

**PROPOSED COAL-FIRED POWER STATION AND ASSOCIATED
INFRASTRUCTURE IN THE WITBANK GEOGRAPHICAL AREA:
NOISE IMPACT ASSESSMENT
(ALTERNATIVE SITE EVALUATION)**

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INTRODUCTION

1.1. Background and Locality

Eskom is planning a new power station in the area between Witbank and Bronkhorstspuit close to the existing Kendal Power Station. Two alternative sites are being evaluated. The development sites lie in the area on the boundary between Gauteng and Mpumalanga Provinces. Ninham Shand (Pty) Ltd is undertaking the environmental impact assessment study of the project and has commissioned Jongens Keet Associates (JKA) to undertake the investigation of the potential noise impact of the planned development. This report documents our approach, findings and recommendations.

1.2. Terms of Reference

The terms of reference (TOR) were as follows:

- i) A sufficiently detailed quantitative (by measurement) and qualitative assessment within the area of influence of the planned Witbank Area Power Station was to be undertaken in order to enable a full appreciation of the nature, magnitude, extent and implications of the potential noise impact of all aspects of the project.
- ii) The two alternative sites were to be evaluated and compared for the selection of a preferred site.
- iii) The colliery which will be used to supply coal to the power station, the coal conveyor system from the colliery to the power station and the transmission line from the new power station were to be excluded from this investigation.
- iv) All aspects of the investigation were to conform to the requirements of relevant environmental legislation and noise standards.
- v) The preliminary general assessment was to include:
 - The collection of baseline information from ground-truthing, if not available from Eskom and Ninham Shand.
 - The determination of the layout of the proposed power station within the two identified alternative sites.
 - The determination of the planned operations at the proposed power station.
 - Accessing and referring to the Traffic Specialist Study.

- Accessing noise measurement/analysis data within the study sites and/or at a similar power station.
 - Accessing information from the Public Participation Process regarding noise concerns.
 - The identification of other noise sources in the vicinity of the two alternative sites.
 - The identification of appropriate noise monitoring sites.
- vi) The ambient noise context at each of the two alternative sites was to be established by means of a field inspection and a noise measurement survey, that were to focus on identified noise sensitive sites and were to include:
- The undertaking of noise measurements in terms of SANS 10103:2004.
 - Assessing and recording the qualitative nature of the noise climate.
 - The review of any noise survey data undertaken by Eskom.
- vii) Assessing the potential noise impacts of the proposed power station on the noise levels at the three candidate sites. This will include:
- Identifying the potential impacts associated with the construction and operational phases of the proposed project.
 - Assessing the impacts of the proposed power station and evaluating the effect on the change in noise climate in terms of the scale of impact, magnitude of impact and the duration of the impact.
- viii) Where relevant, appropriate noise mitigating measures to minimise or eliminate impacts on noise receptors were to be identified. These need only be conceptual at this stage. This was to include the provision of input into the construction and operational phase EMP that is to be developed for the project.
- ix) A report that reflects on the above and which offers an opinion on the preferred site with and without the implementation of mitigating measures was to be compiled.
- x) No public involvement meetings were to be attended by JKA.

1.3. Study Area

The study area was that within the area of influence of the noise generated by the operations of and traffic generated by the proposed Witbank Area Power Station. The areas of influence of the two alternative sites (taking the respective cumulative effect of the existing Kendal Power Station) were considered. Refer to Figure 1.

1.4. Details of the Witbank Area Power Station

The new power station is to be developed in the vicinity of the existing Kendal Power Station. The two sites (Development Zones) that are being considered for the project are located in the area between Witbank and Bronkhorstspuit, and between the N4 and N12 Freeways. These are:

- i) Development Zone X: Portions of the farms Hartebeesfontein 537-JR and Klipfontein 566-JR. The western boundary of this Development Zone lies parallel to and approximately 2500 metres west of Road D686 (Route R545). Refer to Figure C1 in Appendix C.
- ii) Development Zone Y: Portions of the farms Blesbokfontein 558-JR, Witpoort 563-JR, Nootgedacht 564-JR and Dwaalfontein 55-JR. This Development Zone lies to the south-west of Development Zone X. Refer to Figure C2 in Appendix C.

