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ENVIRONMENTAL NOISE IMPACT ASSESSMENT FOR SCOPING PURPOSES INTO THE ESTABLISHMENT OF A WIND ENERGY FACILITY ALONG THE WEST COAST NORTH OF THE OLIFANTS RIVER MOUTH

Prepared by

A.W.D. Jongens

for

Savannah Environmental (Pty) Ltd

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EXECUTIVE SUMMARY

A specialist study was conducted for scoping purposes into the potential impact of noise emanating from the proposed establishment of a Wind Energy Facility (WEF) along the west coast north of the Olifants River mouth and east of Koekenaap.

The land surrounding the proposed facility is primarily undeveloped, undisturbed farmland that is very sparsely populated. The closest farm homesteads or residences identified that might potentially be impacted upon by noise emanating from the wind turbines are at Skaapvlei, Skilpadvlei and Nooitgedag.

Other than at Skaapvlei, situated adjacent to the proposed WEF site, the impact of noise during operation and construction phase at the nearest identified sites of Nooitgedag and Skilpadvlei was anticipated to be low. The conclusions were based on limited information available and would need to be confirmed during the full EIA stage.

In order to minimise the noise during vehicular movement during the construction and operation of the facility it is recommended that the portion of the road to the facility that passes through Koekenaap consist of a low-noise road surface.

This report of the specialist study is submitted by the author independent of any third party influence.

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1 INTRODUCTION

1.1 Background and brief

Jongens Keet Associates was commissioned to undertake a specialist study into the potential impact of noise from the proposed establishment of a Wind Energy Facility (WEF) along the west coast north of the Olifants River mouth and east of Koekenaap. This report describes the scoping phase of the Noise Impact Investigation into the establishment of the Facility.

2 STUDY AREA

The study area is shown on the map of Figure 1. The area is located east of the nearest town, Koekenaap, extending along the west coast north of the Olifants River mouth to south of Brand-se-baai (not shown in the Figure). It is proposed that between 50 and 100 wind turbines, each with an electrical capacity of up to 2 MW, will be located within an area of 37,6 km^2 shown hatched within an orange line. The proposed land area straddles an existing gravel road linking Skaapvlei with the R363 at Koekenaap. The distance between the eastern boundary of the proposed WEF and the R363 is approximately 14 km and to the outskirts of Koekenaap approximately 10 km.

The surrounding land is primarily undeveloped, undisturbed farmland that is very sparsely populated and covered in natural scrub similar to that shown in Figure 5.

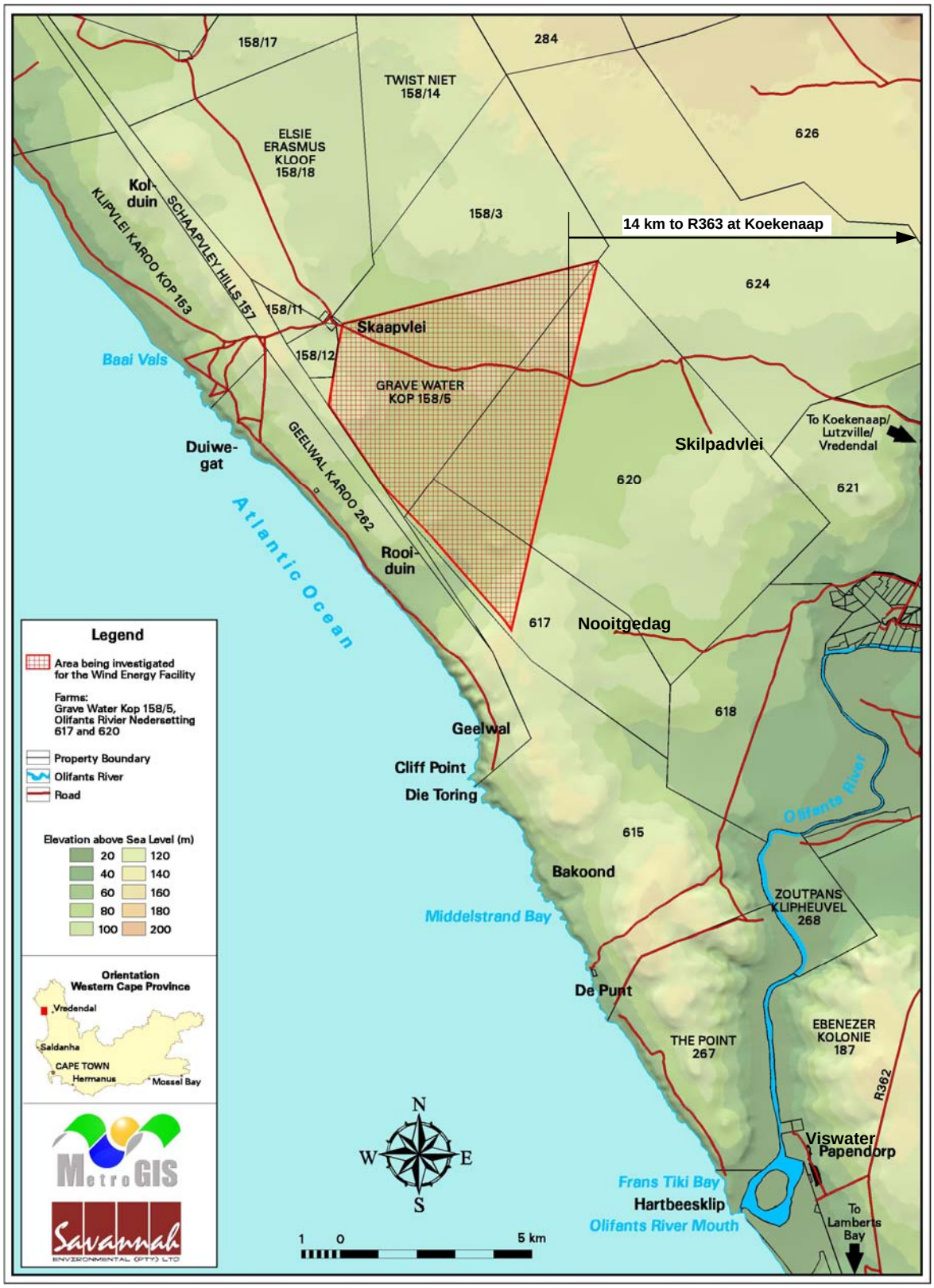

FIGURE 1 Study area showing demarcated area of the proposed Wind Energy Facility

3 METHODOLOGY

The study was conducted in accordance with procedures contained in South African National Standard (SANS) 10328, *Methods for environmental noise impact assessments* in terms of the National Environmental Management Act Nr 107 of 1998. A summary of the procedure is outlined hereunder.

