and Scoping Checklist, and a public participation process.
2005	Project Staff/ Environmental Assessment Practitioner	**Upgrading of the Hex River Valley Weirs, Hex River Valley, Western Cape, South Africa:** Appointed by the Hex Valley Irrigation Board, in association with the Drieriviere Irrigation Board and Worcester East Water Users Association to undertake an EIA for the conversion of the existing Keurhoekkloof, Moraine Kloof and Sand River diversion weirs into measuring stations, and the construction of a new measuring station at Upper Buffelshoek or Dome Kloof. The project entailed the compilation of four Application Forms and Scoping Checklists.

2005	Project Staff/ Environmental Assessment Practitioner	**Further raising of the Zypherfontein Dam, Vanrhynsdorp, Western Cape, South Africa:** Appointed by the Doringrivier Trust to undertake the an EIA for the proposed further raising of the Zypherfontein Dam. This included the compilation of an Application Form and Scoping Checklist and public participation process.
2004 - 2005	Project Staff/ Environmental Assessment Practitioner	**Upgrading of the Darling Wastewater Treatment Works, Darling, Western Cape, South Africa:** Appointed by the Swartland Municipality to undertake an EIA for the proposed upgrading of the Darling Wastewater Treatment Works. The project entailed the compilation of a Background Information Document and an Application Form and Scoping Checklist, as well as a public participation process.
2004	Project Staff	**Eastford Residential Estate, Knysna, Southern Cape, South Africa:** Appointed by Garden Route Quarries (Pty) Ltd. to undertake an EIA for the proposed Eastford residential estate and commercial node, including the compilation of an Application Form and Scoping Checklist, Background Information Document and Scoping Report.
2004	Project Staff	**Little Ladywood Residential Estates, Plettenberg Bay, Southern Cape, South Africa:** Appointed by Swanvest 321 (Pty) Ltd. to undertake an EIA for the development of the proposed Little Ladywood Residential Estate.
2004	Project Staff	**Erf 2 Gordons Bay Residential Development, Gordons Bay, Western Cape, South Africa:** Appointed by Gordonia Mount Properties (Pty) Ltd. to undertake an EIA for the development of a residential estate. The project entailed the compilation of an Application Form and Scoping Checklist, Background Information Document and public participation process.
2004	Project Staff	**Gloria Cove Resort Housing Development, Theewaterskloof Dam, Western Cape, South Africa:** Appointed by Martinique Bay Marketing cc. to undertake an EIA for the proposed Gloria Cove resort development on the Theewaterskloof Dam. The project entailed the compilation of an Application Form and Scoping Checklist and Scoping Report, as well as a public participation process.
2004	Project Staff	**Erf 86 Development, Jacobsbaai, Western Cape, South Africa:** Appointed by Spring Romance 16 (Pty) Ltd. to undertake an EIA for the development of residential and resort erven. The project included the compilation of an Application Form and Scoping Checklist.

2004	Project Staff	**Gamka Private Nature Reserve, Calitzdorp, South Africa:** Appointed to undertake an EIA for the proposed Gamka Private Nature Reserve in Calitzdorp. The project included the compilation of an Application and Scoping Checklist and Background Information Document, as well as a public participation process.
2003 - 2004	Project Staff	**Verlorenvlei Coastal Game and Nature Reserve, Piketberg, Western Cape, South Africa:** Appointed by Dezzo Trading 126 (Pty) Ltd. to undertake an EIA for the proposed Verlorenvlei Coastal Game and Nature Reserve. The appointment entailed the compilation of an Application Form and Scoping Checklist, Background Information Document, Scoping Report and undertaking a public participation process.
2003 - 2004	Project Staff	**Langezandt Fishermen's Village Development, Struisbaai, Western Cape, South Africa:** Appointed by Expectra 525 (Pty) Ltd. to undertake a full EIA for the development of the proposed Langezandt Fishermen's Village, including the compilation of an Application Form and Scoping Checklist, Background Information Document, Scoping Report and Environmental Impact Report.
2003 - 2004	Project Staff	**Longlands Estate and Agricultural Village, Vlottenburg, Stellenbosch, Western Cape, South Africa:** Appointed by SLC Development Services (Pty) Ltd. to undertake a full EIA process for the development of the proposed Longlands Residential Estate and Agricultural village, including the compilation of an Application Form and Scoping Checklist, Background Information Document, Scoping Report and Environmental Impact Report.
2003 - 2004	Project Staff	**Two Oceans Golf Estate and Resort, Bredasdorp, Western Cape, South Africa:** Appointed by Twin Palm Projects (Pty) Ltd. to undertake an EIA for the proposed Two Oceans Golf Estate and Resort development, including the compilation of an Application Form and Scoping Checklist, Background Information Document and Scoping Report, and public participation process.
2003	Project Staff	**Ashton – Montagu Water Pipeline, Western Cape, South Africa:** Appointed by the Breede River Winelands Municipality to undertake an EIA for the construction of a water pipeline from Ashton to Montagu. The appointment entailed the compilation of an Application Form and Scoping Checklist, Scoping Report, public participation process and Environmental Management System.

2003	Project Staff	**Closure and Rehabilitation of the Arniston, Struisbaai and L'Agulhas Waste Disposal Sites, Western Cape, South Africa:** Appointed by the Cape Agulhas Municipality to undertake and EIA for the closure and rehabilitation of the L'Agulhas, Struisbaai and Arniston waste disposal sites. The project entailed the compilation of an Application Form and Scoping Checklist and Scoping Report, and public participation process.
2003	Project Staff	**Langebaan Eco-Lodge, Langebaan, Western Cape, South Africa:** Appointed by G&R Project Services and Developers (Pty) Ltd., to undertake an EIA for the development of the "Langebaan Eco Lodge". This project entailed an environmental evaluation of the site and preparation of a Background Information Document.
2003	Project Staff	**Upgrade of the Pennypinchers Timber Processing Plant, Cape Town, Western Cape, South Africa:** Appointed by the Peter Allan Building Material Trust to undertake an EIA for the upgrade of the Pennypinchers Timber Treatment Plant. This included the compilation of an Application Form and Scoping.
2003	Project Staff	**Upgrade of the Hannesbaai Fish Processing Factory, St Helena Bay, Western Cape, South Africa:** Appointed by Hannasbaai Fishing Co (Pty) Ltd. to undertake an EIA for the upgrade of the Hannesbaai Fish Factory (i.e. the erection of a coal-fired boiler and development of additional storage and factory area). The project entailed the compilation of an Application Form and Scoping Checklist and a public participation process.
2002 - 2004	Project Staff	**De Bosch Estate Development, Stellenbosch, Western Cape, South Africa:** Appointed by Crystal Court (Pty) Ltd. to undertake a full EIA for the proposed De Bosch residential estate. The project entailed the compilation of an Application and Scoping Checklist, Background Information Document, Scoping Report and Environmental Impact Report, as well as a public participation process.
2002 - 2004	Project Staff	**Draaihoek Guesthouse, Piketberg, Western Cape, South Africa:** Appointed by Draaihoek (Pty) Ltd. to undertake an EIA for the development of a guesthouse, which included the compilation of an Application Form and Scoping Checklist.
2002 - 2003	Project Staff	**New Villiersdorp Cemetery, Villiersdorp, Western Cape, South Africa:** Appointed by the Theewaterskloof Municipality to undertake an EIA for the development of the new Villiersdorp Cemetery. The project entailed the compilation of an Application Form and Scoping Checklist, Background Information Document and Scoping Report and public participation process.

2002 - 2003	Project Staff	**Trekoskraal Development, West Coast, Western Cape, South Africa:** Appointed by Castle Estates (Pty) Ltd. to undertake an EIA for the development of ± 4 700 erven on the 1 362ha property. The project (to date) entailed the compilation of an Application Form and Scoping Checklist, Background Information Document and Scoping Report.
2002	Project Staff	**Bokbaai Residential Conservation Smallholdings Development, Western Cape, South Africa**: Appointed by Bokbaai Property (Pty) Ltd. This project entailed an environmental evaluation of the site and preparation of an Application Form and Scoping Checklist.
2002	Project Staff	**Bredasdorp, Struisbaai and Napier Groundwater Development Programme, Western Cape, South Africa:** Appointed by the Cape Agulhas Municipality to undertake an EIA process for a groundwater exploration programme to augment the groundwater supplies of Bredasdorp, Struisbaai and Napier. The project included the compilation of an Environmental Impact Report and requisite public participation processes.
2002	Project Staff	**Bredasdorp - Arniston Water Pipeline, Western Cape, South Africa:** Appointed by the Cape Agulhas Municipality to undertake an EIA for the upgrading of approximately 12km of the existing water pipeline, by construction of a new water pipeline between Bredasdorp and Waenshuiskrans/ Arniston. The project entailed an environmental site evaluation and compilation of an Application Form and Scoping Checklist.
2002	Project Staff	**Koo Valley Groundwater Supply Scheme, Western Cape, South Africa:** Appointed by the Koo Irrigation Board for the Department of Economic Affairs, Agriculture and Tourism to undertake a full EIA for the Koo Valley Groundwater Supply Scheme.
2002	Project Staff	**Rivers Edge Resort, Bonnievale, Western Cape, South Africa:** Appointed by Toekomsbeleggings Nr. 1 (Edms) Bpk to undertake an EIA for the development of the Rivers Edge Resort Development.
2002	Project Staff	**Sixteen Mile Beach Development, Yzerfontein, Western Cape, South Africa:** Appointed by Kovacs Investments 172 (Pty) Ltd. to undertake an EIA for the proposed Sixteen Mile Beach resort development, including the compilation of an Application Form and Scoping Checklist.
2002	Project Staff	**Still Bay Jetski's, Western Cape, South Africa:** Appointed by the Langeberg Municipality to undertake an Environmental Assessment to address the recreational use of Jet Ski's off the Still Bay coastline.

2002	Project Staff	**Swartstomp Resort Development, Theewaterskloof Dam, Western Cape, South Africa:** Appointed by Mr C.J. Roux to undertake an EIA for the development of Swartstomp resort, including the compilation of an Application Form and Scoping Checklist and public participation process.

2) Assessment of Water Resource Developments and Catchment Management:

2012 - date	Project Manager & Environmental Assessment Practitioner	**Proposed Kleinberg Dam Scheme, Hex Valley, Western Cape, South Africa** Appointed by the Hex Valley Water Users Association to undertake a Scoping and Environmental Impact Reporting process for the proposed off stream Kleinberg Dam, Boskloof Dam and pipe distribution networks in the Sandriftkloof of the Hex Valley. The project includes the compilation of a Scoping Report, Environmental Impact Assessment Report, Environmental Management Programme as well as undertaking the public participation process for the EIA process.
2012	Project Manager & Environmental Assessment Practitioner	**Raising of Keerom Dam near Worcester, Western Cape, South Africa** Appointed by the Nuy Irrigation Board to undertake a Basic Assessment Process for the raising of the Keerom Dam near Worcester. The project included the compilation of a Basic Assessment Report, Environmental Management Programme as well as undertaking the public participation process.
2009	Project staff/ Environmental Assessment Practitioner	**C.A.P.E. Olifants Doorn Catchment Management Agency Project, Western Cape, South Africa:** Appointed by CapeNature to compile the catchment management strategy water resource protection sub-strategy for the Olifants-Doorn catchment.
2006 to 2009	Project staff/ Environmental Assessment Practitioner	**Raising of Clanwilliam Dam in the Western Cape, South Africa** The Department of Water Affairs and Forestry initiated a study to consider the feasibility of raising the Clanwilliam Dam whilst undertaking required remedial works. The study included a comprehensive options assessment to identify the preferred suite of development options within the Water Management Area (WMA). The study verified the technical, environmental, social, economic and financial viability of raising the Clanwilliam Dam and determined the optimal dam height. Alternatives for increasing supply volumes were investigated in relation to social development needs in the region. This study included an extensive public consultation and an EIA process.