The planned generating capacity of the proposed Witbank Area Power Station will be of the order of 5 400 Mega-watts (MW) from six generator units. Eskom have indicated that the new power station will be similar to the new Matimba B Power Station, which is also being planned at present. The main noise source from the power station will be the cooling fans, which are installed on one side only of the Power Station. Eskom estimate that the Witbank Area power Station will require 72 cooling fans per generating unit, namely a total of 432 fans. The main orientation of the power station will be south-west to north-east with the fan bank on the north-western side. The condenser fan platform at fan level will be about 50 metres above ground level.

The location of the colliery that is to supply the new power station has not yet been finalised.

2.0. DETAILS OF THE STUDY AREA

Only the aspects, which have an influence on the potential noise impact are dealt with in this Section.

2.1. Topography

The general terrain of the area is flat to gently undulating (*moderately undulating plains*). The Klipspruit flows in a south to north direction through the centre of Development Zone Y and then links up with the Wilge River just north of Road D960.

Figure 1

2.2. Roads

The main roads influencing the study area are:

- i) National Road N4: This freeway is aligned in an east-west direction through the northern sector of the study area. It links Witbank to Bronkhorstspuit (and on to Tshwane). It interchanges with Road D686 (Route R545) on the north-eastern side of the study area near Balmoral and with Road D2236 ("Bossemanskraal" farm road) 11,5 kilometres west of Balmoral.
- ii) National Road N12: This freeway is aligned in an east-west direction through the southern sector of the study area. It links Witbank to Delmas (and on to Johannesburg). It interchanges with Road D686 on the south-eastern side of the study area near Kendal, with Road D960 ("Blesbokfontein" farm road) 8 kilometres west of Kendal and with Road D38 ("Dwarsfontein" farm road) a further 8 kilometres to the west towards Delmas.
- iii) Road D686: This provincial road is aligned in a north-south direction through the eastern sector of the study area and links provincial Road P104/2 (Route R104) at Balmoral to provincial Road P29/1 (Route R555) at Kendal. It also interchanges with the N4 Freeway and the N12 Freeway. For convenience in this report, Road D686 has been divided into two sections called the following:
 - Road D686 North (Route R545): from the N4 Balmoral interchange south to the intersection with Road D1955 (where Route R545 turns eastwards to Ogies).
 - Road D686 South: from the intersection with Road D1955 (where Route R545 turns eastwards to Ogies) southwards to Kendal.
- iv) Provincial Road P104/2 (Route R104): This road is aligned in an east-west direction through the northern sector of the study area.
- v) Provincial Road P29/1 (Route R555): This road is aligned in an east-west direction through the northern sector of the study area. It lies to the south of the N4 Freeway and passes through Kendal.
- vi) Road D960: This road links from the N12 Freeway north-eastwards to Bronkhorstspuit. It is aligned along the eastern and northern boundaries of Development Zone Y and will be the main access road to this site. It is signposted at the N12 interchange as the road to "Blesbokfontein".
- vii) Road D38: This road links north-westwards from its interchange with the N12 Freeway to Route R42 (the main road from Bronkhorstspuit to Delmas). It is signposted at the N12 interchange as the road to "Dwarsfontein".
- viii) Road D961: This is a north-south aligned road linking Road D960 (at a point near the north western corner of Development Zone Y) to Road D38.

- ix) Road D2236: This road links southwards and then westwards from its interchange with the N4 Freeway to connect with Road D960 approximately 3 kilometres south-east of Bronkhorstspuit. It is signposted at the N4 interchange as the road to “Bossemanskraal”.

2.3. Railway Lines

There are two main railway lines through the study area:

- i) The Pretoria-Witbank line to the north of National Road N4 and Road R104. There are 12 trains per day along this line.
- ii) The Johannesburg-Witbank line to the south of National Road N12 and which passes through Kendal. There are 11 trains per day along this line.

2.4. Land Use

2.4.1. Existing Situation

The existing land uses in the study area are:

- i) Residential:
 - a) Voltargo Village. This is the old Wilge Power Station residential village. It lies to the north of Road D1955 (R545) and approximately 3 kilometres east of Road D686.
 - b) There are numerous farmhouses and farm labourer houses spread out through the study area.
- ii) Educational: Kelvin Primary School is located 700 metres south of Road D960 on the farm Witpoort 563-JR. It lies on the north-western boundary of Development Zone Y.
- iii) Industrial:
 - a) Kendal Power Station.
 - b) Brickworks just to the west of Road D686 North near to the N4 Balmoral interchange.
- iv) Mining. The Khutala Colliery, which provides Kendal Power Station with coal is located just to the south-east of the power station.
- v) Agriculture. This is main land use in the study area and its environs.

