APPENDIX AB: DETAILS OF THE NOISE MEASUREMENT SURVEY AND EXISTING NOISE CLIMATE CONDITION ASSESSMENT

AB1. GENERAL

The technical details of the noise measurement survey and general noise climate investigation related to the noise impact aspects for the assessment of the planned Matimba B Power Station near Ellisras (Lephalale) in Limpopo Province are dealt with in this Appendix.

The noise impact assessment was undertaken in accordance with the requirements of the South African National Standard SANS 10328 (SABS 0328) *Methods for Environmental Noise Impact Assessments*. Daytime and evening period noise measurements were taken during the week. During the Scoping measurements were taken at five (5) main monitoring sites at appropriate locations to establish the existing ambient noise conditions around the study area. Measurements were taken at another eight (8) sites where it was attempted to isolate the noise from the existing Matimba Power Station. These were taken at appropriate sites at varying distances from the power station. These measurements were augmented during this EIA phase by a further four (4) measurements at sites close to the selected development site for the power station on the farm NaauOntkomen 509-LQ.

Supplementary noise measurements to establish the baseline noise profiles of various plant/equipment to be used at the new power station were taken at existing operational sites during the Scoping phase.

AB2. STANDARDS AND MEASUREMENT EQUIPMENT

The sound pressure level (SPL) (noise) measurements were taken in accordance with the requirements of the South African National Standard SANS 10103:2003, *The Measurement and Rating of Environmental Noise with Respect to Land Use, Health, Annoyance and Speech Communication*. Two Type 1 Integrating Sound Level Meters, a Bruël and Kjaer Model 2230 meter and a Larson Davis 824 were used for the noise measurements. The former was used to provide supplementary data, where relevant, to that from the Larson Davis meter and thus the readings taken on the latter are the primary data recorded in this report. Both meters were calibrated at the an accredited acoustical laboratory within the last 12 months. The calibration status of the meters was also checked before and after completion of the total measurement period of the day. A calibrated signal with a sound pressure level of 94,0dB at 1 kHz and 114,0dB at 1 kHz were applied to the Bruël and Kjaer meter and the Larson Davis meter respectively. A Larson Davis Model CAL200 was used. A comparative calibration measurement between the two metres was also taken at the start of each measurement session.

For all measurements taken to establish the ambient noise levels, the equivalent noise level (L_{Aeq}), the maximum sound pressure level (L_{Amax}) and the minimum sound pressure level (L_{Amin}) during that measurement period were recorded. The frequency weighting setting was set on "A" and the time weighting setting of the meters were set on *Impulse* (I). Measurement periods of a minimum of 10 minutes were used where ambient conditions were to be established. Where the power station component was to be isolated, the variation in instantaneous sound pressure level (SPL) over a short period was measured when the power station could be heard to predominate. For these latter measurements the time weighting setting of the meter was also set on *Impulse* (I).

At all the measurement sites, the meters were set up with the microphone height at 1,3 metres above ground level and well clear of any reflecting surfaces (a minimum of 3 metres clearance). For all measurements, a standard windshield cover (as supplied by the manufacturers) was placed on the microphone of each meter.

At the same time as each individual measurement was being taken, the qualitative nature of the *noise climate* in the area of the measurement site was assessed and recorded. This comprised an appraisal of the general prevailing acoustic conditions based on the subjective response to the sounds as perceived by the listener (i.e. *auditory observation* by the surveyor), as well as identifying those noise incidents, which influenced the noise meter readings during that measurement period. This procedure is essential in order to ensure that that there is a *human* correlation between the noise as perceived by the human ear and the noise, which is measured by the meter, as well as to establish any anomalies in the general ambient noise conditions.