2005	Project Staff/ Environmental Assessment Practitioner	**Upgrade of the Hex River Valley Weirs, Hex River Valley, Western Cape, South Africa:** Appointed by the Hex Valley Irrigation Board, in association with the Drieriviere Irrigation Board and Worcester East Water Users Association to undertaken an EIA for the conversion of the existing Keurhoekkloof, Moraine Kloof and Sand River diversion weirs into measuring stations, and the construction of a new measuring station at Upper Buffelshoek or Dome Kloof.
2005	Project Staff	**Raising of the Zypherfontein Dam, Vanrhynsdorp, Western Cape, South Africa:** Appointed by the Doringrivier Trust to undertake an EIA for the proposed raising of the Zypherfontein Dam.
2004 to date	Assistant Project Manager	**Southern High Confidence Reserve Determination: Project Management, Western and Eastern Cape, South Africa:** The Resource Directed Measures Directorate of the Department of Water Affairs and Forestry (DWAF) is tasked with the responsibility of determining Reserve requirements. The Reserve refers to the quality and quantity of water that is required to sustain aquatic ecosystems and basic human needs. The Olifants/ Doring and the Kromme/ Seekoei are such stressed catchments that were selected for High Confidence Reserve Determinations. DWAF appointed Ninham Shand to manage the Southern High Confidence Reserve Determination studies on their behalf. The project entailed undertaking administrative and financial control of the technical service providers as well as review of all deliverables.
2002	Project Staff	**Bredasdorp, Struisbaai and Napier Groundwater Development Programme, Western Cape, South Africa:** Appointed by the Cape Agulhas Municipality to undertake an EIA process for a groundwater exploration programme to augment the groundwater supplies of Bredasdorp, Struisbaai and Napier. The project included the compilation of an Environmental Impact Report and requisite public participation processes.
2002	Project Staff	**Koo Valley Groundwater Supply Scheme, Western Cape, South Africa:** Appointed by the Koo Irrigation Board for the Department of Economic Affairs, Agriculture and Tourism to undertake a full EIA for the Koo Valley Groundwater Supply Scheme.

3) Environmental Management Plans:

2008-2009	Environmental Control Officer	**Upgrading and extension of the Ben Schoeman Dock at Cape Town Harbour, Western Cape, South Africa**: Appointed by HMG-JV to provide the services of Environmental Control Officer for the upgrade and extension (including deepening) of the Ben Schoeman Dock at Cape Town Harbour. The primary duties and responsibilities included undertaking regular environmental audits of the project activities, and ultimately to monitoring compliance with the Record of Decision and Environmental Management Plan.
2007	Project Staff/ Environmental Assessment Practitioner	**Upgrading of the Darling Wastewater Treatment Works, Darling, Western Cape, South Africa:** Appointed by the Swartland Municipality to compile the Operational Phase Environmental Management Plan for the upgrading of the Darling WWTW.
2007 to 2009	Environmental Control Officer	**Phase 1B expansion of the iron ore facility at the Port of Saldanha, Saldanha Bay, Western Cape, South Africa:** Appointed by Transnet Projects to provide the services of Environmental Control Officer for Phase 1B expansion of the iron ore facility at the Port of Saldanha. The primary duties and responsibilities included undertaking regular environmental audits of the project activities, to act as secretariat for the monthly Environmental Monitoring Committee (EMC) meetings, to report back monthly at the EMC meetings regarding the status of Environmental Progress of Phase 1B, and ultimately to monitoring compliance with the Record of Decision and Environmental Management Plan.
2006	Environmental Control Officer	**Upgrading of the Darling Wastewater Treatment Works, Darling, Western Cape, South Africa**: Compiled construction phase Environmental Management Plan (EMP) for the upgrading of the Darling WWTW, as well as developing the Environmental Awareness Training Course for construction personnel and monitoring compliance with EMP.
2006	Environmental Control Officer	**Proposed Upgrading of the Bonnievale Wastewater Treatment Works, Bonnievale, Western Cape, South Africa**: Compiled EMP for the upgrading of the Bonnievale WWTW.
2005 - 2006	Environmental Control Officer	**Upgrading of the Hex River Valley Weirs, Hex River Valley, Western Cape, South Africa**: Compiled EMP for the upgrading of the Hex River Valley Weirs, as well as developing the Environmental Awareness Training Course for construction personnel and monitoring compliance with EMP.

2005	Senior Environmental Practitioner	**Proposed Construction of an Effluent Pipeline between the New Town Pump Station in Wellington and the Paarl Wastewater Treatment Works, Paarl, Western Cape, South Africa**: Compiled EMP for the construction of the effluent pipeline between the New Town Pump Station (Wellington) and the Paarl WWTW.
2005	Environmental Control Officer	**Upgrading of Bulk Water Supply Infrastructure at Mier, Northern Cape, South Africa:** Developing and presenting the Education Course for site staff and monitoring compliance with the EMP for the construction of the reservoirs at Klein Mier and Groot Mier.
2005	Environmental Control Officer	**Upgrading of Bulk Water Supply Infrastructure at Vanderkloof, Northern Cape, South Africa:** Developing and presenting the Education Course for site staff and monitoring compliance with the EMP for the construction phase of the project.
2005	Environmental Control Officer	**Upgrading of Bulk Water Supply Infrastructure at Vanwykslvei, Northern Cape, South Africa:** Developing and presenting the Education Course for site staff and monitoring compliance with the EMP for the construction phase of the project.
2005	Environmental Control Officer	**Construction of Water Reticulation at Augrabies, Northern Cape, South Africa:** Developing and presenting the Education Course for site staff and monitoring compliance with the EMP for the construction phase of the project.
2004 - 2005	Environmental Officer	**Tygerfalls Mixed Use Development, Bellville, Western Cape, South Africa**: Facilitate compliance by a private developer, Melvaphanda Property Holdings, with the environmental requirements for the activities associated realignment of the Elsieskraal River in Bellville. This entailed application in terms of the Environment Conservation Act and National Water Act.
2004	Project Staff	**Rivers Edge Resort, Bonnievale, Western Cape, South Africa:** Appointed by Toekomsbeleggings Nr. 1 (Edms) Bpk to compile an Environmental Management Plan for the development of the River's Edge Resort development on the Breede River.
2004	Project Staff	**Villiersdorp Cemetery, Villiersdorp, Western Cape, South Africa:** Appointed by the Theewaterskloof Municipality to compile an Environmental Management Plan for the development of the new Villiersdorp Cemetery.

2004	Project Staff	**Draaihoek Guesthouse, Piketberg, Western Cape, South Africa:** Appointed by Draaihoek (Pty) Ltd. to compile an Environmental Management Plan for the construction phase for the development of the Draaihoek Guesthouse.
2004	Project Staff	**La Pastorale Residential Development, Stellenbosch, Western Cape, South Africa:** Appointed by Mr C.M. Spottiswoode to compile an Environmental Management Plan for the development of the La Pastorale residential estate.
2004	Project Staff	**Swartstomp Resort Development, Theewaterskloof Dam, Western Cape, South Africa:** Appointed by C.J. Roux to compile an Environmental Management Plan for the development of the Swartstomp resort on the Theewaterskloof Dam.
2002	Project Staff	**Bredasdorp, Struisbaai and Napier Groundwater Development Programme:** Appointed by the Cape Agulhas Municipality to compile an Environmental Management Plan for the proposed Bredasdorp, Struisbaai and Napier Groundwater Development Programme (drilling, pump testing and operation of new boreholes).

4) Environmental Planning:

2006	Project Manager	**West Coast Integrated Environmental Programme, Western Cape, South Africa:** Appointed by the West Coast District Municipality to compile an Integrated Environmental Programme for the West Coast Region.

5) Business/Corporate/ Education Environmental Services:

2010	Project Manager	**Information document on environmental legislation and the associated implications for the Department of Civil Engineering Services, Drakenstein, Western Cape:** Appointed by the Drakenstein Municipality to compile an information document on environmental legislation and the associated implications for the Drakenstein Municipality's Department of Civil Engineering Services, including the development of decision support tools.
2009	Project Staff	**Environmental education for the Drakenstein Municipality and their civil engineering service providers:** Appointed by the Municipality to provide environmental training to the Municipality's engineers and environmental personnel, as well as their consulting civil engineers, regarding the changes to environmental legislation, including the NEMA EIA regulations and Waste Act, and the implications of such changes in legislation for the Municipality's proposed civil engineering projects.

2004 Project Staff **Pennypinchers Timber Processes, Cape Town, Western Cape, South Africa:** Appointed by the Peter Allan Building Material Trust to compile an Environmental Management System for the upgrade of the proposed Pennypinchers Timber Treatment Plant in Blackheath.

2003 Project Staff **Ashton – Montagu Water Pipeline, Western Cape, South Africa:** Appointed by the Breede River Winelands Municipality to compile an Environmental Management System for the installation, operation and rehabilitation phases of the Ashton-Montagu water pipeline, environmental awareness training for the site staff and monitoring.

6) Project Management:

2004-2006 Asst. Project Manager **Southern High Confidence Reserve Determination: Project Management, Western and Eastern Cape, South Africa:** The Department of Water Affairs appointed Ninham Shand to manage the Southern High Confidence Reserve Determination studies (i.e. for the Olifants/ Doring and the Kromme/ Seekoei catchments) on their behalf. The project entailed undertaking administrative and financial control of the technical service providers as well as review of all deliverables. Nicole acted as assistant project manager for the Olifants/ Doring component of the study.

COUNTRIES OF WORK EXPERIENCE:

South Africa, United Kingdom

EDUCATION:

- BSc (Environmental and Geographical Science), University of Cape Town, South Africa, 1996.
- BSc (Hons) (Environmental and Geographical Science), University of Cape Town, South Africa, 2000.
- Environmental Impact Assessment and Management Course, University of Stellenbosch, South Africa, June 2002.

EMPLOYMENT RECORD:

2011 - Present Self Employed, t/a Holland & Associates Environmental Consultants, Cape Town, South Africa

2004 - 2011 Senior Environmental Practitioner, Aurecon (previously Ninham Shand Consulting Services), Cape Town, South Africa

2002 - 2004	Environmental Scientist, Withers Environmental Consultants, Stellenbosch, South Africa
2001 - 2002	Senior Applications Analyst, Geosense Limited, Cape Town, South Africa
2000	Honours student, Department of Environmental and Geographical Science, University of Cape Town, Cape Town, South Africa
1998 - 1999	Junior Project Accountant, Warburg Dillon Read (Union Bank of Switzerland), London, United Kingdom

LANGUAGES:

	Speaking	**Reading**	**Writing**
English	Excellent	Excellent	Excellent
Afrikaans	Good	Good	Fair

REFEREES:

Ms Karen Shippey (Director: Sustainability (Western Cape Provincial Government))
Tel: 021483 0776

Mr Brett Lawson (Partner: Environmental Resource Management)
Tel: 083 4570557/Brett.lawson@erm.com

APPENDIX E:

List of Affected Properties

AFFECTED PROPERTIES:

Slingers Hoek (Farm No. 2 Remainder of Portion 2 and Remainder);
Slingers Hoek (Farm No. 2 Portion 4);
Knapdaar (Farm No. 8 Portion 1);
Maatjes Fontain Farm (Farm No. 1 Portion 5);
Vendussie Kuil (Farm No. 165 Remainder of Portion 2);
Vendussie Kuil (Farm No. 165 Portion 11 and Remainder),
within the Emthanjeni Local Municipality and Renosterberg Local Municipality in the Northern Cape Province.

