ACOUSTIC SCOPING REPORT - MARALLA WEST WIND ENERGY FACILITY

BIOTHERM ENERGY (PTY) LTD

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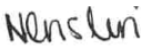
Signature				
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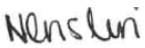
Signature				
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1 INTRODUCTION

Biotherm Energy plan to construct the Maralla West wind power generation facility, near Sutherland in the Northern Cape Province. In order for the project to proceed, an Environmental Impact Assessment (EIA) for the proposed facility is required to determine the impacts that the proposed development may have on the surrounding environment. Wind turbines have the potential to generate noise and as such a specialist Environmental Acoustic Impact Assessment is required as part of the EIA process. This report presents the background acoustic information as required for the Scoping Phase report.

1.1 SCOPE AND LIMITATIONS

The scope of work for the Environmental Acoustic Impact Assessment includes the following:

- Baseline (day and night) acoustic monitoring at sensitive receptor locations surrounding the proposed wind project;
- Development of a comprehensive acoustic inventory to account for all noise sources during both the construction and operational phases of the project;
- Determination of the propagation of noise from the wind power generation facility through the use of acoustic modelling software;
- Assessment of the modelled results to determine any impacts on neighbouring receptors; and
- Provision of mitigation measures should this be deemed necessary.

As with any impact assessment study, various assumptions are made and limitations experienced. For this assessment, these may include the following:

- It is assumed that all information provided by the Client regarding the construction phase and operational phase activities and related noise sources is an accurate representation of what will occur in reality; and
- Accessibility to various locations on site may be a limitation due to the remote and undulous nature of the study area.

2 APPROACH AND METHODOLOGY

For the Scoping Phase of the specialist Environmental Acoustic Impact Assessment, a basic desktop review of current conditions and potential impacts is performed. Impacts are determined using the following impact screening tool:

2.1 IMPACT SCREENING TOOL

To ensure a direct comparison between various specialist studies, an impact screening tool has been developed to assess the significance of identified impacts. The screening tool will allow any impacts of very low significance to be excluded from the detailed studies in the impact assessment phase. The screening tool is based on two criteria, namely probability and severity.

Probability Scale	Severity / Beneficial Scale			
	1	2	3	4
1	Very Low	Very Low	Low	Medium
2	Very Low	Low	Medium	Medium
3	Low	Medium	Medium	High
4	Medium	Medium	High	High

Probability Scale

4	**Definite** Where the impact will occur regardless of any prevention measures
3	**Highly Probable** Where it is most likely that the impact will occur
2	**Probable** Where there is a good possibility that the impact will occur
1	**Improbable** Where the possibility of the impact occurring is very low

Severity / Beneficial Scale

4	**Very severe** An irreversible and permanent change to the affected system(s) or party (ies) which cannot be mitigated.	**Very beneficial** A permanent and very substantial benefit to the affected system(s) or party(ies), with no real alternative to achieving this benefit.
3	**Severe** A long term impacts on the affected system(s) or party(ies) that could be mitigated. However, this mitigation would be difficult, expensive or time consuming or some combination of these.	**Beneficial** A long term impact and substantial benefit to the affected system(s) or party(ies). Alternative ways of achieving this benefit would be difficult, expensive or time consuming, or some combination of these.

2	**Moderately severe** A medium to long term impacts on the affected system(s) or party (ies) that could be mitigated.	**Moderately beneficial** A medium to long term impact of real benefit to the affected system(s) or party(ies). Other ways of optimising the beneficial effects are equally difficult, expensive and time consuming (or some combination of these), as achieving them in this way.
1	**Negligible** A short to medium term impacts on the affected system(s) or party(ies). Mitigation is very easy, cheap, less time consuming or not necessary.	**Negligible** A short to medium term impact and negligible benefit to the affected system(s) or party(ies). Other ways of optimising the beneficial effects are easier, cheaper and quicker, or some combination of these.

3 REGIONAL OVERVIEW

The existing noise climate in the area surrounding the proposed wind energy project is typically rural with limited anthropogenic influences. Current sources of noise include livestock, birds, insects and motor vehicles travelling along nearby roads.