1. Determine the land use zoning and identify all potential noise sensitive sites that could be impacted upon by activities relating to operation of the proposed WEF.
2. Determine the existing ambient levels of noise within the study area by conducting representative sound measurements.
3. Determine the acceptable rating level for noise at identified noise sensitive sites.
4. Identify all noise sources relating to the activities of the WEF during construction phase and operation phase that could potentially result in a noise impact at the identified noise sensitive sites.
5. Determine the sound emission and nature of the sound emission from each of the identified noise sources.
6. Calculate the expected rating level of sound at the identified noise sensitive sites from the combined sound power level emanating from identified noise sources.
7. Calculate the noise impact at identified noise sensitive sites.
8. Assess the noise impact at identified noise sensitive sites in terms of SANS 10328; the Noise Control Regulations; the World Health Organsation; the World Bank.
9. Investigate alternative noise mitigation procedures, if required.
10. Prepare and submit an environmental noise impact scoping report containing the procedures and findings of the investigation.

4 ASSESSMENT OF NOISE

A glossary of the terminology used in South African National Standards for the measurement and assessment of noise is contained in Appendix 1.

4.1 South African National Standards

In accordance with SANS 10328, the predicted impact that noise emanating from a proposed development would have on occupants of surrounding land is assessed by determining whether the rating level, $L_{Req,T}$, of the predicted ambient noise would exceed the residual noise or exceed the acceptable rating level of noise on that land as indicated in Table 2 of SANS 10103 and relating this excess to the probable response of a community to the noise as indicated in Table 5 of SANS 10103. Tables 2 and 5 of SANS 10103 are reproduced hereunder. Refer to Appendix 1 for definitions of terminology.

SANS 10103, Table 2 — Acceptable rating levels for noise in districts

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]	**Day-time $L_{Req,d}$[b]**	**Night-time $L_{Req,n}$[b]**	**Day-night $L_{R,dn}$[a]**	**Day-time $L_{Req,d}$[b]**	**Night-time $L_{Req,n}$[b]**
RESIDENTIAL DISTRICTS						
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
NON RESIDENTIAL DISTRICTS						
d) Urban districts with some workshops, with business premises, and with 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

NOTE 1 If the measurement or calculation time interval is considerably shorter than the reference time intervals, significant deviations from the values given in the table may result.

NOTE 2 If the spectrum of the sound contains significant low frequency components, or when an unbalanced spectrum towards the low frequencies is suspected, special precautions should be taken, and specialist attention is required. In this case the indoor sound levels may significantly differ from the values given in columns 5 to 7. See also annex B.

NOTE 3 Residential buildings, e.g. dormitories, hotel accommodation, residences etc. may only be allowed in non- residential districts on condition that the calculated or anticipated indoor $L_{Req,T}$ values given in column 3 of table 1 are not exceeded.

a The values given in columns 2 and 5 are equivalent continuous rating levels and include corrections for tonal character, impulsiveness of the noise and the time of day.

b The values given in columns 3, 4, 6 and 7 are equivalent continuous rating levels and include corrections for tonal character and impulsiveness of the noise.

SANS 10103, Table 5 — Categories of community/group response

1	2	3
Excess $\Delta L_{Req,T}$ [1)] dBA	**Estimated community/group response**	
	Category	**Description**
0 – 10	Little	Sporadic complaints
5 – 15	Medium	Widespread complaints
10 – 20	Strong	Threats of community/group action
>15	Very strong	Vigorous community/group action

a Calculate $)L_{Req,T}$ from the appropriate of the following:

1) $\Delta L_{Req,T}$ = $L_{Req,T}$ of ambient noise under investigation MINUS $L_{Req,T}$ of the residual noise (determined in the absence of the specific noise under investigation).

2) $\Delta L_{Req,T}$ = $L_{Req,T}$ of ambient noise under investigation MINUS the maximum rating level for the ambient noise given in table 1.

3) $\Delta L_{Req,T}$ = $L_{Req,T}$ of ambient noise under investigation MINUS the acceptable rating level for the applicable district as determined from table 2.

4) $\Delta L_{Req,T}$ = Expected increase in $L_{Req,T}$ of ambient noise in an area because of a proposed development under investigation.

NOTE Overlapping ranges for the excess values are given because a spread in the community reaction may be anticipated

4.2 World Health Organisation

SANS 10103 contains the statement that the acceptable rating levels for ambient noise are essentially in line with the recommendations of the World Health Organisation (WHO) for community exposure.

4.3 World Bank

The World Bank has adopted the WHO recommendations on maximum L_{Aeq} in residential areas and schools. These recommendations apply to all World Bank Group funded projects. The assessments of noise impact in this study therefore embody WHO and World Bank assessments.

4.4 Impact qualifiers

The **intensity** of a predicted noise impact was determined in relation to the categories of community response contained in Table 5 of SANS 10103 and are qualified as follows:

Negligible	Predicted $L_{Req,T}$ does not exceed the residual or acceptable $L_{Req,T}$
Low	Predicted $L_{Req,T}$ exceeds the residual or acceptable $L_{Req,T}$ by between 0 & 5 dB
Medium	Predicted $L_{Req,T}$ exceeds the residual or acceptable $L_{Req,T}$ by between 5 & 10 dB
High	Predicted $L_{Req,T}$ exceeds the residual or acceptable $L_{Req,T}$ by more than 10 dB

For a 16-hour daytime assessment $L_{Req,d}$ replaces $L_{Aeq,T}$.
For an 8-hour night-time assessment $L_{Req,n}$ replaces $L_{Aeq,T}$.

4.5 Noise Control Regulations

The control of noise in the Western Cape is legislated in the form of the Noise Control Regulations of the Environment Conservation Act No. 73 of 1989 applicable to the Province of the Western Cape, Provincial Gazette Number 5309 of 20 November 1998.