It is only the existing residential and educational areas in the study area that may defined as noise sensitive land uses.

2.4.2. Planned Land Use

There are presently no known developments in the study area that could be adversely affected by proposed power station.

2.5. Aspects of Acoustical Significance

The terrain across the study area is fairly flat to undulating. There are no natural features that will assist in the attenuation of noise.

The main meteorological aspect that will affect the transmission (propagation) of the noise is the wind. The wind can result in periodic enhancement downwind or reduction upwind of noise levels. Analysis of the wind records for the area indicates that the wind blows mainly from the north-western quadrant 39% of the time during the day, and from the eastern quadrant 42% of the time during the night. There are “still” periods 7% of the time during the day and 13% of the time at night.

3. METHODOLOGY

3.1. General

The general procedure used to determine the noise impact was guided by the requirements of the Code of Practice SANS 10328:2003: *Methods for Environmental Noise Impact Assessments*. The level of investigation was the equivalent of an EIA of the situation. A comprehensive assessment of all noise impact descriptors (standards) has been undertaken. The noise impact criteria used specifically take into account those as specified in the South African National Standard SANS 10103:2004, *The Measurement and Rating of Environmental Noise with Respect to Land Use, Health, Annoyance and Speech Communication* as well as those in the National Noise Control Regulations. The investigation comprised the following:

- i) Determination of the existing situation (prior to the planned Development).
- ii) Determination of the situation during and after development.
- iii) Assessment of the change in noise climate and impact.
- iv) Comparison of alternative sites.
- v) Identification of mitigating measures.

3.2. Determination of the Existing Conditions

This phase comprised the following:

- i) The relevant technical details of the existing and the planned power stations, the existing traffic patterns and the existing and planned land use in the study area were reviewed in order to establish a comprehensive understanding of all aspects of the project that will influence the future noise climate in the study area.

- ii) Using these data, the limits of the study area for each alternative development site were determined and the potential noise sensitive areas, other major noise sources and potential problems in these areas were identified.
- iii) Applicable noise standards were established. The Gauteng and the National Noise Control Regulations, and the SANS 10103:2004 standards were applied.
- iv) The existing *noise climate* of the Study Area was determined by means of a field inspection and a noise measurement survey. The measurement survey appropriately covered the whole of the study area, focussing specifically on the identified noise sensitive/problem areas. Measurements were taken at 13 monitoring sites in the study area. Both the daytime and night-time conditions were measured. The sound pressure level (SPL) (noise) measurements were taken in accordance with the requirements of the Code of Practice SANS 10103:2004, *The Measurement and Rating of Environmental Noise with Respect to Land Use, Health, Annoyance and to Speech Communication*. Type 1 Integrating Sound Level meters were used for the noise measurements. All measurements were taken under dry weather and normal traffic (that is mid-week/school term) conditions. Refer to Appendix B.
- v) On the general field inspection and 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 there is a *human* correlation between the noise as perceived by the human ear and that, which is measured by the meter, as well as to establish any anomalies in the general ambient noise conditions.
- vi) The existing noise climates along the main roads as related to the current traffic volumes and patterns were established. These traffic noise levels were calculated using the South African National Standard SANS 10210 (SABS 0210) *Calculating and Predicting Road Traffic Noise* for Route. The Year 2006 traffic was used as the baseline reference.
- vii) The calculated 24-hour period noise indicators, as well as those for the daytime period and night-time period provided the main data for the impact assessment. The measured data provided a field check of the acoustic conditions.

3.3. Assessment of Planning/Design Phase and Construction Phase Impacts

Aspects of the pre-design field surveys and construction activities that potentially will have a noise impact were identified and, where appropriate, mitigating measures have been recommended.

3.4 Assessment of Operational Phase Impacts

The main focus of the operational phase assessment was to establish the nature, magnitude and extent of the potential change in *noise climate* in the study area directly related to and within the area of influence of each of the two alternative development sites. This was done as follows:

- i) The impact of the new power station with its ancillary operations (including traffic) was established, and then its cumulative effects with Kendal Power Station were determined.
- ii) In order to determine the most appropriate site, the two alternative power station sites (coupled with their ash dump sites) were compared by rating 12 noise impact aspects related to the development infrastructure and site characteristics.
- iii) Based on the findings, appropriate noise mitigating measures (site scale) have been investigated and recommendations made. These are conceptual and not detailed to final design level.