The South African National Standards (SANS) 10328:2008 (*Methods for environmental noise impact assessments*) presently inform environmental acoustic impact assessment in South Africa. As per SANS 10103:2008 (*The measurement and rating of environmental noise with respect to annoyance and to speech communication)*, typical rating levels with regard to noise are applicable in different districts, as presented in **Table 1**. In order to assess the existing noise climate in the region, the "rural" SANS classification (Classification A) will apply to areas surrounding the proposed wind project. Monitored noise levels will be assessed against these standards (45 dB(A) during the day and 35 dB(A) at night). Current noise levels are not anticipated to exceed such standards, but will be confirmed with the assessment of the baseline monitoring results, which will be presented in the final EIA report.

Table 1: Typical Rating Levels for Noise in Districts (adapted from SANS 10103:2008)

Type of District	Classification	Equivalent Continuous Rating level for Noise ($L_{Req,T}$) (dB(A))	
		Outdoors	
		Day-time ($L_{Req,d}$)	Night-time ($L_{Req,n}$)
a) Rural	A	45	35
b) Suburban (with little road traffic)	B	50	40
c) Urban	C	55	45
d) Urban (with one or more of the following: workshops, business premises and main roads)	D	60	50
e) Central Business Districts	E	65	55
f) Industrial District	F	70	60
Guidelines in red are applicable to this noise impact assessment			

4 IMPACTS AND ISSUES IDENTIFICATION

For the Environmental Acoustic Impact Assessment, three farmhouse receptor locations in and around the vicinity of the Maralla West wind project have been identified (Error! Reference source not found.). The relevant predicted impacts on these receptors are discussed for each of the site components in detail in the sections that follow.

4.1 MARALLA WEST WIND ENERGY FACILITY

Acoustic impacts at the Maralla West site will be anticipated at some farmhouse receptor locations during both the construction and operational phases. Potential noise sources during the construction phase include excavators, graders, compactors, rollers, cranes and various vehicles including haulers and concrete trucks.

During the operational phase, the noise from the wind turbines are anticipated to impact on the noise climate at some farmhouse receptor locations. Noise from the wind turbines can originate from the mechanical components (namely the gearbox, generator, yaw drives, cooling fans and auxiliary equipment) but the main source of noise is aerodynamic, produced by flow of air over the turbine blades. Such aerodynamic noise is not deemed as intrusive, but merely an augmentation to background natural noise and as such it is advised that turbines are placed no closer than 300 m to a residential dwelling (Casey, 2013).

At the Maralla West site, the acoustic impacts during both the construction and operational phases may directly impact on the Farmhouse 1 receptor, due to its close proximity to surrounding wind turbines (nearest turbine is 340 m from this farmhouse) (**Figure 1**). It must be noted, however, that this farmhouse is the landowner's house, who is in support of this proposed wind energy project. Based on the impact screening tool, acoustic impacts from the wind turbines at the Maralla West site will be highly probable (specifically at Farmhouse 1) in terms of probability and moderately severe in terms of severity. This will result in the impact being "medium" and as such noise associated with the Maralla West wind turbines will be assessed thoroughly in the specialist Environmental Acoustic Impact Assessment (**Table 2**).

Table 2: Significance of Acoustic Impacts at the Maralla West Wind Energy Facility

Impact Description	Severity	Probability	Significance
Construction Phase			
Impact on sensitive receptors due to close proximity to construction activities	2	3	**Medium**
Operational Phase			
Impact on sensitive receptors due to close proximity to wind turbines	2	3	**Medium**