In terms of Clause 2 (d) of the Noise Control Regulations:

"*A local authority may, before changes are made to existing facilities or existing use of land or buildings, or before new buildings are erected, in writing require that noise impact assessments or tests be conducted to the satisfaction of the local authority by the owner, developer, tenant or occupant of the facilities, land or buildings and that reports or certificates relating to the noise impact be submitted to the local authority, to the satisfaction of the local authority, by the owner, developer, tenant or occupant."*

In terms of Schedule 3 (c) of the Noise Control Regulations:

"No person shall make changes to existing facilities or existing use of land or buildings or erect new buildings, if these will house or cause activities that will, after such changes 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 Clause 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, animal, machine, device or apparatus or any combination thereof."

Disturbing noise means a noise level that exceeds the ambient sound level measured continuously at the same measuring point by 7 dB or more.

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 meter was put into operation.

Certain terminologies used in the Noise Control Regulations and in the SANS 10103 have similar sounding, but not equal, meanings. Thus,

Noise Control Regulations:		SANS 10103:
Ambient sound level	is similar to	Residual noise
Noise level	is similar to	Rating level of ambient noise

Cognisance needs to be taken of the fact that the Provincial Noise Control Regulations have undergone major revision to bring them in line with recommendations of the World Health Organisation, WHO. South Africa is a signatory of WHO and is thereby bound by its recommendations. Although the existing Noise Control Regulations remain in force until promulgation of the revised Noise Control Regulations, the draft revision could be promulgated within the near future. Noise limits in the draft revision of the Noise Control Regulations are based on the acceptable rating levels of ambient noise contained in SANS 10103. Thus,

disturbing noise, in terms of the revised Regulations, would mean a specific noise level that exceeds either the outdoor equivalent continuous day/night rating level (L_{Rdn}), the outdoor equivalent continuous day rating level (L_{Rd}) and/or the outdoor equivalent continuous night rating level (L_{Rn}) for the particular neighbourhood indicated in SANS 10103 as the outdoor ambient noise in various districts.

5 NOISE SENSITIVE SITES

The closest farm homesteads or residences that might potentially be impacted upon by noise emanating from the wind turbines are at Skaapvlei, Skilpadvlei and Nooitgedag indicated in Figures 1 and 2

6 EXISTING AMBIENT SOUND LEVELS

Ambient sound levels were recorded at four locations within the study area on Thursday 5th and Friday 6th April 2007. The equivalent continuous A-weighted sound pressure level, $L_{Aeq,T}$, simultaneously with the 1/3rd octave band equivalent sound pressure levels were measured using a Larson Davis Type 824 precision integrating sound level meter mounted on a tripod with the microphone positioned 1,4 metres above the ground and at least 1,5 metres from any large sound-reflecting surface. The microphone was fitted with a windshield. Prior to and after the measurements the calibration of the meter was checked using a Brüel & Kjaer type 4230 Calibrator.

The locations were established by means of a Magellan Meridian GPS unit and are indicated as L1 through L4 on the map of Figure 2. A description of each measurement location is recorded in Table 1 together with the geographical position, elevation and the measured $L_{Aeq,T}$ in the absence of noise from an occasional passing vehicle. The duration, T, of each measurement was approximately 10 minutes. Repeat measurements were within 0,6 dB. The stability of the sound levels indicated that the duration was long enough to be representative of that occurring during a daytime period for the same weather conditions. The $L_{Aeq,T}$ was therefore considered to represent the daytime rating level, $L_{Req,d}$. The weather on both days was fine. The usually strong wind that blows in the area did not materialise. On both days there was little to no air movement.

TABLE 1 Ambient sound level at measurement locations

Location		Latitude	Longitude	Elevation, m.	$L_{Aeq,T}$, dBA
L1	Viswater north of Papendorp	31° 40.93S	018° 12.23E	8	42
L2	Highest elevation of road to De Punt	31° 38.05S	018° 10.82E	129	36
L3	Road overlooking Olifants river & Zoutpansklipheuwel	31° 37.19S	018° 11.05E	65	36
L4	Road to Skaapvlei beyond turnoff to Skilpadvlei	31° 30.06S	018° 10.03E	80	34

Photographs of measurement locations L1 through L3 are recorded in Figures 3, 5 and 7, respectively. No photograph was taken at location L4. The equivalent continuous A-weighted sound level in each 1/3rd octave frequency band from 31,5 Hz to 8000 Hz measured at Locations L1 through L4 are recorded in Figures 4, 6, 8 and 9 respectively.

The measurements of ambient sound levels were conducted prior to knowledge of the WEF site proposed in this report. The choice of the sound measurement locations was based on a previous proposal for WEF site locations that included land surrounding location L2 that is reasonably close to location L1. Location L1 lying in a more wind sheltered area was chosen as it was anticipated that the impact of noise emanating from wind turbines in the vicinity of location L2 would potentially have the greatest impact on the latter land area. All other sites are more exposed to wind and associated wind noise.

The ambient sound levels measured at locations L3 and L4 were considered to be representative of land in the vicinity of the identified noise sensitive sites at Nooitgedag and Skildapvlei. Within a dB they were equal to the acceptable night-time rating level, $L_{Req,n}$, for a rural residential district.