APPENDIX F:

Public Participation Process

Appendix F1:
I&AP Database

ORGANISATION	NAME	ADDRESS	TOWN	CODE
AUTHORITIES				
Department of Environmental Affairs (DEA)	Muhammad Essop	Environment House, 473 Steve Biko Road, Arcadia	Pretoria	0001
Department of Agriculture, Forestry and Fisheries: Directorate: Land Use and Soil Management	Francina Mokomo	1st Floor, Delpen Building, Cnr Annie Botha and Union Street,	Pretoria	0001
Department of Agriculture, Forestry and Fisheries: Directorate: Land Use and Soil Management	Mashudu Marbubini	2nd Floor, Delpen Building, Cnr Annie Botha and Union	Pretoria	0001
Department of Water and Sanitation (DWS)	Shaun Cloete	Louise Vale Drive/ Pvt Bag X5912	Upington	8800
Northern Cape Department of Agriculture, Land Reform and Rural Dvelopment	Mr. V Mothibi	162 George Street	Kimberley	8300
Northern Cape Department of Energy (NCDoE)	The Director c/o Sebabatso Mokuele	65 Phakamile Mabjija Street; Perm Building, 3rd floor	Kimberley	8300
Northern Cape Department of Environment and Nature Conservation (DENC)	Mr I Gwija/ Mr Brian Fisher	Sasko Building, 90 Long Street	Kimberley	8300
Northern Cape Department of Transport (NCDT)	Ramon C Barlow	45 Schmidtsdrift Road	Kimberley	8300
Northern Cape Department of Transport, Safety and Liaison	Ms Martha Bartlett	Southey Chambers, 1st Floor, Southey Street	Kimberley	8300
Emthanjeni Local Municpality	Francois Taljaard	PO Box 42	De Aar	7000
Eskom	John Geeringh	PO Box 1091	Johannesburg	2000
Heritage Northern Cape	Ratha Timothy / Andrew Hall	1 Mondridge Park, Cnr Kekewich Drive & Memorial	Kimberley	8300
South African Heritage Resources Agency	Dr Mariagrazia Galimberti	PO Box 4637	Cape Town	8000
SAHRA Northern Cape Provincial Office	The Provincial Manager	P.O. Box 1930	KIMBERLEY	8300
Pixley ka Seme District Municpality	The Municipal Manager	PO Box 1012	De Aar	7000

G L Nyl	Ward Councillor (Ward 6)	Email only		
Johannes Olifant	Ward Councillor	Email only		
Renosterberg Local Municipality	Mr Sandile Dick	P O Box 112	Petrusville	8770
Northern Cape Department of Roads and Public Works	Mr Kholekile Nogwili	9-11 Stokroos Street, Squarehill Park,	Kimberley	8301
DEA: Chief Directorate: Transfrontier Conservation And Protected Areas	Ms Skumsa Mancotywa	Fedsure Forum Building, 315 Pretorius Street	Pretoria	0001
Renosterberg Local Municipality	The Municipal Manager,c/o Mr G. Nieuwenhuizen	PO Box 112	Petrusville	8770
GENERAL I&APS				
Pienaarskloof	Daniel Petrus van den Heever	P O Box 70	De Aar	7000
Modderfontein	JH Potgieter	Posbus 777	De Aar	7000
	De Aar Stone Crushers bk	PO Box 340	De Aar	7000
Vendussie Kuil	Jan Andries Venter	Posbus 78	Vanderkloof,	8771
Baardmanskoppie	Pieter Stefanus Du Toit	Posbus 557	De Aar	7000
	PJ. Van der Walt	PO. Box 102	Philipstown	8795
EIE Broedery	Diederik Albertyn	P O Box 217	De Aar	7000
Square Kilometer Array (SKA)	Dr. Adrian Tiplady	P. O. Box 522940	Saxonwold	2132
De Aar Public Library	Liezl Thomas	2 Station Street	De Aar	7000

	Adam Treki	Email only		
	G. Sieberhagen	PO Box 24	De Aar	7000
	JP Theron	PO Box 683	De Aar	7000
	Johannes Willhelm van Zyl	PO Box 12	De Aar	7000
	N vd Merwe	PO Box 240	De Aar	7000
	P Julius	PO Box 70	De Aar	7000
	PJ vd Merwe	PO Box 56	Britstown	8782
	Willem J vd Merwe	PO Box 612	De Aar	7000
	Zwiegers Jan Hendrik	PO Box 393	De Aar	7000
African Clean Energy Developments (Pty) Ltd	Pikwe Vasey	Email only		
Blaauwkrans Boerdery	De Put Trust (Henrik de Jager)	PO Box 227	De Aar	7000
Bloemhof Plaas	Roelof Erasmus Venter	PO Box 41	De Aar	7000
De Aar Agri	Andre Theron	Email only		
De Aar Wastewater	Willie Lubbe	PO Box 42	De Aar	7000
Enkeldebult	Petrus Johannes vd Walt	PO Box 102	Phillipstown	8795

EWT - African Crane Conservation Programme	Bradley Gibbons	PO Box 40	Middelburg	5900
EWT - Wildlife Energy Interaction Group (WEIG)	Luke Strugnell	Private Bag X11	Parkview	2122
Jakkalskuilen	Frank Bailey	Posbus 401	De Aar	7000
Mynfontein	Dr Jan van Zyl	Posbus 477	Onrusrivier	7201
Nordex Energy South Africa (Pty) Ltd	Elbrecht Oswald	Email only	Century Way	7441
Nuwejaarsfontein	WSO Marais (Sterrie)	Posbus 94	De Aar	7000
Pienaarskloof, Rusfontein	Charl Andre Theron	PO Box 117	De Aar	7000
Potties B&B	Arnold Pansi	30 Hoop Street	De Aar	7000
Rietfontein	Tersius Marais	Posbus 282	De Aar	7000
Rusoord	Dederik Albertyn	Posbus 217	De Aar	7000
Smouspoort Boerdery Pty Ltd, RE 130	Frederick van Zyl	PO Box 1	De Aar	7000
South African National Biodiversity Institute (SANBI)	NPAES	Private Bag X101	Pretoria	0001
Twee kree poortjie en Matjiesfontein	Jan Carel Venter	Posbus 506	De Aar	7000
Wag 'n Bietjie	Bennie vd Merwe	Posbus 177	De Aar	7000
Washbank	Erik Gustav Battenhaussen	PO Box 117	Phillipstown	8795

WESSA NC	Suzanne Erasmus	PO Box 316	Kimberley	8300
Zwagershoek, Welgegund, Enkeldebult, Zwagershoek	Fritz Conrad Battenhaussen	Posbus 67	Phillipstown	8795
LANDOWNERS				
Slingershoek	Johan Hendrick Petrus vd Merwe	Posbus 53	De Aar	7000
Slingershoek	Marietha vd Merwe	PO Box 345	De Aar	7000
Knapdaar	Elsje Magdalena Vermeulen	PO Box 429	De Aar	7000
Maatjes Fountain, Vendussie Kuil	Diepfontein Boerdery Bk c/o DP Van den Heever	PO Box 70	De Aar	7000
Vendussie Kuil (Pnt 0) Remaining Extent & Pnt 11	Petrus Johannes Venter	Kranskop, Posbus 78	Philipstown	8795

Appendix F2:
Site Notice

PROPOSED WIND ENERGY FACILITY SITUATED ON THE EASTERN PLATEAU (SOUTH) NAR DE AAR, NORTHERN CAPE PROVINCE

APPLICATION FOR AMENDMENT OF THE ENVIRONMENTAL AUTHORISATION: PUBLIC PARTICIPATION PROCESS

(DEA Ref No: 12/12/20/2463/AM3)

Longyuan Mulilo De Aar 2 South (Pty) Ltd (i.e. the Applicant) is applying for an amendment of the Environmental Authorisation (EA) in terms of the National Environmental Management Act (No. 107 of 1998) (NEMA) and Environmental Impact Assessment (EIA) Regulations (2014) for the proposed wind energy facility (WEF) situated on the eastern plateau (south) near De Aar in the Northern Cape Province.

Proposed project for which EA has been granted: The approved WEF comprises the construction of approximately 103 turbines with a potential capacity of 155 - 258 MW. Infrastructure associated with the WEF includes permanent hard standings adjacent to each turbine, construction lay down areas, gravel access roads, cabling and transmission lines, and a substation.

Location: Slingers Hoek (Farm No. 2 Remainder of Portion 2 and Remainder); Slingers Hoek (Farm No. 2 Portion 4); Knapdaar (Farm No. 8 Portion 1); Maatjes Fontain Farm (Farm No. 1 Portion 5); Vendussie Kuil (Farm No. 165 Remainder of Portion 2); Vendussie Kuil (Farm No. 165 Portion 11 and Remainder) within the Emthanjeni Local Municipality and Renosterberg Local Municipality in the Northern Cape Province.

Application for amendment of the EA in terms of NEMA (Act No. 107 of 1998): On 1 March 2013, the Department of Environmental Affairs (DEA) granted environmental authorisation in connection with the proposed project for Items 10, 11 & 18 of GN R.544; Item 1 of GN R. 545; and Item 14 of GN R.546 in the 2010 EIA Regulations. On 24 July 2014, a further environmental authorisation for the proposed project was granted in respect of Items 13 & 16 of GN 546 by the Northern Cape Department of Environment and Nature Conservation (DENC).

An Application for Amendment of the EA has been submitted to DEA in terms of the NEMA EIA Regulations (2014). The Applicant is applying for an amendment to the project description, as well as a correction of a typographical error in the EA. The proposed amendments include increasing the generating size of the wind turbine generators (WTG) to align to current international WTG models, while reducing the number of WTG's at the WEF (i.e. reduced from 103 to approximately 61). The proposed amendments include increasing the hub heights and blade lengths of the WTGs, increasing the generation size of the WTG's from the approved 1.5MW – 2.5MW to 2.3MW – 4MW, and minor refinements to the layout. The generation capacity of the WEF would be 140MW. The listed activities in respect of which environmental authorisation has been granted for the project are similarly listed to Activities 11, 12, & 19 of GN No. R.983; Activities 1 & 15 of GN No.R.984; and Activity 14 of GN No. R.985 in the 2014 EIA Regulations. In the circumstances, the proposed amendments do not, on their own, trigger any listed activities requiring environmental authorisation.

Holland & Associates Environmental Consultants has been appointed to undertake the EA Amendment Application on behalf of the Applicant. Notice is hereby given of the commencement of a public participation process in terms of the NEMA EIA Regulations (2014).

Opportunity to participate: Interested and Affected Parties (I&APs) are invited to register as I&APs and to provide comment on the proposed Amendment Application. Copies of the Application for Amendment of EA and associated Environmental Assessment Report are available for review for a period of 30 days from 4 August 2015 - 7 September 2015 at the De Aar Public Library, and are available for download on the Holland & Associates Environmental Consultant's website (www.hollandandassociates.net). I&APs must provide their comments together with their name, contact details (including their preferred method of notification, e.g. e-mail, post or fax number) and an indication of any direct business, financial, personal or other interest which they have in the application, to the contact person indicated below by 7 September 2015. The DEA reference number indicated above must be referred to in all correspondence submitted by I&APs.

For more information contact: Ms Nicole Holland, Holland & Associates Environmental Consultants: P.O. Box 31108, Tokai, 7966; tel: 0834645246; fax: 0867626126 or e-mail: nicole@hollandandassociates.net.

Holland & Associates
Environmental Consultants

DIE BEOOGDE WINDENERGIE-AANLEG OP DIE OOSTELIKE PLATO (SUID) NABY DE AAR, NOORD-KAAPPROVINSIE

AANSOEK VIR DIE WYSIGING VAN DIE OMGEWINGS-MAGTIGING: PROSES VAN OPENBARE DEELNAME:

(DOS VERWYSINGSNR: 12/12/20/2463/AM3)

Longyuan Mulilo De Aar 2 South (Edms) Bpk (hierna die Applikant genoem) doen aansoek vir die wysiging van die Omgewingsmagtiging (OM) wat kragtens die Nasionale Wet op Omgewingsbestuur (Nr 107 van 1998) (NEMA) en die Regulasies (2014) vir 'n Omgewingsinvloedbepaling (OIB) uitgereik is vir die beoogde windenergie-aanleg (WEA) op die oostelike plato (suid) naby De Aar in die Noord-Kaapprovinsie.

Beoogde projek waarvoor die OM toegestaan is: Die goedgekeurde WEA bestaan uit die oprigting van ongeveer 103 turbines met 'n moontlike kapasiteit van 155 - 258 MW. Infrastruktuur wat op die WEA van toepassing is, sluit in permanente harde oppervlaktes langs elke turbine, konstruksiegebiede, begruisde toegangspaaie, kabels en transmissielyne en 'n substasie.