AB3. MEASUREMENT SITES

The original five general sites in the study area (Site G1 to Site G5) and the four new sites (Site G6 to Site G9) where the residual noise condition was established were:

i) SITE G1: In Onverwacht (North), on the northern sidewalk of Bergsig Street, 30 metres from the intersection with Ngoako Ramathlodi Road. The site is approximately 7700 metres east of the existing power station.

ii) SITE G2: In Onverwacht (South), on the northern sidewalk of Waterlelie Road at the western extremity of the block from Zebra Street. The site is at the south-eastern extremity of the township and is approximately 5700 metres south-east the existing power station.

iii) SITE G3: In Marapong Township on eastern sidewalk of the road just south of the Marapong Private Hospital. The site is approximately 700 metres northeast of the existing power station.

iv) SITE G4: On the southern side and 10 metres from the centreline of the Steenbokpan Road at approximately the boundary between the farms Naauontkomen 509-LQ and Eenzaamheid 512-LQ. The site is approximately 8500 metres southwest of the existing power station.

v) SITE G5: On the access road to the Farm Peerboom 466-LQ (on the boundary with the farm Welgelegen 469-LQ). The site is approximately 6300 metres east of the existing power station.

vi) SITE G6: Farm worker dwellings on the farm Hanglip 508-LQ, situated just north of the Steenbokpan Road, just west of the conveyor to the existing ash dump and approximately 3000 metres east of the new power station.

vii) SITE G7: Weekend Lodge (no permanent residents) on the farm Kuipersbult 511-LQ, situated south of the Afguns Road and approximately 1000 metres south of the new power station.

viii) SITE G8: Farmhouse on the farm Kromdraai 503-LQ, situated just west of the Afguns Road, and approximately 5000 metres south-west of the new power station.

ix) SITE G9: Farm worker dwellings on the farm Hieromtrent 460-LQ, situated just north of the Steenbokpan Road and approximately 6500 metres west of the new power station. The buildings are in the vicinity of the western extremity of the planned ash dump.

The eight sites where the existing Matimba Power Station noise was isolated were:

i) SITE M1: On the southern fence line of Matimba Power Station in line with the centreline of the bank of cooling fans. The site is approximately 300 metres south of the existing power station.

ii) SITE M2: On the eastern fence line of Matimba Power Station in line with the centreline of the power station building (centreline of the bank of cooling fans). The site is approximately 430 metres east of the existing power station.

iii) SITE MMR3: On the southern side of Nelson Mandela Drive Extension (main road to power station) just west of Onverwacht Township. The site is approximately 4600 metres south-east of the existing power station.

iv) SITE MMR4: On the southern side of Nelson Mandela Drive Extension at the intersection with the entrance road to the ash dump (on the boundary between the farms Hanglip 508-LQ and Zwartwater 507-LQ). The site is approximately 2800 metres south of the existing power station.

v) SITE MMR5: On the southern side of Nelson Mandela Drive Extension at the intersection with the Steenbokpan Road. The site is approximately 1900 metres south of the existing power station.

vi) SITE MSR6: On the northern side of the Steenbokpan Road at the level crossing with the railway line. The site is approximately 4600 metres south-west of the existing power station.

vii) SITE MMR7: On the northern side of Nelson Mandela Drive Extension at the intersection with the main entrance road to Matimba Power Station. The site is approximately 1300 metres south-west of the existing power station.

viii) SITE MMR8: On the southern side of Nelson Mandela Drive Extension at the intersection with the entrance road to Grootgeluk Colliery and the road to Marapong Township. The site is approximately 2600 metres west of the existing power station.

AB4. MEASUREMENT DATES/TIMES

During the Scoping phase, general observation of the noise conditions in the areas around the Development site as well as the site specific sound pressure level (noise) measurements and observations were taken on Monday 4 April, Tuesday 5 April and Wednesday 6 April 2005 during the daytime period from 9h30 to 17h00 and during the evening period from 19h30 to 22h30. Further measurements were taken on Tuesday 24 May 2005. The EIA phase measurements were taken on Sunday, 5 February and Monday, 6 February 2006 during the daytime period from 14h30 to 17h30 and during the evening period from 19h30 to 22h30.

AB5. NOISE MEASUREMENT DETAILS

AB5.1. Summary of Ambient Sound Pressure Level Measurements

The results of the ambient noise condition measurement survey are summarised in Table B1. The equivalent sound pressure (noise) level (L_{Aeq}), the maximum sound pressure level (L_{Amax}) and the minimum sound pressure level (L_{Amin}) are indicated. Note that the equivalent sound pressure (noise) level may, in layman's terms, be taken to be the average noise level over the given period. This "average" is also referred to as the residual noise level (excluding the impacting noise under investigation) or the ambient noise level (if the impacting noise under investigation is included).