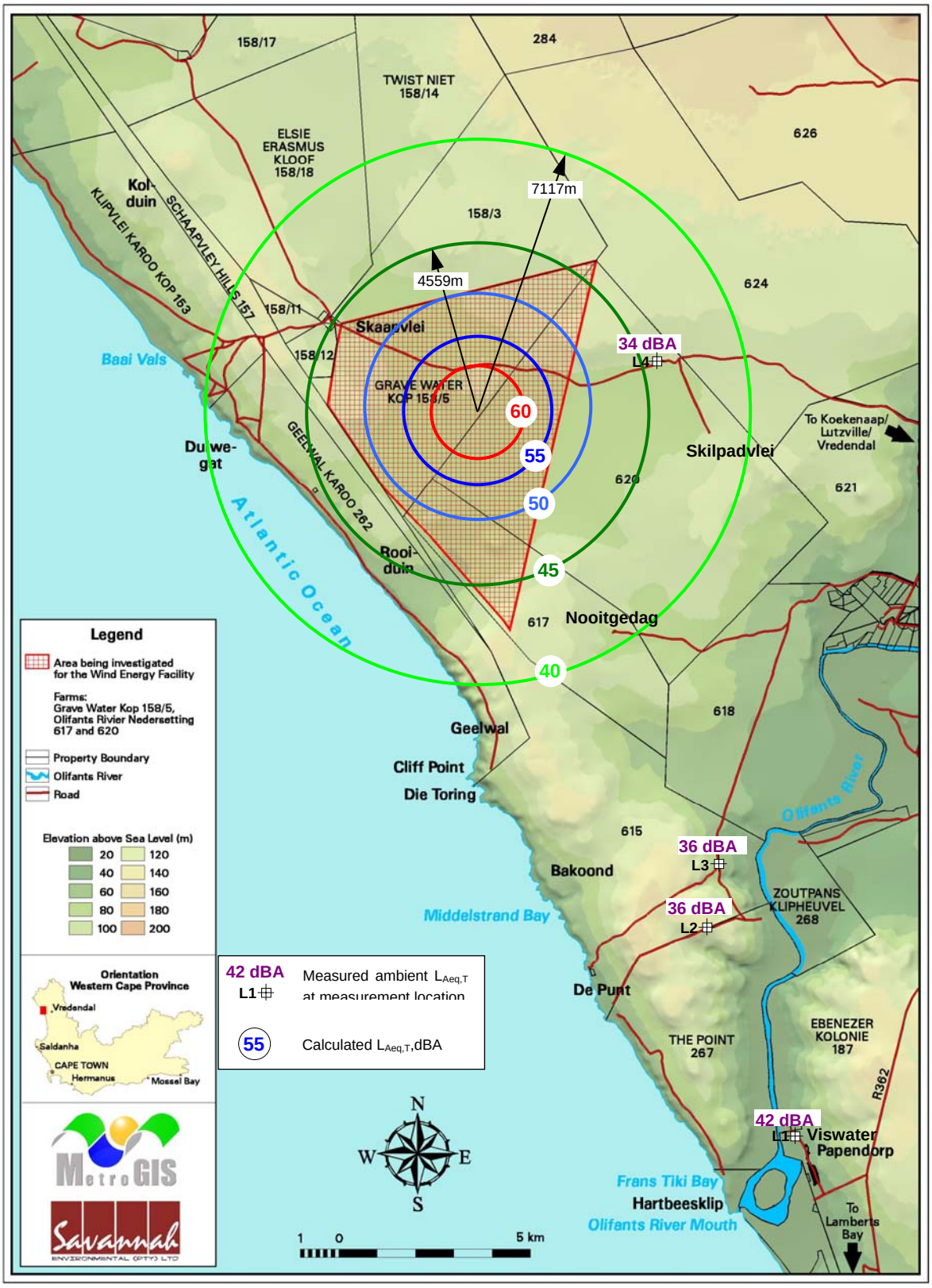

FIGURE 2 **Map of study area including ambient sound measurement locations with measured $L_{Aeq,T}$ and approximate contours of predicted $L_{Aeq,T}$ emanating from 100 Vestas V66 turbines located at the central area of the proposed site.**

FIGURE 3 measurement location L1 at Viswater, north of Papendorp settlement, looking west towards the Olifants River mouth

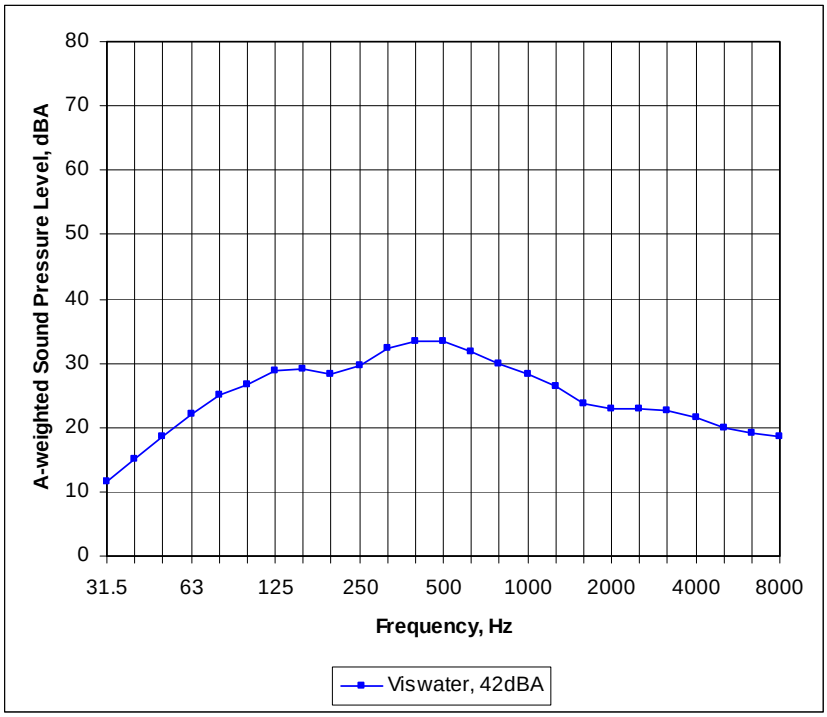

FIGURE 4 Sound level spectrum measured at L1, Viswater

Date & time:	Thursday 5 April 2007; 18:40hrs
Weather:	Clear; mist developing over sea; slight sea breeze
Audible sounds:	Sea surf
$L_{Aeq,T}$:	42 dBA

FIGURE 5 Measurement location L2 - Highest elevation of road to Die Punt looking south towards Viswater & Papendorp settlement near Olifants River mouth

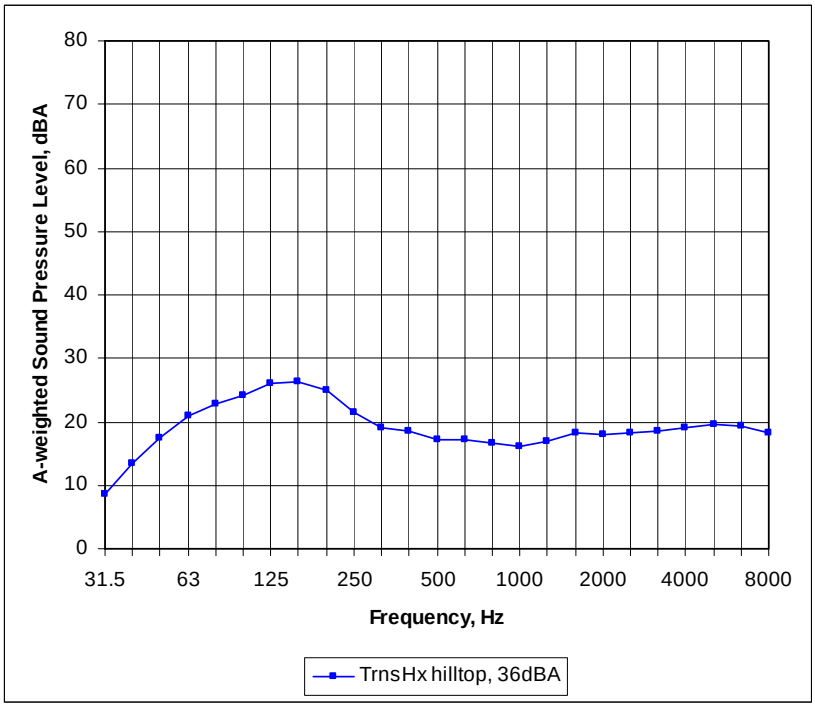

FIGURE 6 Sound level spectrum measured at location L2

Date & time:	Friday 6 April 2007; 10:50hrs
Weather:	Clear; no wind
Audible sounds:	Sea surf just audible
$L_{Aeq,T}$:	36 dBA