Ligging: Slingers Hoek (Plaas Nr 2 Restant van Gedeelte 2 en Restant); Slingers Hoek (Plaas Nr 2 Gedeelte 4); Knapdaar (Plaas Nr 8 Gedeelte 1); Maatjes Fontain Farm (Plaas Nr 1 Gedeelte 5); Vendussie Kuil (Plaas Nr 165 Restant van Gedeelte 2); Vendussie Kuil (Plaas Nr 165 Gedeelte 11 en Restant) binne die Emthanjeni Plaaslike Munisipaliteit en Renosterberg Plaaslike Munisipaliteit in die Noord-Kaapprovinsie.

Aansoek vir die wysiging van die OM in terme van die NEMA (Wet Nr 107 van 1998): Die Departement van Omgewingsake (DOS) het op 1 Maart 2013 'n Omgewingsmagtiging (OM) vir die voorgestelde projek vir Items 10, 11 & 18 van GK R.544; Item 1 van GK R. 545; en Item 14 van GK R.546 in terme van die OIB Regulasies 2010 uitgereik. Op 24 Julie 2014, 'n verdere omgewingsmagtiging vir die voorgestelde projek is verleen ten opsigte van items 13 & 16 van GK 546 deur die Noord-Kaapse Departement van Omgewing en Natuurbewaring (DONB).

'n Aansoek vir die Wysiging van die OM is in terme van die NEMA se OIB-regulasies (2014) by die DOS ingedien. Die Applikant doen aansoek vir die wysiging van die projek beskrywing, sowel as 'n regstelling van 'n tipografiese fout in die EA. Die voorgestelde wysigings sluit in 'n verhoging in die windturbine-generators (WTG) se kragopwekkingsvermoë sodat dit in lyn is met huidige internasionale WTG-modelle. Dit het tot gevolg dat die aantal WTGs by die WEA sal verminder (i.e. 'n afname van 103 tot ongeveer 61). Die voorgestelde wysigings aan die WTGs sluit in 'n hoër naafhoogte en langer draaivlerke wat die kragopwekkingsvermoë van die WTGs van die goedgekeurde 1.5MW – 2.5MW tot 2.3MW – 4MW sal laat toeneem, asook klein veranderings aan die uitleg. Die algemene opwekkingskapasiteit van die WEA sal 140MW beloop. Die gelyste aktiwiteite ten opsigte waarvan omgewingsmagtiging vir die projek toegestaan is is insgelyks gelys met Aktiwiteite 11, 12, en 19 van GK Nr R.983, Aktiwiteite 1 & 15 van GK No.R.984, en Aktiwiteit 14 van GK No. R.985 in die 2014 OIB Regulasies. In die omstandighede, die voorgestelde wysigings, sal nie op hul eie, enige gelyste aktiwiteite wat omgewingsmagtiging vereis, aktiveer nie.

Holland & Associates Omgewingskonsultante is aangestel om die Wysigingsaansoek vir die OM namens die Applikant te hanteer. Kennis geskied hiermee van die begin van 'n proses van openbare deelname kragtens NEMA se OIB-regulasies (2014).

Geleentheid om deel te neem: Belanghebbende en Geaffekteerde Partye (B&GPe) word uitgenooi om as B&GPe te registreer en kommentaar op die voorgestelde Wysigingsaansoek te lewer. Afskrifte van die Aansoek vir die Wysiging van die OM en die verwante Omgewingsinvloedbepalingsverslag is vir 'n tydperk van 30 dae, d.w.s. vanaf 4 Augustus 2015 - 7 September 2015 beskikbaar by die De Aar Openbare Biblioteek, en kan ook afgelaai word vanaf Holland & Associates Omgewingskonsultante se webblad (www.hollandandassociates.net). B&GPe moet hulle kommentaar, tesame met hulle naam, kontakbesonderhede (wat 'n aanduiding moet gee van hulle voorkeur kennisgewingmetode, bv. e-pos, pos of faks) en 'n bekendmaking van enige direkte sake-, finansiële, persoonlike of ander belang by die projek, teen 7 September 2015 aan onderstaande persoon stuur. Bostaande DOS-verwysingsnommer moet op alle korrespondensie vanaf B&GPe verskyn.

Vir meer inligting kontak: Me Nicole Holland, Holland & Associates Omgewingskonsultante: Posbus 31108, Tokai, 7966; tel: 083-464-5246; faks: 086-762-6126 of e-pos: nicole@hollandandassociates.net.

Holland & Associates
Environmental Consultants

Appendix F3:
Advertisements

AANSOEK VIR DIE WYSIGING VAN DIE OMGEWINGSMAGTIGING VIR DIE BEOOGDE WINDENERGIE-AANLEG OP DIE OOSTELIKE PLATO (SUID) NABY DE AAR, NOORD-KAAPPROVINSIE: PROSES VAN OPENBARE DEELNAME (DOS VERWYSINGSNR: 12/12/20/2463/AM3)

Longyuan Mulilo De Aar 2 South (Edms) Bpk (hierna die Applikant genoem) doen aansoek vir die wysiging van die Omgewingsmagtiging (OM) wat kragtens die Nasionale Wet op Omgewingsbestuur (Nr 107 van 1998) (NEMA) en die Regulasies (2014) vir 'n Omgewingsinvloedbepaling (OIB) uitgereik is vir die beoogde windenergie-aanleg (WEA) op die oostelike plato (suid) naby De Aar in die Noord-Kaapprovinsie.

Beoogde projek waarvoor die OM toegestaan is: Die goedgekeurde WEA bestaan uit die oprigting van ongeveer 103 turbines met 'n moontlike kapasiteit van 155 - 258 MW. Infrastruktuur wat op die WEA van toepassing is, sluit in permanente harde oppervlaktes langs elke turbine, konstruksiegebiede, begruisde toegangspaaie, kabels en transmissielyne en 'n substasie.

Ligging: Slingers Hoek (Plaas Nr 2 Restant van Gedeelte 2 en Restant); Slingers Hoek (Plaas Nr 2 Gedeelte 4); Knapdaar (Plaas Nr 8 Gedeelte 1); Maatjes Fontain Farm (Plaas Nr 1 Gedeelte 5); Vendussie Kuil (Plaas Nr 165 Restant van Gedeelte 2); Vendussie Kuil (Plaas Nr 165 Gedeelte 11 en Restant) binne die Emthanjeni Plaaslike Munisipaliteit en Renosterberg Plaaslike Munisipaliteit in die Noord-Kaapprovinsie.

Aansoek vir die wysiging van die OM in terme van die NEMA (Wet Nr 107 van 1998): Die Departement van Omgewingsake (DOS) het op 1 Maart 2013 'n Omgewingsmagtiging (OM) vir die voorgestelde projek vir Items 10, 11 & 18 van GK R.544; Item 1 van GK R. 545; en Item 14 van GK R.546 in terme van die OIB Regulasies 2010 uitgereik. Op 24 Julie 2014, 'n verdere omgewingsmagtiging vir die voorgestelde projek is verleen ten opsigte van items 13 & 16 van GK 546 deur die Noord-Kaapse Departement van Omgewing en Natuurbewaring (DONB).

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Holland & Associates Omgewingskonsultante is aangestel om die Wysigingsaansoek vir die OM namens die Applikant te hanteer. Kennis geskied hiermee van die begin van 'n proses van openbare deelname kragtens NEMA se OIB-regulasies (2014).

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Holland & Associates
Environmental Consultants

APPLICATION FOR AMENDMENT OF THE ENVIRONMENTAL AUTHORISATION FOR THE PROPOSED WIND ENERGY FACILITY SITUATED ON THE EASTERN PLATEAU (SOUTH) NEAR DE AAR, NORTHERN CAPE PROVINCE (DEA REF NO.: 12/12/20/2463/AM3)

Longyuan Mulilo De Aar 2 South (Pty) Ltd (i.e. the Applicant) is applying for an amendment of the Environmental Authorisation (EA) in terms of the National Environmental Management Act (No. 107 of 1998) (NEMA) and Environmental Impact Assessment (EIA) Regulations (2014) for the proposed wind energy facility (WEF) situated on the eastern plateau (south) near De Aar in the Northern Cape Province.

Proposed project for which EA has been granted: The approved WEF comprises the construction of approximately 103 turbines with a potential capacity of 155 - 258 MW. Infrastructure associated with the WEF includes permanent hard standings adjacent to each turbine, construction lay down areas, gravel access roads, cabling and transmission lines, and a substation.

Location: Slingers Hoek (Farm No. 2 Remainder of Portion 2 and Remainder); Slingers Hoek (Farm No. 2 Portion 4); Knapdaar (Farm No. 8 Portion 1); Maatjes Fontain Farm (Farm No. 1 Portion 5); Vendussie Kuil (Farm No. 165 Remainder of Portion 2); Vendussie Kuil (Farm No. 165 Portion 11 and Remainder) within the Emthanjeni Local Municipality and Renosterberg Local Municipality in the Northern Cape Province.

Application for amendment of the EA in terms of NEMA (Act No. 107 of 1998): On 1 March 2013, the Department of Environmental Affairs (DEA) granted environmental authorisation in connection with the proposed project for Items 10, 11 & 18 of GN R.544; Item 1 of GN R. 545; and Item 14 of GN R.546 in the 2010 EIA Regulations. On 24 July 2014, a further environmental authorisation for the proposed project was granted in respect of Items 13 & 16 of GN 546 by the Northern Cape Department of Environment and Nature Conservation (DENC).

An Application for Amendment of the EA has been submitted to DEA in terms of the NEMA EIA Regulations (2014). The Applicant is applying for an amendment to the project description, as well as a correction of a typographical error in the EA. The proposed amendments include increasing the generating size of the wind turbine generators (WTG) to align to current international WTG models, while reducing the number of WTG's at the WEF (i.e. reduced from 103 to approximately 61). The proposed amendments include increasing the hub heights and blade lengths of the WTGs, increasing the generation size of the WTG's from the approved 1.5MW – 2.5MW to 2.3MW – 4MW, and minor refinements to the layout. The generation capacity of the WEF would be 140MW. The listed activities in respect of which environmental authorisation has been granted for the project are similarly listed to Activities 11, 12, & 19 of GN No. R.983; Activities 1 & 15 of GN No.R.984; and Activity 14 of GN No. R.985 in the 2014 EIA Regulations. In the circumstances, the proposed amendments do not, on their own, trigger any listed activities requiring environmental authorisation.

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Opportunity to participate: Interested and Affected Parties (I&APs) are invited to register as I&APs and to provide comment on the proposed Amendment Application. Copies of the Application for Amendment of EA and associated Environmental Assessment Report are available for review for a period of 30 days from 4 August 2015 - 7 September 2015 at the De Aar Public Library, and are available for download on the Holland & Associates Environmental Consultant's website (www.hollandandassociates.net). I&APs must provide their comments together with their name, contact details (including their preferred method of notification, e.g. e-mail, post or fax number) and an indication of any direct business, financial, personal or other interest which they have in the application, to the contact person indicated below by 7 September 2015. The DEA reference number indicated above must be referred to in all correspondence submitted by I&APs.

For more information contact: Ms Nicole Holland
Holland & Associates Environmental Consultants:
P.O. Box 31108, Tokai, 7966;
tel: 0834645246; fax: 0867626126
or e-mail: nicole@hollandandassociates.net.

Holland & Associates
Environmental Consultants

AANSOEK VIR DIE WYSIGING VAN DIE OMGEWINGSMAGTIGING VIR DIE BEOOGDE WINDENERGIE-AANLEG OP DIE OOSTELIKE PLATO (SUID) NABY DE AAR, NOORD-KAAPPROVINSIE (DOS VERWYSINGSNR: 12/12/20/2463/AM3)

Longyuan Mulilo De Aar 2 South (Edms) Bpk (hierna die Applikant genoem) doen aansoek vir die wysiging van die Omgewingsmagtiging (OM) wat kragtens die Nasionale Wet op Omgewingsbestuur (Nr 107 van 1998) (NEMA) en die Regulasies (2014) vir 'n Omgewingsinvloedbepaling (OIB) uitgereik is vir die beoogde windenergie-aanleg (WEA) op die oostelike plato (suid) naby De Aar in die Noord-Kaapprovinsie.