The weather conditions on all the survey days were such that the measurements to establish the ambient noise levels were not adversely affected and no specific corrective adjustments needed to be made.

TABLE AB1: EXISTING (YEAR 2005) AMBIENT NOISE LEVELS IN THE AREA OF THE PLANNED MATIMBA B POWER STATION

Measurement Site	Measured Sound Pressure Level (dBA)					
	Daytime Period			Evening Period		
	L_{Aeq}	L_{max}	L_{min}	L_{Aeq}	L_{max}	L_{min}
SITE G1	51.9	66.7	39.2	53.5	72.5	36.1
SITE G2	43.8	57.6	36.6	45.4	51.6	31.0
SITE G3	50.2	68.2	42.5	53.2	61.1	51.6
SITE G4	45.1	57.1	37.3	39.6	42.3	33.3
SITE G5	44.3	58.4	23.6	-	-	-
SITE G6	56.4	58,4	54,2	56.1	58.7	53.9
SITE G7	36.2	46.7	30.2	35.1	44.1	28.7
SITE G8	36.9	46.6	28.7	38.1	48.1	28.1
SITE G9	46.2	57.7	29.7	47.2	56.3	42.3

AB5.2. Noise from Matimba Power Station

Short duration sound pressure level measurements, which isolated the noise from Matimba Power Station were taken at eight sites. These data, which give an indication of the noise component from thee power Station at varying distances from Matimba are summarised in Table B2.

TABLE AB2: NOISE COMPONENT FROM MATIMBA POWER STATION

Site	Distance from Matimba (m)	Noise Level (dBA)	Comment
M1	300	58	Noise from cooling fans the main component.
M2	430	54	Noise from cooling fans the main component.
MMR3	4600	41	Night conditions/ still wind condition.
MMR4	2800	48	Night conditions/ still wind condition.
MMR5	1900	56	Night conditions/ still wind condition..
MSR6	4600	38	Night conditions/ still wind condition.
MMR7	1300	47	Quieter side of Power Station.
MMR8	2600	48	Infiltration of colliery noise. Matimba hardly audible.

AB5.3. Measurements at Other Main Noise Generators

Measurements were also taken at the following other main noise generators related to the Matimba Power Station operation:

i) Conveyor belt system for the coal supply to the Power Station and for ash disposal to ash dump.
ii) Drive house for conveyor belt system.
iii) Ash dump ash spreading operation.
iv) Sewage works.

AB5.3.1. ***Conveyor Belt System.***

Noise levels as follows were recorded:

i)	Under elevated section at live stockpile (at power station)	-	79,6dBA.
ii)	5m from elevated section at live stockpile (at power station)	-	75,8dBA.
iii)	10m from conveyor belt at ash dump	-	64,3dBA.
iv)	10m from conveyor belt at crossing of Steenbokpan Road	-	64,3dBA.

AB5.3.2. ***Conveyor Belt Drive House***

The noise level at approximately 3 metres from drive house was measured at 91,4dBA.

AB5.3.3. ***Operations at the Ash Dump***

The ambient noise level of 66.7dBA was measured at a distance of 50 metres from the ash dumper and the spreading operation by means of a front end loader. The conveyor belt was operating 50 metres away.

AB5.3.4. ***Sewage Works***

Noise levels as follows were recorded:

i)	1m from aeration rotor motor	-	81,6dBA.
ii)	5,5m from aeration rotors	-	75,9dBA.
iii)	General ambient 30 metres from sewage ponds	-	59,7dBA.

Note that the aeration ponds are generally sunken into the ground or are in the form of concrete tanks. Within a short distance of the ponds noise levels are attenuated significantly due to the shielding effect of the pond walls.

AB5.4. Noise Climate Related to the 24 hour Road Traffic

In order to complement the short-term noise measurements in the study area, the existing 24-hour residual noise levels related to the average daily traffic (ADT) flows on Nelson Mandela

Drive Extension and Steenbokpan Road were also calculated. These data provide an accurate base for the SANS 10103 descriptors.