FIGURE 7 Measurement location L3 looking east towards Olifants River and Zoutpansklipheuwel

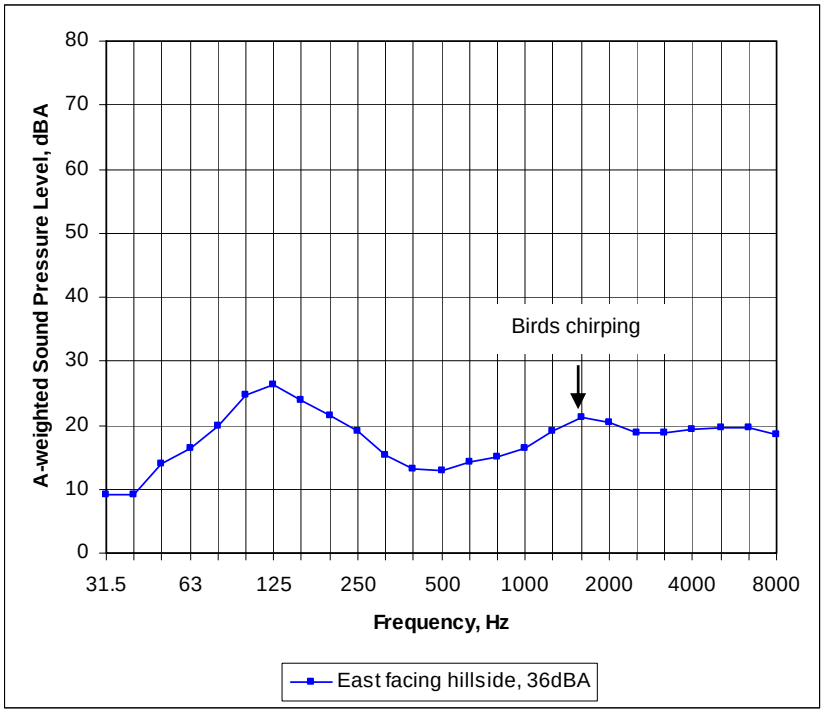

FIGURE 8 Sound level spectrum measured at location L3

Date & time:	Friday 6 April 2007; 11:15hrs
Weather:	Clear; no wind
Audible sounds:	Sea surf and/or distant vehicle noise just audible; chirping birds
$L_{Aeq,T}$:	36 dBA

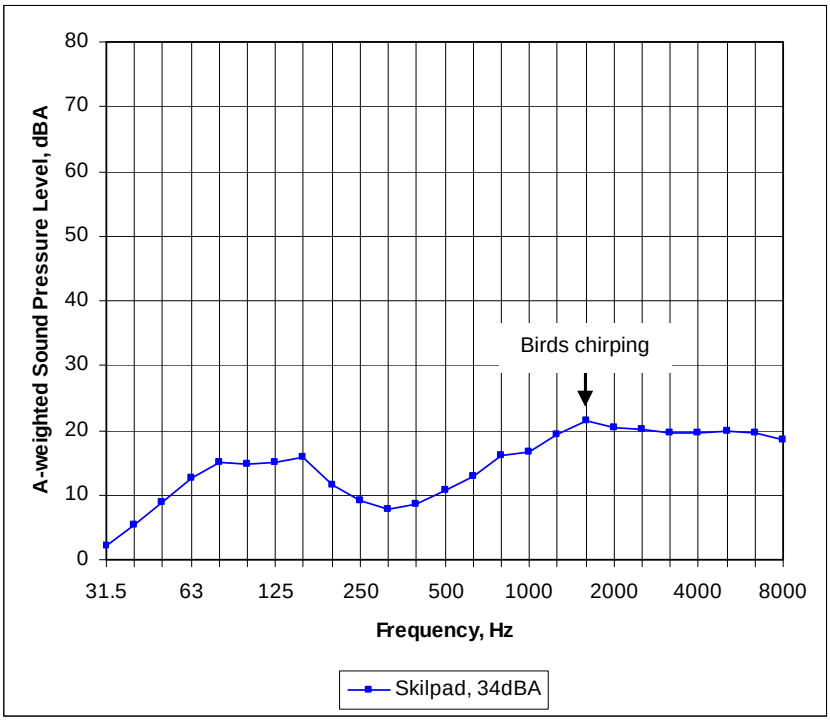

FIGURE 9 Sound level spectrum measured at location L4 on gravel road to Skaapvlei just beyond turnoff to Skilpadvlei (no photograph)

Date & time: Friday 6 April 2007; 12:20hrs
Weather: Clear; no wind
Audible sounds: Chirping birds
$L_{Aeq,T}$: 34 dBA

7 NOISE SOURCES

It is proposed that between 50 and 100 wind turbines will be located within an area of 25 km^2 shown hatched within an orange line in Figures 1 and 2. At the time of preparation of this report no decision had been made on the type, electrical capacity, or number of wind turbines to be erected and where they would be placed on the site. These parameters would need to be considered at the EIA phase of the Noise Impact Study.

8 APPROXIMATE IMPACT OF NOISE AT RECEIVER LOCATIONS

8.1 Outdoor rating level $L_{Req,T}$

A report entitled Klipheuwel Audible Noise, dated 2005 was received from Mr I. Smit of Eskom. The report contains results of sound measurements conducted at the Klipheuwel Wind Energy Demonstration Facility (KWEDF) at Klipheuwel including graphs of the minimum, average and maximum sound power levels emitted in each 1/3rd octave frequency band by three wind turbines extending from 25 Hz to 10 kHz.
A Vestas V66, 1,7 MW wind turbine is the largest of these and was chosen as a yardstick for this scoping study.