Beoogde projek waarvoor die OM toegestaan is: Die goedgekeurde WEA bestaan uit die oprigting van ongeveer 103 turbines met 'n moontlike kapasiteit van 155 - 258 MW. Infrastruktuur wat op die WEA van toepassing is, sluit in permanente harde oppervlaktes langs elke turbine, konstruksiegebiede, begruisde toegangspaaie, kabels en transmissielyne en 'n substasie.

Ligging: Slingers Hoek (Plaas Nr 2 Restant van Gedeelte 2 en Restant); Slingers Hoek (Plaas Nr 2 Gedeelte 4); Knapdaar (Plaas Nr 8 Gedeelte 1); Maatjes Fontain Farm (Plaas Nr 1 Gedeelte 5); Vendussie Kuil (Plaas Nr 165 Restant van Gedeelte 2); Vendussie Kuil (Plaas Nr 165 Gedeelte 11 en Restant) binne die Emthanjeni Plaaslike Munisipaliteit en Renosterberg Plaaslike Munisipaliteit in die Noord-Kaapprovinsie.

Aansoek vir die wysiging van die OM in terme van die NEMA (Wet Nr 107 van 1998): Die Departement van Omgewingsake (DOS) het op 1 Maart 2013 'n Omgewingsmagtiging (OM) vir die voorgestelde projek vir Items 10, 11 & 18 van GK R.544; Item 1 van GK R. 545; en Item 14 van GK R.546 in terme van die OIB Regulasies 2010 uitgereik. Op 24 Julie 2014, 'n verdere omgewingsmagtiging vir die voorgestelde projek is verleen ten opsigte van items 13 & 16 van GK 546 deur die Noord-Kaapse Departement van Omgewing en Natuurbewaring (DONB).

'n Aansoek vir die Wysiging van die OM is in terme van die NEMA se OIB-regulasies (2014) by die DOS ingedien. Die Applikant doen aansoek vir die wysiging van die projek beskrywing, sowel as 'n regstelling van 'n tipografiese fout in die OM. Die voorgestelde wysigings sluit in 'n verhoging in die windturbine-generators (WTG) se kragopwekkingsvermoë sodat dit in lyn is met huidige internasionale WTG-modelle Dit het tot gevolg dat die aantal WTGs by die WEA sal verminder (i.e. 'n afname van 103 tot ongeveer 61). Die voorgestelde wysigings aan die WTGs sluit in 'n hoër naafhoogte en langer draaivlerke wat die kragopwekkingsvermoë van die WTGs van die goedgekeurde 1.5MW – 2.5MW tot 2.3MW – 4MW sal laat toeneem, asook klein veranderings aan die uitleg. Die algemene opwekkingskapasiteit van die WEA sal 140MW beloop. Die gelyste aktiwiteite ten opsigte waarvan omgewingsmagtiging vir die projek toegestaan is is insgelyks gelys met Aktiwiteite 11, 12, en 19 van GK Nr R.983, Aktiwiteite 1 & 15 van GK No.R.984, en Aktiwiteit 14 van GK No. R.985 in die 2014 OIB Regulasies. In die omstandighede, die voorgestelde wysigings, sal nie op hul eie, enige gelyste aktiwiteite wat omgewingsmagtiging vereis, aktiveer nie.

Holland & Associates Omgewingskonsultante is aangestel om die Wysigingsaansoek vir die OM namens die Applikant te hanteer. Kennis geskied hiermee van die begin van 'n proses van openbare deelname kragtens NEMA se OIB-regulasies (2014).

Geleentheid om deel te neem: Belanghebbende en Geaffekteerde Partye (B&GPe) word uitgenooi om as B&GPe te registreer en kommentaar op die voorgestelde Wysigingsaansoek te lewer. Afskrifte van die Aansoek vir die Wysiging van die OM en die verwante Omgewingsinvloedbepalingsverslag is vir 'n tydperk van 30 dae, d.w.s. vanaf 4 Augustus 2015 - 7 September 2015 beskikbaar by die De Aar Openbare Biblioteek, en kan ook afgelaai word vanaf Holland & Associates Omgewingskonsultante se webblad (www.hollandandassociates.net). B&GPe moet hulle kommentaar, tesame met hulle naam, kontakbesonderhede (wat 'n aanduiding moet gee van hulle voorkeur kennisgewingmetode, bv. e-pos, pos of faks) en 'n bekendmaking van enige direkte sake-, finansiële, persoonlike of ander belang by die projek, teen 7 September 2015 aan onderstaande persoon stuur. Bostaande DOS-verwysingsnommer moet op alle korrespondensie vanaf B&GPe verskyn.

Vir meer inligting kontak: Me Nicole Holland,
Holland & Associates Omgewingskonsultante:
Posbus 31108, Tokai, 7966;
tel: 083-464-5246; faks: 086-762-6126 of e-pos:
nicole@hollandandassociates.net.

Holland & Associates
Environmental Consultants

Appendix F4:
Letter to I&APs

Holland & Associates
Environmental Consultants
Impact Assessments - Environmental Management Programs - Compliance Monitoring - Process Review

31 July 2015

Dear Interested and/or Affected Party

APPLICATION FOR AMENDMENT OF THE ENVIRONMENTAL AUTHORISATION FOR THE PROPOSED WIND ENERGY FACILITY SITUATED ON THE EASTERN PLATEAU (SOUTH) NEAR DE AAR, NORTHERN CAPE PROVINCE (DEA REF NO.: 12/12/20/2463/AM3)

Notification of Application for Amendment of the Environmental Authorisation

The purpose of this letter is to inform Interested and Affected Parties (I&APs) that Longyuan Mulilo De Aar 2 South (Pty) Ltd (hereafter referred to as the Applicant) is applying for an amendment of the Environmental Authorisation in terms of the National Environmental Management Act (No. 107 of 1998) (NEMA) and Environmental Impact Assessment (EIA) Regulations (2014) for the proposed wind energy facility (WEF) situated on the eastern plateau (south) near De Aar in the Northern Cape Province.

I&APs are invited to provide comment on the Application for Amendment of the Environmental Authorisation (EA). In this regard, copies of the Application for Amendment of the EA and associated Environmental Assessment Report are available for review for a period of 30 days from **4 August 2015 – 7 September 2015**. Refer to Section 4 below for further details in this regard.

A brief background to the proposed project as well as a summary of the Application for Amendment of the EA and associated public participation process is included herewith for your information.

1. Background

Mulilo Renewable Energy (Pty) Ltd[1] applied for Environmental Authorisation[2] from the Department of Environmental Affairs (DEA) in 2011 to establish a Wind Energy Facility (WEF) and associated infrastructure on the eastern plateau (south) of De Aar (approximately 20 km to the east of the town) (referred to herein as the "De Aar 2 South WEF"). The proposed development site is approximately 12,832ha in extent and consists of 8 portions of 4 farms, i.e. Slingers Hoek (Farm No. 2 Remainder of Portion 2 and Remainder); Slingers Hoek (Farm No. 2 Portion 4); Knapdaar (Farm No. 8 Portion 1); Maatjes Fontain Farm (Farm No. 1 Portion 5); Vendussie Kuil (Farm No.

[1] Now known as Mulilo Renewable Project Developments

[2] The Application for Environmental Authorisation entailed undertaking an Environmental Impact Assessment (EIA) process in terms of the NEMA (No.107 of 1998) EIA Regulations (2010)

165 Remainder of Portion 2); Vendussie Kuil (Farm No. 165 Portion 11 and Remainder) within the Emthanjeni Local Municipality and Renosterberg Local Municipality in the Northern Cape Province. The authorised WEF comprises approximately 103 turbines, each with a generation capacity of 1.5 - 2.5MW. (Note that the potential generation capacity of the WEF has subsequently been limited to 140MW in accordance with the Department of Energy's cap on maximum megawatts, although 258MW was authorised).

On 1 March 2013, DEA granted environmental authorisation in connection with the proposed project for Items 10, 11 & 18 of GN R.544; Item 1 of GN R. 545; and Item 14 of GN R.546 in the 2010 EIA Regulations. On 24 July 2014, a further environmental authorisation for the proposed project was granted in respect of Items 13 & 16 of GN 546 by the Northern Cape Department of Environment and Nature Conservation (DENC)[3].

This Application for Amendment relates to the EA granted in respect of the proposed project by DEA on 1 March 2013.

The infrastructure associated with the authorised WEF, as described and authorised in the DEA Environmental Authorisation dated 1 March 2013, includes the following:

- *"The construction of approximately 103 wind turbines with a potential capacity of 155 - 258 MW.*
- *A permanent hard standing made of compacted gravel and approximately 20[4] 50 m x 40 m would be constructed adjacent to each turbine location for the crane.*
- *A total of three construction laydowns in the south would be required with each having a footprint of approximately 200 x400m.*
- *Gravel surface access roads of approximately 4m wide would also be required between each turbine.*
- *Cables connecting each turbine would interconnect with overhead transmission lines that will follow the route of the access roads. Each turbine would have a transformer that steps up the voltage from 690 Volt to 22kilovolt (kV). This transformer is housed within each turbine tower or immediately outside the turbine.*
- *The cabling between the turbines would traverse the site to the three substations, where the power from all the turbines would be metered.*
- *The proposed substations and associated control buildings would have a footprint of approximately 200 x 100m.*
- *The electricity distribution infrastructure comprises of three existing distribution lines (1 x 132kV, 2 x 400kV and 2 x 220kV) traversing the site. The transmission lines terminate at Eskom's Hydra Substation located 9.Skm to the north east of De Aar".*

An Application for Amendment of the EA was submitted by the Applicant to DEA in May 2013 to change the Special Purpose Vehicle (SPV) name from "Mulilo Renewable Energy (Pty) Ltd" to "Longyuan Mulilo De Aar 2 South (Pty) Ltd". This amendment of the EA was granted by DEA on 21 May 2013. On the 10 July 2014, the Applicant submitted a second Application for Amendment of the Environmental Authorisation to DEA for the following amendments: Amendment to extend the validity period; amendment to the property descriptions of the EA; and amendments to Conditions 43, 44 and 45. The amendment of the EA was granted by DEA on 14 August 2014.

The Applicant now proposes to amend the project description of the proposed WEF, as outlined in Section 2 below. The proposed amendments will require re-assessment of the potential impacts associated with the proposed project, as required in terms of the National Environmental

[3] for activities that had been missed in the original EIA for the project

[4] Refer to Section 2.2. below regarding the proposed amendment of this typographical error in the EA

Management Act (No. 107 of 1998) Environmental Impact Assessment (EIA) Regulations (2014).

It is pointed out that the listed activities in respect of which environmental authorisation has been granted for the project are similarly listed to Items 11, 12, & 19 of GN No. R.983; Items 1 & 15 of GN No.R.984; and Item 14 of GN No. R.985 in the 2014 EIA Regulations. In the circumstances, the proposed amendments do not, on their own, trigger any listed activities requiring environmental authorisation.

Holland & Associates Environmental Consultants has been appointed by the Applicant to undertake the requisite Application for Amendment of the Environmental Authorisation for the proposed project, in accordance with the National Environmental Management Act (NEMA) (No. 107 of 1998) EIA Regulations (2014).

2. Application for Amendment of the Environmental Authorisation

2.1 Proposed amendments to project description and refinements to layout

As onshore wind energy facilities (WEF) receive continued support worldwide from governments and energy regulators, technological improvements are being seen on a constant basis. In order to ensure that a wind energy facility has the smallest possible footprint per total installed capacity, the wind turbine generators (WTG) are evolving in higher yielding and more efficient generating units. As the engineering loads and fatigues are better understood on the units, it allows the designers and engineers to design the most optimal and highest yielding WTGs for the specific terrain and climatic conditions.