The noise levels generated from the traffic on these Roads were calculated using the South African National Standard SANS 10210 (SABS 0210), *Calculating and Predicting Road Traffic Noise*. Typical situations were used for the calculation sites. The Year 2005 traffic was used as the baseline for the calculations. The traffic data were obtained from the consulting engineers Goba Consulting Engineers and Project Management.

The noise levels at various offsets from the centreline of Nelson Mandela Drive and Steenbokpan Road are summarised in Table B3. The noise descriptors used are those prescribed in SANS 10103:2003, namely:

i) Daytime equivalent continuous rating (noise) level ($L_{Req,d}$) (L_d used in Table), namely for the period from 06h00 to 22h00).

ii) Night-time equivalent continuous rating (noise) level ($L_{Req,n}$) (L_n used in Table), namely for the period from 22h00 to 06h00).

iii) Day-night equivalent continuous rating (noise) level ($L_{R,dn}$) (L_{dn} used in Table), namely for the 24 hour period from 06h00 to 06h00).

The noise levels given are the unmitigated values. A conservative approach has been taken in that a hard intervening ground condition has been modelled to simulate winter conditions (burnt veld). The thick vegetation in the area will generally result in greater attenuation with distance than shown. There will also be greater attenuation with distance than shown where there are houses, other buildings and terrain restraints in the intervening ground between the source and the receiver point.

TABLE AB3: EXISTING NOISE CLIMATE ADJACENT TO MAIN ROADS (YEAR 2005)

Road	Noise Levels Alongside Roads at Given Offset from Centreline (SANS 10103 Indicator) (dBA)											
	50m Offset			100m Offset			200m Offset			500m Offset		
	L_d	L_n	L_{dn}	L_d	L_n	L_{dn}	L_d	L_n	L_{dn}	L_d	L_n	L_{dn}
N Mandela Dr Ext	58.4	47.5	58.1	55.4	44.5	55.1	52.4	41.5	52.1	48.4	37.5	48.1
Sterkpoort Road	58.4	47.5	58.1	55.4	44.5	55.1	52.4	41.5	52.1	48.4	37.5	48.1
Steenbokpan Rd	47.7	34.7	46.9	44.7	31.7	43.9	41.7	28.7	40.9	37.7	24.7	36.9

AB5.5. Prevailing Noise Climate

In overview, the existing situation with respect to the *noise climates* in the study area was found to be as follows:

i) The areas relatively far from the main roads and Matimba Power Station are generally very quiet. Most of the area has a typical rural *noise climate*.

ii) The main sources of noise in the area are from traffic on the main roads, Matimba Power Station, power station infrastructure remote from the facility, and Grootgeluk Colliery.

iii) With regard to Nelson Mandela Drive, existing residences in the residential areas of Lephalale (Ellisras) and Onverwacht up to approximately a 250 metre offset from the road impacted. In these areas the noise levels exceed acceptable suburban residential living conditions as specified in SANS 10103:2003. Ideally the ambient noise level should not exceed 50dBA during the daytime period (06h00 to 22h00) and 40dBA during the night-time period (22h00 to 06h00). Refer to the SANS 10103:2003 standards as given in Appendix A.

iv) Ambient noise levels due to traffic in the areas along Steenbokpan Road are not high and impact is insignificant.

v) Noise levels from Matimba Power Station adversely affect the daytime noise climate at any residences in the surrounding area for up to a distance of 3000 metres around the facility base on the rural standards that need to be applied for this area. At night the radius of impact increases to approximately 6000 metres.

vi) There are also noise sources from power station equipment at locations remote from the power station as well as other isolated (or infrequent) noise sources such as:

   a) Coal conveyor belt from the colliery to the power station and the conveyor belt transporting the ash residue from the power station to the ash dump.

   b) Operations at the ash dump that include the dumping and spreading of the ash, and the rehabilitation of the dump.

   c) The sewage works serving the power station, which is located 3 kilometres to the north of the power station.

   d) Coal haul trains on the railway line from the colliery to Thabazimbi. There are at present 2 trains per day. Noise from the pass-by of this type of train (drawn by diesel locomotives) peaks in the vicinity of 92dBA at a 30 metre offset from the track. The railway line crosses the Steenbokpan Road a level crossing where it is mandatory that the trains sound a warning horn. Noise from these horn soundings can be as loud as 105dBA at 30 metres.