The sound power emission data of the Vestas V66 was used to calculate the approximate $L_{Req,T}$ in the vicinity of the proposed WEF. A copy of the sound power emission graph contained in the Klipheuwel report is displayed in Figure 10. No pure tones are evident. Therefore the $L_{Aeq,T}$ equals the rating level, $L_{Req,T}$, for constant operation of, hence constant noise emission from the WEF.

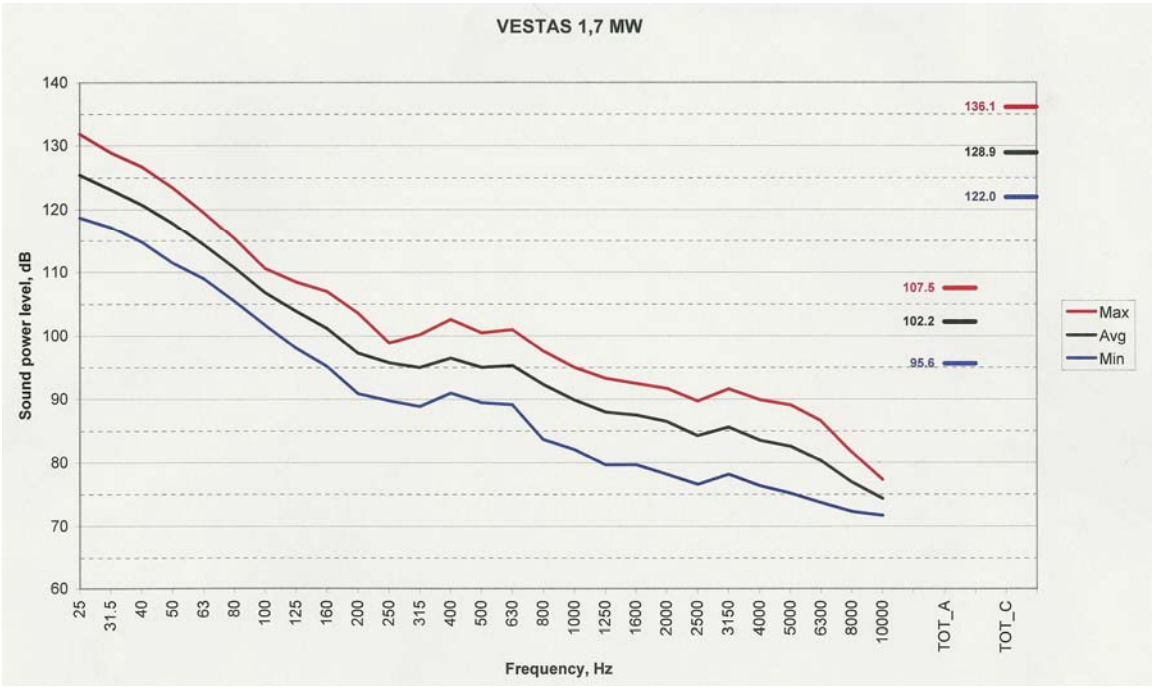

FIGURE 10 Sound power level emission of a Vestas, V66 wind turbine

The octave band sound power levels from 31,5 Hz to 4000 Hz for the maximum sound emission were derived from the 1/3rd octave values read off the graph. It was interpreted that the maximum sound emission occurred at a wind speed of between 7 and 8 m/s. No tabulated values were included. The maximum sound emission levels provided a worst-case scenario for sound emission from this turbine type.

The combined octave band sound power levels for 100 such turbines was calculated and used to calculate A-weighted sound pressure level contours around the proposed WEF site in accordance with procedures contained in SANS 10357, *The calculation of sound propagation by the Concawe method*. It was assumed that all 100 turbines were located in the central area of the proposed site. The assumption is obviously not practically realisable. However, without any indication of the type, the number and location of each turbine the greatly increased amount of calculation and time required for a supposed scenario that might not be representative was not considered warranted to provide an improved accuracy for the scoping phase of the noise impact investigation. Detailed modelling will be conducted during the EIA phase.

The resultant $L_{Req,T}$ contours are displayed in Figure 2. The contours are to be interpreted as the $L_{Req,T}$ at any point on the contour during meteorological conditions providing most favourable propagation of sound from the sound source to the listener.

The predicted $L_{Req,T}$ contours for the selected type, capacity, number and placement of the proposed facility will deviate from the circular contours contained in this report. The difference in contour shapes are expected to be greatest closest to the site where they will follow the distribution of the turbines but less so for the 45 dBA and 40 dBA contours in Figure 2.

The $L_{Req,T}$ contours in Figure 2 provide the best estimate of the sound exposure on the surrounding land for the worst-case scenario of the highest noise emission values and for most favourable conditions for the propagation of sound from the turbines to receivers on the surrounding land.

8.2 Assessment of noise impact when applying $L_{Aeq,T}$

The two identified sites Skilpadvlei and Nooitgedag lie between the 40 and 45 dBA contour lines. The ambient $L_{Aeq,T}$ measured of 36 and 34 dBA at location L3 and L4 were obtained during almost wind still conditions during daytime. Due to the presence of audible surf noise and the absence of audible man-made noise at most locations it was anticipated that the night-time levels would not be significantly lower.

In the Klipheuwel report $L_{Aeq,T}$ of the order of 45 dBA or more were recorded for wind speeds in excess of 5 m/s prior to construction of the KWEDF. The sound levels were attributed to interaction between the wind and the foliage of trees, grass and other structures. The latter wind speed is the cut-in speed for many wind turbines that only operate during wind speeds in excess of 5 m/s. It was thus anticipated that the outdoor $L_{Req,T}$ due to noise emission from the wind turbines would not exceed an ambient $L_{Req,T}$ of 45 dBA, or higher, due to wind noise at the Skilpadvlei and Nooitgedag sites.

In terms of SANS 10103 the outdoor $L_{Req,T}$ of noise emanating from the wind turbines would not be considered to disturbing or otherwise intrusive at these two sites and at any other sites situated at or beyond approximately 4500 m from the WEF. In terms of the NCR the noise would not be considered to be a disturbing noise.

Dependent on the placement of the wind turbines it was anticipated that the $L_{Req,T}$ due to the wind turbines could exceed the ambient $L_{Req,T}$ due to wind noise at Skaapvlei. In terms of SANS 10103 the $L_{Req,T}$ of noise emanating from the wind turbines would probably be considered to disturbing or otherwise intrusive at Skaapvlei. In terms of the NCR the noise could possibly be considered to be disturbing.