The Applicant wishes to increase the generating size of the WTG's for the De Aar 2 South WEF in order to align to current international WTG models, while reducing the number of WTG's on the WEF. The following changes to the WTG parameters are proposed:

- Increasing hub heights from 100 m to 120m
- Increasing blade lengths from 60 m to 80m
- Increasing the WTG generation size to encompass a range of 2.3MW to 4.0MW

Note: The generation capacity of the WEF would be a maximum of 140MW (in accordance with the Department of Energy's Renewable Energy Independent Power Producer Procurement (REIPPP) Programme cap on maximum megawatts).

Component	Approved	Proposed amendment
Number of turbines	103	61 Turbines @ 2.3MW per turbine (to 30 Turbines @ 4MW per turbine). Note: The maximum of 61 is being applied for.
Generation capacity per turbine	1.5 - 2.5MW	2.3MW – 4.0MW
Generation capacity of the WEF	155 - 258MW	140 MW
Rotor / blade diameters	120m	(min) 100m (max) 160m (Note: The maximum of 160m is being applied for)

Hub height	100m	(min) 90m (max) 120m (Note: The maximum of 120m is being applied for)
Permanent construction pad	"20" 40 x 50m (adjacent to each turbine) (Note: it is apparent that the "20" is a typographical error in the EA. Refer to Section 2.2 below in this regard)	40 x 50m (adjacent to each turbine)
Permanent affected area (foundation size)	16 x 16m and 2 m deep	18,4m diameter, that narrows up to 10,6m at the surface (the visible portion) once the foundation is completed. Depth : 3,5m

(Note: The Application for amendment of the EA will assess the "worst case scenario" of 61 turbines @ 2.3MW per turbine with the understanding that should the Applicant use 4MW turbines (which will be the same dimensions as the 2.3MW turbines) then the Applicant would reduce the number of turbines to 30. The maximum turbine dimensions will be assessed and applied for. It is furthermore noted that the generation capacity of the WEF is limited to 140MW. Even though 61 turbines of 2.3MW = 140.3MW, the Applicant will be limited to 140MW).

These changes would result in an increase of the turbine tower base diameter from 15m to 20m however the construction pad would remain 40 x 50m.

The Applicant has indicated that these are the upper limits of possible future WTG sizing, and if the De Aar 2 South WEF is to be constructed in the next few years, the actual WTG sizing will be in the middle range. The general benefits of using larger sized turbines, compared to older generation turbines are:

- Improved grid code compliance and voltage regulation, providing a more secured energy supply;
- Improved warranted power and noise curves;
- Decrease in WTG load fatigue, maintenance costs and downtime;
- Decrease in the road area coverage per installed capacity;
- More efficiently yielding the wind energy resource, and reducing the need for further WEF development to increase the total installed capacity (Longyuan Mulilo De Aar 2 South (Pty) Ltd, May 2015)

According to the Applicant, the proposed location for the De Aar 2 South WEF is adequately positioned for a Wind Energy Facility, due to the following attributes:

- Excellent consistent wind resource;
- Eskom substation positioned close to the WEF, with minimal distance required for the transmission lines to be built;
- Most accessible positions have been chosen, with the least impact on the environment and construction costs; and
- The Wind Energy Facility is located in a central position in the Northern Cape/ Eskom Grid, thereby being able to offset any electrical loses that occur due to transmitting electricity to the region (Longyuan Mulilo De Aar 2 South (Pty) Ltd, May 2015)

Refinements to the WEF preliminary layout are also proposed. Refer to Figure 1 for the updated layout. It should be noted that, as required in terms of Condition 13 of the EA, the Applicant will still

submit a final layout plan (and Environmental Management Programme) for the entire wind energy facility for approval to DEA, prior to commencement of the activity.

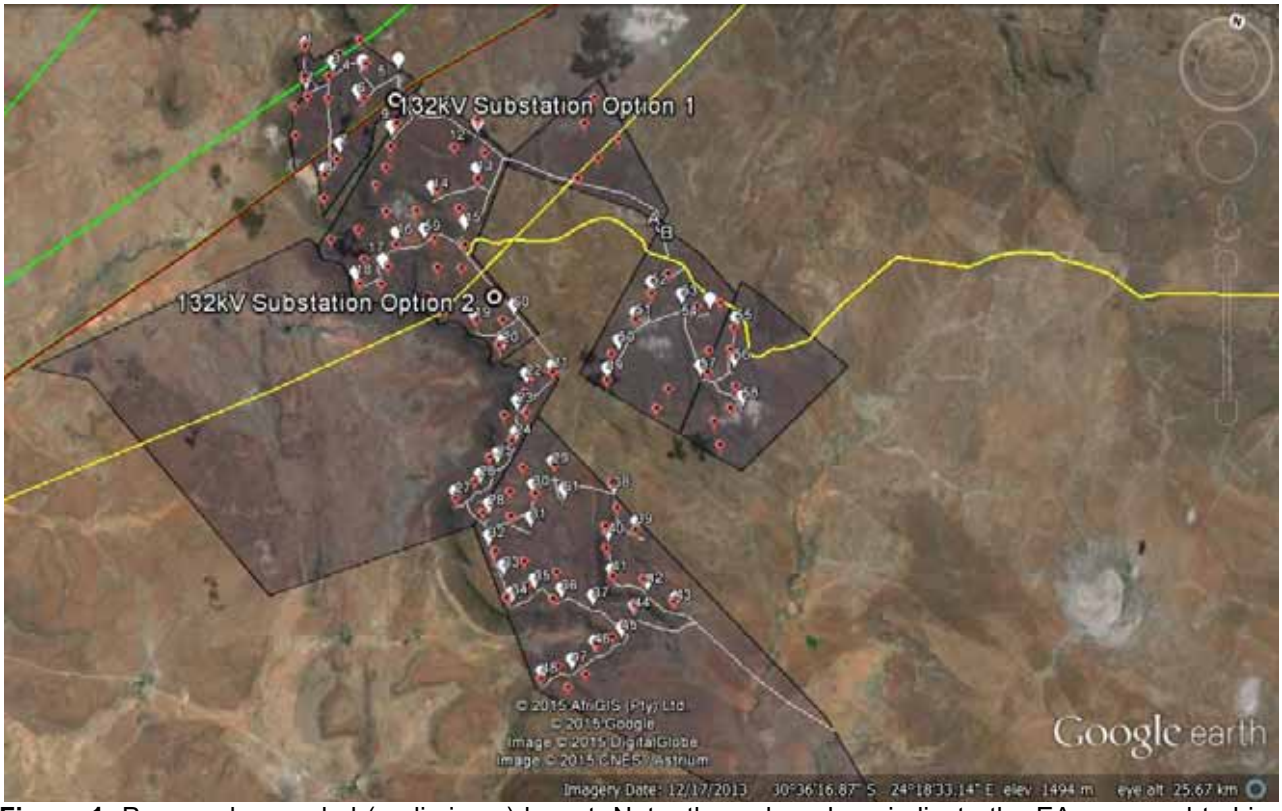

Figure 1: Proposed amended (preliminary) layout. Note: the red markers indicate the EA approved turbine positions and white markers indicate the new revised turbine positions. (Transmission lines are blue, red, green and yellow. Access roads are yellow and white).

2.2 Amendment of Environmental Authorisation

The Applicant is applying for an amendment of the EA for the project in terms of the NEMA EIA Regulations (2014). The proposed amendments of the project description constitute a "change in scope" and accordingly the application will be undertaken in terms of Part 2 (Regulations 31 and 32) of GN R. 982.

The proposed amendments to the project description will require an amendment to the sub-section of the Environmental Authorisation titled "*The infrastructure associated with this facility includes*", specifically page 5 of the EA, which currently describes the proposed project as:

> *"- the construction of approximately 103 turbines with a potential capacity of 155 - 258 MW".*

The proposed amendment of this sentence on page 5 of the EA is as follows:

> *"- the construction of approximately 61 turbines (with a generation capacity of 2.3MW per turbine) to approximately 30 turbines (with a generation capacity of 4MW per turbine). The generation capacity of the WEF would be 140 MW".*

Correction of a typographical error in the description of associated infrastructure on page 5 of the EA:

There is a typographical error on page 5 of the Environmental Authorisation dated

1 March 2013 relating to one of the associated infrastructure descriptions. In particular, the EA refers to:

> *"A permanent hard standing made of compacted gravel and approximately 20 50 m x 40 m would be constructed adjacent to each turbine location for the crane ".*

The Applicant requests that the editorial error be corrected in the EA by removing the number “20”, given that there would be a hard standing area adjacent to each turbine (as indicated in the remainder of the description), and therefore more than 20 hard standing areas would be required. It is therefore requested that the sentence be amended as follows:

> *"A permanent hard standing made of compacted gravel and approximately 50 m x 40 m would be constructed adjacent to each turbine location for the crane".*

3. Assessment of impacts associated with the proposed amendments

Potential environmental impacts associated with the proposed amendments have been assessed and described in an Environmental Assessment Report, compiled in terms of Regulation 32 (a)(i) of GN R 982. In this regard, all of the specialists that undertook specialist studies for the original EIA for the proposed De Aar 2 South WEF, have undertaken a re-assessment of the potential environmental impacts (within their area of expertise), to determine the implications of the proposed amendments in terms of potential environmental impacts. The following specialist investigations were undertaken:
:

- Impact on ecology
- Impact on avifauna
- Impact on bats
- Impact on freshwater resources
- Impact on heritage resources (including archaeological and palaeontological resources)
- Visual impact
- Impact on noise
- Impact on agricultural land

The results of the updated specialist studies have been summarised and included in the Environmental Assessment Report.

Based on the findings of the updated specialist studies, the report concluded that the proposed amendments will not result in an increase in the significance of any of the potential environmental impacts associated with the proposed project. Given that no significant additional impacts are associated with the proposed amendments and only slight differences (mostly improvement) in impact significance exist between the approved and proposed amended project, it is recommend that the proposed amendments be considered for approval. The proposed amendments will support technological improvements, which will result in a more efficient electricity generating facility.

4. Public Participation Process

A public participation process is being undertaken to ensure that I&APs are given an opportunity to comment on the proposed amendments to the EA for the proposed wind energy facility. The public participation process includes the following:

- Notification of all previously registered I&APs for the proposed project of the Application for Amendment of the EA:
    - A letter of notification has been distributed to all affected landowners, to notify them of the Application for Amendment of the EA.
    - A letter of notification (this letter) has been distributed to all registered[5] I&APs, notifying registered I&APs of the Application for Amendment of the EA and opportunity to comment (30 day comment period) on the Application for Amendment of the EA and associated report.
- Notification of all potential I&APs
    - Placement of a site notice, notifying potential (and registered) I&APs of the Application for Amendment of the EA. The notice provides a brief description of the proposed amendment of the EA, and invites members of the public to register as I&APs and submit any comments on the proposed EA Amendment Application.
    - Placement of an advertisement in the local *Echo* and regional *Volksblad* newspapers providing notification of the proposed amendment of the EA, and inviting members of the public to register as I&APs and raise any issues or concerns, as part of the 30 day comment period.
- All potential and registered I&AP's (including relevant State Departments) will be given an opportunity to review and comment on the Application for Amendment of the EA and associated report for a 30 day comment period, i.e. from 4 August 2015 – 7 September 2015. A hard copy of the report has been lodged at the De Aar Public Library, and has also been made available for download on the Holland & Associates Environmental Consultants website (www.hollandandassociates.net) during the comment period.
- All comments submitted by I&APs will be collated, summarised and responded to in a Comments and Response Report (CRR), which will be submitted to DEA for decision making, together with the final Environmental Assessment Report.
- Registered I&APs will be notified, in writing, of DEA's decision.

5. Way Forward

The Application for Amendment of the EA and associated report (Environmental Assessment Report) will be made available to the public for a 30 day comment period, i.e. from 4 August 2015 to 7 September 2015. Copies of the report are available for viewing at the De Aar Public Library as well as on the Holland & Associates Environmental Consultants website (www.hollandandassociates.net). You are invited to review and comment on the abovementioned documents during the 30 day comment period.