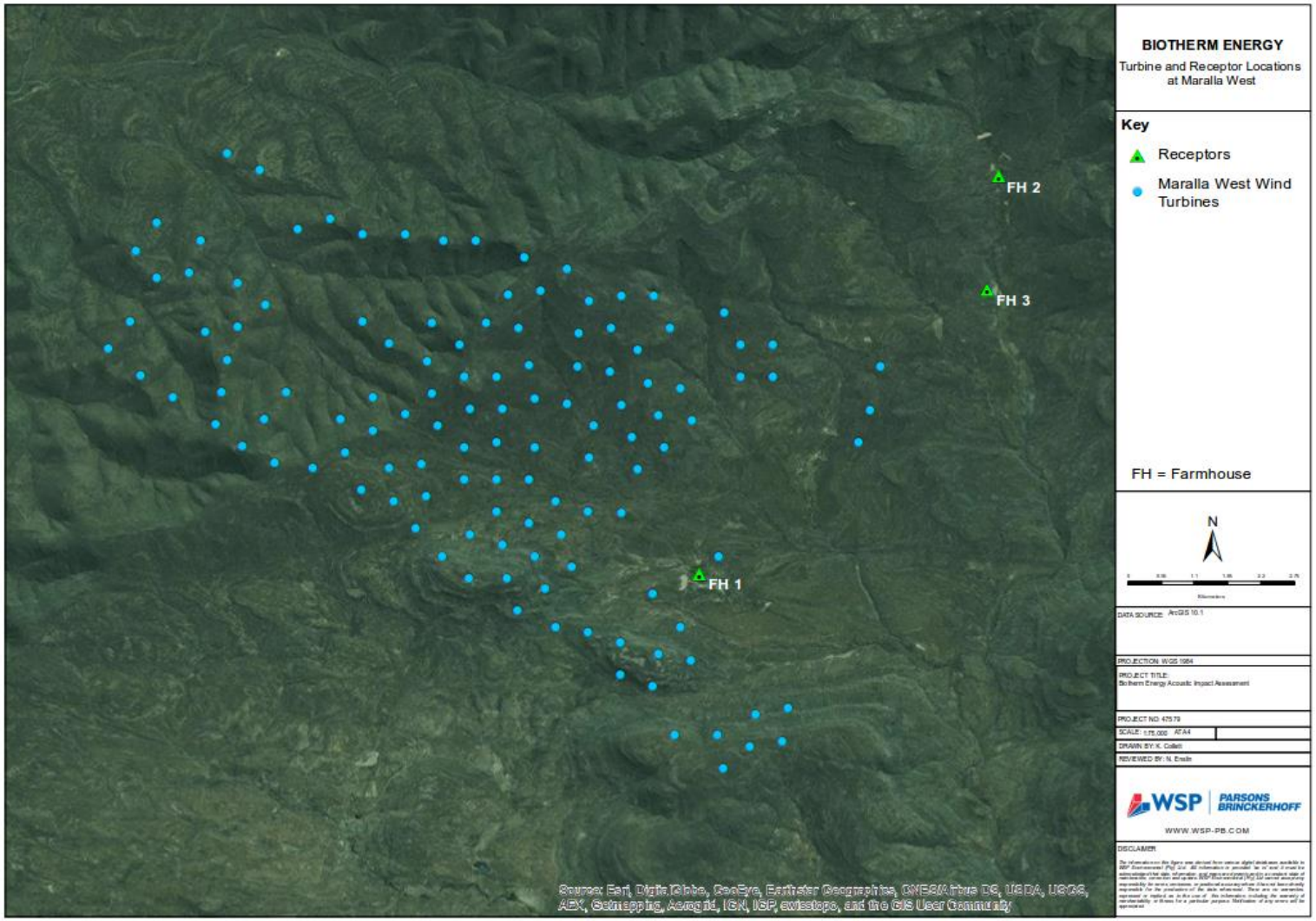

Figure 1: Location of sensitive receptors and wind turbines at the Maralla West site

4.2 TRANSMISSION LINE

Acoustic impacts from the transmission lines at the Maralla West site may only be sensed at the farmhouse receptor locations during the construction phase. Due to the temporary nature of this phase, impacts are deemed to be minimal. Noise during the operational phase of the transmission line is envisaged to be negligible.

Based on the impact screening tool, acoustic impacts from the transmission lines will be negligible in terms of severity and improbable to probable in terms of probability. This will result in the impact being "very low" and as such, noise associated with the transmission lines will not be assessed in the specialist Environmental Acoustic Impact Assessment (**Table 3**).