4. FINDINGS AND ASSESSMENT OF IMPACT

The following conditions were observed in the study area and the following aspects were determined from the surveys, calculations of noise indicators and the predictive modelling undertaken for the assessment of the noise impact of the planned power station.

4.1. General Details

General aspects of note were as follows:

- i) The weather conditions on 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.
- ii) The main sources of noise (or potential sources of noise) which presently affect the residual *noise climate* in the Study Area were found to be the following:
 - a) Traffic on the main roads.
 - b) Kendal Power Station.
 - c) Khutala Colliery.
 - d) Conveyor belt systems at Kendal.
 - e) Operations at the ash dump at Kendal.
- iii) The existing noise sensitive areas, which are likely or could possibly be impacted by the proposed Witbank Area Power Station are:

- a) Various farmhouses and farm labourer houses on farms and agricultural holdings.
 - b) Voltago Village.
- iv) One aspect that has limited a final comprehensive assessment of noise impact has been that the current details of all the farmhouses, farm labourer dwellings and other noise sensitive sites in the area that are potentially affected are not yet available. The specific land use (type of farming activity) and position of the all the farmhouses, labourers' houses and other habitations have not been confirmed. For this study, the position of houses/dwellings on the farms was taken off 1:50 000 topographical cadastral maps. Even though the latest editions were used, the relevant maps are 3 to 11 years out of date and there may be new dwellings and/or some of the existing shown buildings may be derelict. During the field survey for the noise measurement survey, such aspects were noted where possible. Refer to Section C1 in Appendix C.

4.2. The Existing Ambient Noise Climate

Measurements and *auditory observations* were taken at thirteen (13) main sites in order to establish the ambient noise conditions of the study area. Measurements were taken at another three (3) sites where it was attempted to isolate the noise from Kendal Power Station. These were taken at appropriate sites at varying distances from the power station. For a description of the all of the measurement sites and for more technical details of the measurement survey, refer to Appendix B. Refer also to Figure 2. Briefly the main sites are:

- i) Site K1: At the entrance gate to Langgelegen (Kaia Thandi) on the north-eastern boundary of Development Zone X.
- ii) Site K2: At the entrance gate to Klipfontein (Swanepoel Boerdery) on the eastern boundary of Development Zone X.
- iii) Site K3: In the central area of the old Wilge Power Station residential village (Voltargo).
- iv) Site K4: At the entrance to Klipfontein, 1000 metres east of the south-eastern corner (boundary) of Development Zone X.
- v) Site K5: In the agricultural holdings on Klipfontein 588-JR.
- vi) Site K6: On the farm Dwaalfontein 565-JR approximately 1200 metres west of Road D960 (Blesbokfontein Road).
- vii) Site K7: At farmhouse on Dwaalfontein 565-JR on the western side of Road D960 (Blesbokfontein Road).
- viii) Site K8: At the Kelvin Primary School on the farm Witpoort 583-JR.
- ix) Site K9: At entrance to farmhouse on Blesbokfontein 558-JR on the northern side of Road D960 (Blesbokfontein Road).

- x) Site K10: At the entrance to farmhouse on farm Brakfontein 559-JR on the eastern side of Road D961 (Dwarsfontein-Bronkhorstspruit Road).

Figure 2

- xi) Site K11: At the entrance to Bossemanskraal (Topigs), on the eastern side of Road D2236 (Bosmanskraal Road).
- xii) Site K12: At the entrance to Willows Farm (Dyke Feld Country Estate), on the eastern side of Road D2236 (Bosmanskraal Road).
- xiii) Site K13: In the Kendal Forest Holdings.

Conditions for the daytime and evening periods were ascertained. The summary of all the noise measurements taken at the main sites is given in Table 1. 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 definitions/details of the noise descriptors for the measurements are given in Appendix A and Appendix B.