Should you have any comments, issues or concerns regarding the proposed amendments, please submit your comments in writing via post, e-mail or fax to Ms Nicole Holland of Holland & Associates Environmental Consultants (Fax: (086)7626126, email: nicole@hollandandassociates.net or post: P.O. Box 31108, Tokai, 7966) on or before **7 September 2015.** The DEA reference number (12/12/20/2463/AM3) must be referred to in all correspondence submitted by I&APs.

All comments received by I&APs will be responded to in a Comments and Response Report, and will be submitted to DEA for consideration together with the Environmental Assessment Report at the end of the 30 day I&AP comment period. DEA will then conclude their review and decision making process for the amendment application. Once DEA issues their decision on the proposed amendment application, all registered I&APs will be notified in writing of the outcome of DEA's decision.

[5] Previously registered I&APs for the original EIA and amendment of the EA application processes.

Should you require any further information or have any queries please contact the undersigned.

Yours sincerely

NICOLE HOLLAND (Pr. Sci. Nat.)
For: Holland & Associates - Environmental Consultants

Holland & Associates
Environmental Consultants
Impact Assessments - Environmental Management Programs - Compliance Monitoring - Process Review

31 Julie 2015

Geagte Belanghebbende en/of Geaffekteerde Party

BEOOGDE AANSOEK VIR DIE WYSIGING VAN DIE OMGEWINGSMAGTIGING UITGEREIK VIR DIE VOORGESTELDE WINDENERGIE-AANLEG OP DIE OOSTELIKE PLATO (SUID) NABY DE AAR, NOORD-KAAPPROVINSIE (DOS VERWYSINGSNOMMER: 12/12/20/2463/AM3)

Kennisgewing van 'n Aansoek vir die Wysiging van die Omgewingsmagtiging

Die doel van hierdie brief is om alle Belanghebbende en Geaffekteerde Partye (B&GPe) in kennis te stel dat Longyuan Mulilo De Aar 2 South (Edms) Bpk (hierna die Applikant genoem) aansoek doen vir 'n wysiging van die Omgewingsmagtiging (OM) wat kragtens die Wet op Nasionale Omgewingsbestuur (Nr 107 van 1998) (NEMA) en die Regulasies (2014) vir Omgewingsinvloedbepalings (OIB) uitgereik is vir die voorgestelde windenergie-aanleg (WEA) geleë op die oostelike plato (suid) naby De Aar in die Noord-Kaapprovinsie.

B&GPe word uitgenooi om kommentaar op die Aansoek vir die Wysiging van die Omgewingsaansoek (OM) te lewer. Afskrifte van die Aansoek vir die Wysiging van die OM en die gepaardgaande Omgewingsinvloedbepalingsverslag is vir 'n tydperk van 30 dae, van **4 Augustus 2015 – 7 September 2015** vir hierdie doeleindes beskikbaar. Verwys na Afdeling 4 hieronder vir verdere inligting hieromtrent.

Vir u inligting word 'n kort agtergrond tot die voorgestelde projek hierby ingesluit, asook 'n opsomming van die Aansoek vir die Wysiging van die OM en die gepaardgaande proses van openbare deelname.

1. Agtergrond

Mulilo Renewable Energy (Edms) Bpk[1] het in 2011 by die Departement van Omgewingsake (DOS) aansoek gedoen vir 'n Omgewingsmagtiging[2] om 'n Windenergie-aanleg (WEA) en gepaardgaande infrastruktuur op die oostelike plato (suid) naby De Aar (ongeveer 20 km oos van die dorp) op te rig (hierna die "De Aar 2 Suid WEA" genoem). Die beoogde terrein vir die ontwikkeling is ongeveer 12,832ha groot en bestaan uit 8 gedeeltes van 4 plase, naamlik Slingers

[1] Staan nou bekend as Mulilo Renewable Project Developments
[2] Die Aansoek vir 'n Omgewingsmagtiging behels die uitvoer van 'n Omgewingsinvloedbepalingsproses (OIB) kragtens die NEMA (Nr 107 van 1998) se OIB-regulasies (2010)

Hoek (Plaas Nr 2 Restant van Gedeelte 2 en Restant); Slingers Hoek (Plaas Nr 2 Gedeelte 4); Knapdaar (Plaas Nr 8 Gedeelte 1); Maatjes Fontain Farm (Plaas Nr 1 Gedeelte 5); Vendussie Kuil (Plaas Nr 165 Restant van Gedeelte 2); Vendussie Kuil (Plaas Nr 165 Gedeelte 11 en Restant) – almal geleë binne die Emthanjeni Plaaslike Munisipaliteit en die Renosterberg Plaaslike Munisipaliteit in die Noord-Kaapprovinsie. Die gemagtidge WEA bestaan uit ongeveer 103 turbines, elk met 'n opwekkingskapasiteit van 1.5 - 2.5MW. (Neem kennis dat die moontlike opwekkingskapasiteit van die WEA intussen beperk is tot 140MW – in ooreenstemming met die Departement van Energie se boperk op die maksimum megawatt, alhoewel 258MW gemagtig is).

Die DOS het op 1 Maart 2013 'n omgewingsmagtiging vir die voorgestelde projek goedgekeur wat betref Items 10, 11 & 18 van GK R.544; Item 1 van GK R. 545; en Item 14 van GK R.546 van die 2010 OIB-regulasies. 'n Verdere omgewingsmagtiging vir die voorgestelde projek is 24 Julie 2014 deur die Noord-Kaapse Departement van Omgewing- en Natuurbewaring (DENC)[3] in terme van Items 13 & 16 van GK 546.

Hierdie Aansoek vir 'n Wysiging het betrekking op die OM wat op 1 Maart 2013 deur die DOS vir die projek uitgereik het.

Die volgende infrastruktuur hou onder andere verband met die WEA, soos beskryf en gemagtig in die DOS se Omgewingsmagtiging wat op 1 Maart 2013 uitgereik is:

- *"Die oprigtingting van ongeveer 103 windturbines met 'n moontlike kapasiteit van 155 - 258 MW.*
- *'n Permanente harde blad bestaande uit gekompakteerde gruis, ongeveer 20[4] 50 m x 40 m, sal langs elke turbine aangebring word om 'n hyskraan te huisves.*
- *'n Totaal van drie konstruksie-oppervlaktes, elk ongeveer 200m x 400m groot, wat aan die suidekant aangebring sal word.*
- *Gruispaaie, ongeveer 4m breed, wat tussen elke turbine nodig is.*
- *Kabels wat turbines met mekaar verbind sal by die oorhoofse transmissielyne aansluit. Hierdie lyne sal dieselfde roete as die toegangspaaie volg. Elke turbine sal toegerus wees met 'n transformator wat die stroomspanning van 690 Volt na 22kilovolt (kV) sal opstoot. Hierdie transformator word binne die turbine-toring, of direk daarbuite, geplaas.*
- *Die kabels tussen die turbines sal op terrein na drie substasies geneem word waar die hoeveelheid elektrisiteit vanaf elke turbine gemeter sal word.*
- *Die voorgestelde substasies en verwante kontrolegeboue sal 'n voetspoor van ongeveer 200 x 100m hê.*
- *Die infrastruktuur wat met die verspreiding van elektrisiteit verband hou sal bestaan uit drie bestaande distribusielyne (1 x 132kV, 2 x 400kV en 2 x 220kV) wat oor die terrein loop. Die transmissielyne eindig by Eskom se Hydra Substasie, ongeveer 9.5km noord-oos van De Aar".*

'n Aansoek vir die Wysiging van die OM om die naam van die houer van die Omgewingsmagtiging (OM) van "Mulilo Renewable Energy (Edms) Bpk" na "Longyuan Mulilo De Aar 2 South (Edms) Bpk" te verander is in Mei 2013 ingedien. Die wysiging van die OM is op 21 Mei 2013 deur die DOS goedgekeur. Die Applikant het op 10 Julie 2014 'n tweede Aansoek vir die Wysiging van die Omgewingsmagtiging by die DOS ingedien, en wel vir die volgende wysigings: Wysiging van die geldigheidstydperk; wysiging van die eiendombeskrywings in die OM; en wysigings aan Voorwaardes 43, 44 en 45. Hierdie wysigings aan die OM is op 14 Augustus 2014 deur die DOS toegestaan.

Die Applikant doen nou aansoek om die projekbeskrywing van die voorgestelde WEA te wysig

[3] Vir daardie aktiwiteite wat in die oorspronklike OIB vir die projek oorgeslaan is
[4] Verwys na Afdeling 2.2 hieronder wat die voorgestelde wysiging van hierdie tipografiese fout in die OM betref

soos in Afdeling 2 hieronder uiteengesit. Die voorgestelde wysigings beteken dat die moontlike impakte van die voorgestelde projek herbeoordeel moet word, soos vereis kragtens die Wet op Nasionale Omgewingsbestuur (Nr 107 van 1998) se (2014) Regulasies vir Omgewings-invloedbepalings (OIB).

Neem asseblief kennis dat die gelyste aktiwiteite van die projek waarvoor omgewingsmagtigings uitgereik is, ook gelys word in Items 11, 12, & 19 van GK Nr R.983; Items 1 & 15 van GK No.R.984; en Item 14 van GK Nr R.985 van die 2014 OIB-regulasies. In hierdie geval gee die voorgestelde wysigings (op hul eie) geen verdere aanleiding tot enige gelyste aktiwiteite wat 'n omgewingsmagtiging nodig het nie.

Holland & Associates Omgewingskonsultante is deur die Applikant aangestel om die nodige Aansoek vir die Wysiging van die Omgewingsmagtiging vir die voorgestelde projek te hanteer in ooreenstemming met die Wet op Nasionale Omgewingsbestuur (NEMA) (Nr. 107 van 1998) se OIB-regulasies (2014).

2. Aansoek vir die Wysiging van die Omgewingsmagtiging

2.1 Beskrywing van voorgestelde wysigings aan die projekbeskrywing

Aangesien landgebaseerde windenergie-aanlegte (WEA) wêreldwyd deur regerings en energiereguleerders ondersteun word, verbeter die tegnologie daarvan ook deurlopend. Om die kleinste moontlike voetspoor per totale geïnstalleerde kapasiteit van 'n windenergie-aanleg te verseker, word windturbine-generators (WTG) verbeter tot eenhede wat meer energie op 'n meer doeltreffende wyse opwek. Soos wat die ingenieursverwante dravermoë en materiaalverswakking van eenhede beter verstaan word, is ontwerpers en ingenieurs in staat om meer doeltreffende WTGs met 'n beter optimale lewering vir 'n spesifieke terrein en klimaatstoestande te ontwerp.

Die applikant wil graag die kragopwekkingsvermoë van die WTGs by die De Aar 2 Suid WEA verhoog sodat dit ooreenstem met huidige internasionale WTG-modelle. Dit sal terselfdertyd die aantal WTGs by die WEA verminder. Daar word voorgestel dat die volgende veranderings aan die WTGs aangebring word:

- Verhoog die naafhoogte van 100 m tot 120m
- Verleng die deursnit van die draaivlerke van 60 m tot 80m
- Vermeerder die WTG se kragopwekkingsgrootte van 2.3MW tot 4.0MW

(Neem kennis: Die opwekkingskapasiteit van die WEA sal maksimaal 140MW beloop – wat ooreenstem met die Departement van Energie se boperk vir die maksimum megawatt wat in sy Aanskaffingsprogram vir Onafhanklike Hernubare Energievervaardigers [REIPPP] vervat is).