Table 3: Significance of Noise Impacts for the Transmission lines

Impact Description	Severity	Probability	Significance
Construction Phase			
Impact on sensitive receptors due to close proximity to construction activities	1	2	**Very Low**
Operational Phase			
Impact on sensitive receptors due to operational activities within the transmission line servitude	1	1	**Very Low**

4.3 ACCESS ROAD

Acoustic impacts from the access roads at the Maralla West site may only be sensed at the farmhouse receptors during the construction phase. Due to the temporary nature of this phase and the fact that equipment will remain on site throughout the construction phase with only smaller vehicles travelling along the road daily, impacts are deemed to be minimal. Noise during the operational phase of the access road is envisaged to be negligible due to the small number of vehicles accessing the sites per day.

Based on the impact screening tool, acoustic impacts from the access roads will be negligible in terms of severity and improbable to probable in terms of probability. This will result in the impact being "very low" and as such noise associated with the access roads will not be assessed in the specialist Environmental Acoustic Impact Assessment (**Table 4**).

Table 4: Significance of Noise Impacts for the Access Road

Impact Description	Severity	Probability	Significance
Construction Phase			
Impact on sensitive receptors due to close proximity to construction activities	1	2	**Very Low**
Operational Phase			
Impact on sensitive receptors due to close proximity to the access road	1	1	**Very Low**

5 TERMS OF REFERENCE FOR THE IMPACT ASSESSMENT PHASE

The Environmental Acoustic Impact Assessment will be conducted using the methodology detailed below:

5.1 BASELINE ASSESSMENT

The baseline assessment will consist of:

- Review of applicable legislation including any province-specific noise regulations and by-laws
- An assessment of the existing noise climate in the vicinity of each proposed site through baseline noise monitoring:
  - Day and night-time noise monitoring will be conducted at the four identified farmhouse receptors. All sound level measurement procedures will be undertaken according to the relevant South African Code of Practice, South African National Standards (SANS) 10103:2008. Sound level measurements will be undertaken using a Casella™ Type 1 Integrating Sound Level Meter. Monitoring will be conducted in hourly intervals in order to develop a representative baseline for the area. Day-time monitoring will occur between 06:00 and 22:00, and the night-time monitoring between 22:00 and 06:00.
  - Assessment of monitored results against the relevant guideline rating levels as provided in SANS 10103:2008.

5.2 ACOUSTIC INVENTORY COMPILATION

A detailed inventory of all noise sources associated with the construction and operation of the proposed wind project will be developed. This will include all construction and operational equipment and associated on-site activities. Typical noise levels for wind energy projects will be calculated based on sound level data provided by the Client.

5.3 ACOUSTIC MODELLING

Environmental noise modelling will be conducted using the internationally accredited noise modelling software, CadnaA (Computer Aided Noise Abatement). The CadnaA software provides an integrated environment for noise predictions under varying scenarios and calculates the cumulative effects of various sources. The model uses ground elevations in the calculation of the noise levels in a grid and uses meteorological parameters that have an effect on the propagation of noise. CadnaA has been utilised in many countries across the globe for the modelling of environmental noise and town planning. It is comprehensive software for 3-dimensional calculations, presentation, assessment and prediction of environmental noise emitted from industrial plants, parking lots, roads, railway schemes or entire towns and urbanized areas.

The noise source inventory detailed above will be utilised as input for the CadnaA model. Gridded outputs from CadnaA will then be input into ArcGIS to provide a visual representation (isopleth output) of noise levels throughout the region. The noise contribution of the proposed wind project to the existing noise levels (monitored data) will be calculated, with comparisons being made to relevant National guidelines.

5.4 ACOUSTIC IMPACT ASSESSMENT

A detailed Environmental Acoustic Impact Assessment will be performed detailing the findings of the baseline assessment, acoustic modelling results and impacts. Recommendations for

appropriate mitigation measures will also be provided should this be deemed necessary. The impact rating/significance for each site will also be assessed through the utilisation of the Hacking methodology.

6 REFERENCES

- Casey, Z. (2013): Noise farms: A Noisy Neighbour? Available online at: http://www.renewableenergyworld.com/articles/2013/02/wind-farms-a-noisy-neighbor.html.
- South African National Standards (2008): SANS – Code of Practice 10103:2008, The measurement and rating of environmental noise with respect to annoyance and to speech communication, Standards South Africa, 6th Edition (ISBN 978-0-626-20832-5).