8.3 Low frequency sound content

Perusal of international references regarding noise from wind turbines indicates that there is uncertainty whether, when there is public response to noise from wind turbines, the response is related to the presence, or not, of low frequency sound. This may partly be ascribed to the difficulty of measuring low frequency sound and particularly in isolating low-frequency sound of a source under investigation from the low-frequency ambient noise due to wind and human activities. Use of the standard metrics $L_{Aeq,T}$ and $L_{Req,T}$ for the measurement and assessment of sound do not provide an adequate relationship between the objective measurement of sound under consideration and the human subjective response to that sound when the sound contains strong low-frequency content. Low-frequency sound is understood to include all sound below a frequency of 125 Hz.

No standardised test and measurement procedure is yet available for the assessment of low-frequency noise. However, Annex B of SANS 10103 contains a procedure to determine whether noise at a receiver location contains sound with strong low frequency content. Annex B states: that “the procedure is only suitable to be applied indoors”.

Figure 11 contains graphs of the one-octave frequency band levels, in dB, calculated for the outdoor $L_{Req,T}$ = 60dBA contour at 1225 m from the assumed sound source and for the $L_{Req,T}$ = 40dBA contour at 7117 m. A Low Frequency Noise Rating (LFNR) curve was superimposed onto each of these graphs in accordance with Annex B.

In terms of Annex B, where the measured or calculated sound level exceeds the LFNR curve the low frequency noise may be adjudicated as disturbing.

The graphs of Figure 11 indicate that up to a range of 1225 m from the assumed sound source there is no indication of disturbing low-frequency noise outdoors within the frequency range considered.

With increasing distance of the propagation of sound from a source high frequencies attenuate more rapidly than lower frequencies. Although the overall $L_{Req,T}$ level decreases with increasing distance, lower frequencies become more noticeable and potentially more disturbing. Thus, at a distance of 7117 m where the calculated outdoor $L_{Req,T}$ = 40 dBA this contains predominantly sound at low frequencies.

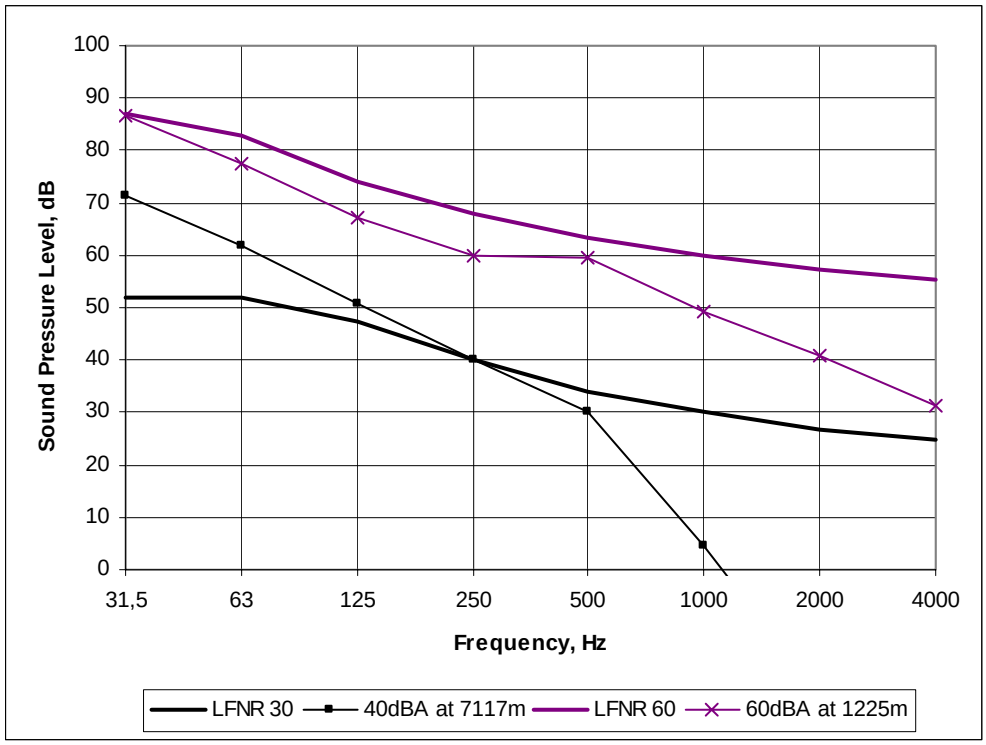

FIGURE 11 Low Frequency Noise Rating curves superimposed onto calculated outdoor octave band sound pressure levels

8.4 Assessment of low-frequency noise impact

Assessment of the potential impact of low-frequency sound indoors in accordance with Annex B of SANS 10103 would require knowledge of the sound insulation of the building(s) under consideration. This can vary greatly between buildings and is difficult to determine.

The difference in the level of sound inside a building with that outside of the building is dependent on the sound insulation of materials used in the construction of the building and whether windows are open or closed. With windows closed the airborne sound insulation of the building increases with increasing frequency of sound above the fundamental resonant frequency of each of the various materials (walls, roof/ceiling, windows, doors, etc). The resonant frequency for common building materials generally occurs below 125 Hz. At and close to the resonant frequency the building material provides limited reduction of sound between outdoors and interior spaces. The

reduction of sound of a standard cavity brick wall is less than 30 dB at a resonant frequency of approximately 30 Hz and that of a sheet metal roof is less than 6dB at a resonant frequency of approximately 60 Hz.

The building structure effectively reduces high frequency noise of wind interacting with shrubs in the vicinity of the building but is less effective in reducing low-frequency noise emanating from the wind turbines thereby rendering any low-frequency sound more noticeable indoors. Due to many variables associated with the construction of a particular building and between different buildings it is very difficult to calculate with any degree of accuracy the indoor sound level spectrum for an existing building from knowledge of the outdoor sound level spectrum without on-site measurements of the sound reduction between outdoors and indoor spaces of the building. The potential impact of low-frequency sound indoors at a particular site can therefore not be predicted with any degree of confidence.

The results of this scoping investigation do, however, indicate that noise emission from the proposed WEF might result in low-frequency sound being perceived within dwellings at the identified noise sensitive sites within a radius of approximately 7 km and that these might be considered intrusive even although the outdoor $L_{Req,T}$ due to noise emission from the WEF might not exceed the ambient $L_{Req,T}$.