Komponent	Goedgekeur	Voorgestelde wysiging
Aantal turbines	103	61 Turbines @ 2.3MW per turbine (tot 30 turbines @ 4MW per turbine). Nota: Daar word aansoek gedoen word vir die maksimum aantal, 61.
Kragopwekkingskapasiteit per turbine	1.5 - 2.5MW	2.3MW – 4.0MW
Kragopwekkingskapasiteit van die WEA	155 - 258MW	140 MW
Deursnit van draaivlerke	120m	(min) 100m (max) 160m Nota: Daar word aansoek gedoen word

		vir die maksimum 160m.
Naafhoogte	100m	(min) 90m (max) 120m Nota: Daar word aansoek gedoen word vir die maksimum 120m
Harde-oppevlakte konstruksieblad	"20" 40 x 20m (langs elke turbine. (Nota: Dit is duidelik dat die "20" 'n tipografiese fout in die OM is. Verwys na Afdeling 2.2 hieronder)	40 x 50m (langs elke turbine)
Permanente geaffekteerde gebied (grootte van fondasie)	16 x 16m en 2 m diep	18,4m deursnee, wat vernou na 10,6m by die oppervlakte (sigbare gedeelte) wanneer fondasie voltooi is. Diepte : 3,5m

(Nota: Die Aansoek vir die Wysiging van die OM sal ondersoek instel na die mees nadelige ("worst case") scenario van 61 turbines @ 2.3MW per turbine met die verstandhouding dat indien die Applikant van 4MW turbines gebruik maak (met dieselfde afmetings as die 2.3MW turbines), die Applikant dan die aantal turbines na 30 sal verminder. Daar sal vir die maksimum turbine-afmetings aansoek gedoen word; en dus beoordeel word. Daar moet verder kennis geneem word dat die opwekkingskapasiteit van die WEA tot 140MW beperk is. Alhoewel 61 turbines van 2.3MW = 140.3MW, sal die Applikant tot 140MW beperk word).

Die veranderings het tot gevolg dat die deursnit van die basis van die turbinetoring van 15m tot 20m sal toeneem. Die konstruksie-oppervlakte bly egter 40 x 50m.

Volgens die Applikant is die voorgestelde plasing van die De Aar 2 Suid WEA op grond van onderstaande eienskappe geskik vir 'n Windenergie-aanleg:

- Uitstekende volgehoue bron van wind;
- Eskom-substasie naby die WEA, met 'n minimale afstand vir transmissielyne wat opgerig moet word;
- Mees toeganklike posisies is gekies, met die minste impak op die omgewing en konstruksiekostes;
- Die windenergie-aanleg is geleë in 'n sentrale deel van die Noord-Kaap/ Eskomnetwerk, wat dien as kompensasie vir enige elektrisiteitsverliese a.g.v. die transmissie van elektrisiteit na die streek (Longyuan Mulilo De Aar 2 South (Edms) Bpk, Mei 2015).

Daar word ook beoog om die uitleg van die WEA te verfyn. Verwys na Figuur 1 vir die opgedateerde uitleg. Neem kennis dat, soos vereis ingevolge Voorwaarde 13 van die OM, die Applikant 'n finale uitlegplan (en Omgewingbestuursprogram) vir die hele windenergie-aanleg by die DOS vir goedkeuring moet indien voordat enige werksaamhede kan begin.

Figuur 1: (Voorlopige) voorgestelde gewysigde uitleg. Neem kennis: die rooi merke dui die posisies aan van die turbines wat in die OM goedgekeur is, en die wit merkers dui die hersiene posisies van die nuwe turbines aan. (Transmissielyne is blou, rooi, goen en geel. Toegangspaaie word in geel en wit aangedui.)

2.2 Wysiging van die Omgewingsmagtiging

Die Applikant doen aansoek vir die wysiging van die OM vir die projek kragtens NEMA se OIB-regulasies (2014). Die voorgestelde wysigings aan die projekbeskrywing het ‘n “verandering in omvang” tot gevolg, en die aansoek word dus ingedien kragtens Deel 2 (Regulasies 31 en 32) van GK R. 982.

Bogenoemde voorgestelde veranderings aan die projekbeskrywing verg ‘n wysiging aan die afdeling van die Omgewingsmagtiging getiteld “*Die infrastruktuur wat verband hou met die aanleg sluit in*”, en spesifiek bladsy 5 van die OM, waarin die voorgestelde projek tans as volg beskryf word:

> *“- die oprigting van ongeveer 103 turbines met ‘n moontlike opwekkingskapasiteit van 155-258 MW”.*

Die voorgestelde wysiging van hierdie sin op bladsy 5 van die OM lees as volg:

> *“-die oprigting van ongeveer 61 turbines (met ‘n opwekkingskapasiteit van 2.3MW per turbine) tot ongeveer 30 turbines (met ‘n opwekkingskapasiteit van 4MW per turbine). Die opwekkingskapasiteit van die WEA sal 140 MW wees”.*

Regstelling van ‘n tipografiese fout in die beskrywing van ‘n verwante infrastruktuur op bladsy 5 van die OM:

Daar is ‘n tipografiese fout op bladsy 5 van die Omgewingsmagtiging gedateer 1 Maart 2013 wat verband hou met die beskrywing van een van die infrastruktuur-aspekte, spesifiek waar die OM

verwys na:

"'n Permanente harde blad bestaande uit gekompakteerde gruis, ongeveer 20 50 m x 40 m sal langs elke turbine aangebring word om 'n hyskraan te huisves".

Die applikant versoek dat hierdie tipografiese fout in die OM reggestel word deur die syfer "20" weg te laat, siende dat 'n harde oppervlak langs elke turbine aangebring sal word (soos in die res van die beskrywing aangedui) en meer as 20 oppervlaktes nodig sal wees. Daar word dus versoek dat die sin as volg verander word:

"'n Permanente harde blad bestaande uit gekompakteerde gruis, ongeveer 50 m x 40 m sal langs elke turbine aangebring word om 'n hyskraan te huisves".

3. Beoordeling van die impakte wat op die voorgestelde wysigings betrekking het

Moontlike omgewingsimpakte wat met die voorgestelde wysigings verband hou, is beoordeel en word in 'n Omgewingsinvloedbepalingsverslag aangespreek wat opgestel is kragtens Regulasie 32 (a)(i) van GK R 982. Al die deskundiges wat aangestel was om die spesialisstudies vir die oorsponklike OIB vir die voorgestelde De Aar 2 Suid WEA uit te voer, het die moontlike omgewingsimpakte (binne hulle studieveld) van die voorgestelde wysigings her-beoordeel om die gevolge daarvan in terme van moontlike omgewingsimpakte te bepaal. Die volgende spesialisstudies is uitgevoer:

- Impak op ekologie
- Impak op avifauna
- Impak op vlêrmuise
- Impak op varswater-hulpbronne
- Impak op erfenishulpbronne (wat argeologiese en paleontologiese hulpbronne insluit)
- Visuele impak
- Impak van geraas
- Impak op landbougrond

Die resultate van die opgedateerde spesialisstudies is opgesom en by die Omgewings-invloedbepalingsverslag ingesluit.

Op grond van die bevindinge van die opgedateerde spesialisstudies, kom die verslag tot die slotsom dat die voorgestelde wysigings nie die betekenisvolheid van enige van die omgewingsimpakte vir die voorgestelde projek sal vererger nie. Synde dat die voorgestelde wysigings geen bykomende betekenisvolle impakte tot gevolg het nie en daar slegs geringe verskille (meestal verbeterings) in die betekenisvolle impakte tussen die goedgekeurde projek en voorgestelde wysigings is, word daar aanbeveel dat die voorgestelde wysigings vir goedkeuring oorweeg word. Die voorgestelde wysigings is deel van tegnologiese verbeterings, wat 'n meer doeltreffende kragopwekkingsaanleg tot gevolg sal hê.

4. Proses van Openbare Deelname

'n Proses van Openbare Deelname word onderneem om te verseker dat alle geregistreerde B&GPe geleentheid het om kommentaar te lewer op die voorgestelde wysigings aan die OM vir die voorgestelde windenergie-aanleg. Die proses van openbare deelname sluit die volgende in:

- 'n Kennisgewing aan alle voorheen-geregistreerde B&GPe in die voorgestelde projek om hulle in te lig rakende die aansoek is vir die Wysiging van die OM:

- ‘n Brief is aan alle geaffekteerde grondeienaars gestuur waarin hulle in kennis gestel is van die Aansoek vir die Wysiging van die OM.
- ‘n Brief (hierdie brief) is uitgestuur aan alle geregistreerde[5] B&GPe, waarin geregistreerde B&GPe in kennis gestel is van die Aansoek vir die Wysiging van die OM en dat hulle (vir ‘n 30-dag kommentaartydperk) geleentheid het om op die Aansoek vir die Wysiging van die OM en die gepaardgaande verslag kommentaar te lewer.

- ‘n Kennisgewing aan alle moontlike B&GPe
  - Plasing van ‘n kennisgewing op terrein waarin moontlike (en geregistreerde) B&GPe in kennis gestel word van die Aansoek vir die Wysiging van die OM. Hierdie kennisgewing gee ‘n kort beskrywing van die voorgestelde Wysiging van die OM, en nooi lede van die publiek uit om as B&GPe te registreer en kommentaar op die voorgestelde OM Wysigingsaansoek in te dien.
  - Plasing van advertensies in die plaaslike *Echo* en die *Volksblad* streekskoerant oor die voorgestelde Wysiging van die OM, en waarin lede van die publiek uitgenooi word om as B&GPe te registreer en enige kwessies en kwellinge wat hulle mag hê binne die 30-dag kommentaartydperk bekend te maak.
- Alle moontlike en geregistreerde B&GP’s (die toepaslike Staatsdepartemente ingesluit) sal die geleentheid hê om die Aansoek vir die Wysiging van die OM en gepaardgaande verslag vir ‘n 30-dag kommentaartydperk, i.e. van 4 Augustus 2015 – 7 September 2015, na te gaan en daarop kommentaar te lewer. ‘n Afskrif van die verslag sal gedurende die kommentaartydperk in die De Aar Openbare Biblioteek beskikbaar wees, en kan ook afgelaai word vanaf Holland & Associates Environmental Consultants se webwerf (www.hollandandassociates.net).
- Alle kommentaar deur B&GPe sal in ‘n Kommentaar- en Antwoordverslag (K&AV) opgeneem, opgesom en beantwoord word, en tesame met die Omgewings-invloedbepalingsverslag by die DOS vir besluitneming ingedien word.
- Geregistreerde B&GPe sal skriftelik van die DOS se besluit in kennis gestel word.

5. Volgende Stappe

Die Aansoek vir die Wysiging van die OM en gepaardgaande verslag (Omgewings-invloedbepalingsverslag) sal vanaf 4 Augustus 2015 tot 7 September 2015 vir ‘n kommentaartydperk van 30 beskikbaar wees. Dit kan besigtig word by die De Aar Openbare Biblioteek, of afgelaai word vanaf Holland & Associates Environmental Consultants se webwerf (www.hollandandassociates.net). U word uitgenooi om bogenoemde dokumente tydens die 30-dag kommentaartydperk deur te lees en kommentaar daarop te lewer.

Enige kommentaar, kwessies of kwellinge oor die voorgestelde wysigings moet asseblief voor of op **7 September 2015** skriftelik per pos, e-pos of faks gestuur word aan Me Nicole Holland van Holland & Associates Environmental Consultants (Faks: (086)762-6126, e-pos: nicole@hollandandassociates.net of per pos: Posbus 31108, Tokai, 7966). Die DOS-verwysingsnommer (12/12/20/2463/AM3) moet aangebring word op alle korrespondensie wat deur B&GPe ingedien word.

Alle kommentaar deur B&GPe sal in ‘n Kommentaar- en Antwoordverslag beantwoord word, en sal na afloop van die 30-dag B&GP-kommentaartydperk tesame met die Omgewingsbepalingsverslag by die DOS vir oorweging ingedien word. Die DOS sal dan hulle oorsig- en besluitnemingsproses vir die gewysigde aansoek afsluit. Sodra die DOS hulle besluit oor die voorgestelde wysigingsaansoek uitgereik het, sal alle geregistreerde B&Pe skriftelik van die besluit in kennis

[5] Voorheen-geregistreerde B&GPe vir die oorspronklike OIB en aansoekproses vir die Wysiging van die OM

gestel word.

Tree asseblief met die onderstaande in verbinding indien u enige verdere inligting verlang of navrae het.

Die uwe

NICOLE HOLLAND (Pr. Sci. Nat.)
Vir: Holland & Associates - Environmental Consultants

APPENDIX G:

Final Environmental Impact Report (April 2012) including original specialist studies (electronic format)