8.5 Summary of noise impact

Within the constraints of information available it was identified that low-frequency noise emanating from the proposed WEF during operation might have a negative impact of low significance on land within approximately 7km radius of the proposed site.

9 CONSTRUCTION PHASE

The proposed WEF is to be located at a large distance from inhabited land other than at Skaapvlei. It was thus anticipated that on-site construction noise would not impact on anybody other than at Skaapvlei. The potential impact of noise accompanying the erection of the 132kV power line will be conducted during the EIA phase when the associated access road will be known.

The existing gravel road to Skaapvlei via Koekenaap is in poor condition and would probably be upgraded to provide access to the WEF site both for construction purposes and to provide access during the operation phase. Noise accompanying the upgrading of the gravel road would be typical of any road construction operation. The greatest impact would occur on several residential properties in Koekenaap situated along the

road. At the scoping stage it was not known what the duration of construction of the road would be. It was anticipated, however, that the negative impact due to road building and also of truck movement to the WEF site during construction, would be offset by the improved access to the affected residences.

In order to minimise the impact of noise to the Koekenaap residents road construction through the town is to be limited to normal week day operating times.

The road surface texture will have a large influence on the noise emanating from vehicular traffic on the road. It is strongly recommended that the road surface through Koekenaap and extending at least 500 m beyond the town limits comprise a well rolled, smooth asphalt surface containing aggregates no larger than 10 mm. A chip-and-spray surface, or similar, should not be considered. Beyond these limits the type of road surface would have little noise impact on inhabited land.

It is assumed that construction and transportation vehicles to the site will travel through the towns of Vredendal and Lutzville. The potential impact on noise sensitive sites in these towns will need to considered during the EIA phase.

10 CONCLUSIONS

The results of the scoping study into the potential impact of noise from the proposed Wind Energy Facility indicated that the land surrounding the facility is very sparsely inhabited and that few, if any, residents would probably be affected by noise emanating from the facility during the operation phase. Other than at Skaapvlei, situated adjacent to the proposed WEF site, the impact of noise at the nearest identified sites of Nooitgedag and Skilpadvlei was anticipated to be low. This would need to be confirmed during the EIA phase.

It was anticipated during the construction phase noise accompanying movement of construction and transportation traffic to the site might impact on residents situated along the access routes.
The potential impact of noise associated with the following aspects would need to be considered in more detail in accordance with procedures contained in SANS 10328:

- Noise emission from the wind turbines.
- Ambient noise levels at wind speeds associated with operating conditions of the wind turbines.
- Construction noise associated with the upgrading of existing gravel road through Koekenaap.
- Construction noise associated with construction of new access roads.

- Noise emission from construction and transportation vehicles along access routes through towns and other potentially noise sensitive land.

11 RECOMMENDATIONS

It is recommended that the potential impact of noise associated with the aspects listed in Section 10 of this report be investigated in more detail in the EIA phase.

12 THE AUTHOR

The author of this report, A.W.D. Jongens, M.Sc. (Elec.) Eng, UCT, has since 1971 conducted numerous studies and submitted reports and recommendations to government departments, defence institutions, local authorities, local & international industries and private bodies relating to noise & vibration control, building and architectural acoustics, community noise, environmental noise and transportation noise throughout sub-Saharan Africa. The following is an abridged list of previous contracts relating to the present study.

» Royal Dutch Shell oil refinery, Rotterdam, The Netherlands.
» Pretoria Portland Cement limestone mine, Eastern Cape.
» Rand Refinery, Germiston, Transvaal
» Natal Portland Cement Simuma cement factory, Oribi Gorge, Natal.
» Anglo Alpha limestone mine and cement factory, Saldanha, Cape.
» Maputo Steel mill and slurry pipeline from Phalaborwa to Maputo.
» Kudu gas power plant, Oranjemund, Namibia.
» Saldanha Steel Plant, Saldanha, Cape.
» African Portland Cement factory & mines, Otjiwarango, Namibia.
» De Beers diamond mines, Cullinan.
» Bellville South Waste Disposal site.
» Landfill alternative site investigations at Atlantis and Kalbaskraal.
» Eskom Open Cycle Gas Turbine plants at Atlantis and Mossel Bay.

APPENDIX

Glossary of terms used in the measurement and assessment of sound

This appendix contains definitions of terms used in SANS 10103.

Ambient noise

the totally encompassing sound in a given situation at a given time, and is usually composed of sound from many sources, both near and far. It includes the noise from the noise source(s) under investigation.

A-weighted sound pressure level (sound level), L_{pA}

the sound pressure level, in decibels, relative to a reference sound pressure, and incorporating an electrical filter network in the measuring instrument corresponding with the human ear's different sensitivity to sound at different frequencies.

Equivalent continuous A-weighted sound pressure level, $L_{Aeq,T}$

A formal definition is contained in SANS 10103. The term "equivalent continuous" may be understood to mean the "average" A-weighted sound level measured continuously, or calculated, over a period of time, T.

Equivalent continuous rating level, $L_{Req,T}$

the equivalent continuous A-weighted sound pressure level, $L_{Aeq,T}$, measured or calculated during a specified time interval T, to which is added adjustments for tonal character, impulsiveness of the sound and the time of day. An adjustment of 5 dB is added for any tonal character, if present, plus a further 5 dB if the noise is also of an impulsive nature. Where neither is present, the $L_{Req,T}$ is equal to the $L_{Aeq,T}$.

Reference time interval

The time interval to which an equivalent continuous A-weighted sound pressure level, $L_{Aeq,T}$, or rating level of noise, $L_{Req,T}$, is referred. Unless otherwise indicated, the reference time interval is interpreted as follows:

– Day-time: 06:00 to 22:00hrs T=16 hours when $L_{Req,T}$ is denoted $L_{Req,d}$

– Night-time: 22:00 to 06:00hrs T=8 hours when $L_{Req,T}$ is denoted $L_{Req,n}$

Residual noise

the ambient noise that remains at a given position in a given situation when one or more specific noises (usually those under investigation) are suppressed.

Equivalent continuous day/night rating level, $L_{R,dn}$

$L_{Req,d}$ combined (on an energy basis) with ($L_{Req,n}$ + 10 dB). The reference period T = 24 hours. 10 dB is added to $L_{Req,n}$ because of the greater sensitivity to noise during night time.