TABLE 1: EXISTING (YEAR 2006) NOISE LEVELS IN THE AREAS OF THE ALTERNATIVE SITES FOR THE PLANNED WITBANK AREA 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 K1	39.3	57.8	26.6	41.6	58.9	28.2
Site K2	41.2	58.3	24.1	38.1	52.6	26.1
Site K3	51.7	70.6	40.6	38.7	44.2	30.6
Site K4	41.6	52.2	30.1	31.7	42.1	23.6
Site K5	46.6	62.4	31.3	38.2	46.1	29.3
Site K6	37.5	54.6	27.7	35.9	47.6	28.4
Site K7	46.6	57.4	35.9	33.7	47.1	21.2
Site K8	39.4	50.4	25.7	34.1	45.9	23.6
Site K9	47.2	54.0	39.5	33.2	46.8	24.1
Site K10	40.6	54.9	27.2	36.8	47.7	28.2
Site K11	38.4	50.4	26.3	33.2	48.1	27.2
Site K12	44.4	57.1	35.8	35.4	47.1	28.4
Site K13	42.4	54.4	33.0	39.9	48.9	37.5

The details of the sites where measurements were taken to isolate the Kendal Power Station noise, and measurements at ancillary works are given in Appendix B.

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 all the major roads in the area 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 2006 traffic was used as the baseline for the calculations. The traffic data were obtained from the consulting engineers Ninham Shand (Pty) Ltd.

The noise levels at various offsets from the centreline of these roads are summarised in Table B3. Refer to Appendix B.

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

- ii) The main sources of noise in the area are from traffic on the main roads, Kendal Power Station, power station infrastructure remote from the facility (such as the ash dump) the Pretoria-Witbank and the Johannesburg-Witbank railway lines, and Khutala Colliery.
- iii) The areas relatively far from the main roads and Kendal Power Station are generally very quiet. Most of the area has a typical rural *noise climate*.
- iv) The minor farm roads that penetrate the study area carry small volumes of traffic and the impact of traffic noise from these facilities is minimal.
- v) The noise climate close to the main roads is severely degraded and adjacent to the following roads for the distances shown from the road the noise levels exceed acceptable rural residential living conditions as specified in SANS 10103:2004.
 - N4 Freeway - 3000 metres
 - N12 Freeway - 3000 metres
 - Road D686 North (Route R545) - 1500 metres
 - Road D686 South - 1200 metres
 - Road P29/1 (Route R555) - 1000 metres

- vi) Ideally the ambient noise level should not exceed 45dBA during the daytime period (06h00 to 22h00) and 35dBA during the night-time period (22h00 to 06h00). Refer to the SANS 10103:2004 standards as given in Appendix A.
- vii) Noise levels from Kendal Power Station adversely affect the daytime noise climate at any residences in the surrounding area for up to a distance of approximately 1000 metres around the facility (based on the rural standards that need to be applied for this area). At night the radius of impact increases to approximately 2300 metres.
- viii) The train movements on the two train lines through the study area have only a minor influence on the general noise climate of the area, except at noise sensitive sites very close to the respective railway lines.

Refer to Appendix B for more details.

4.3. Assessment of the Pre-Construction Phase

Activities during the planning and design phase that normally have possible noise impact implications are those related to field surveys (such seismic testing and geological test borehole drilling for large building foundations). As these activities are usually of short duration and take place during the day, they are unlikely to cause any noise disturbance or nuisance in adjacent areas.

4.4. Assessment of the Construction Phase

This Section summarises the more detailed analysis, which is documented in Appendix C.

Construction will likely be carried out during the day from 07h00 to 18h00, or at the latest 20h00. It should however be noted that certain activities may occasionally extend into the late evening period, while others such as de-watering operations may need to take place over a 24-hour period. Some of the activities such as the construction of the chimney stacks could take place continuously (24-hours a day) over a number of weeks if a continuous sliding shutter concreting operation is used. It is estimated that the development of the project will take place over a period of 6 to 7 years.

The nature of the noise impact from general activities on large construction sites such as the power station contract is likely to be as follows:

- i) Source noise levels from many of the construction activities will be high. Noise levels from all work areas will vary constantly and in many instances significantly over short periods

during any day working period. The level and character of the construction noise will be highly variable as different activities with different plant/equipment take place at different times, over different periods, in different combinations, in different sequences and on different parts of the construction site. Details of the anticipated main sources of construction noise and the noise levels generated are given in Table C1a in Appendix C and Table 2.

- ii) Exact daytime period and night-time period continuous equivalent sound pressure levels are not possible to calculate with certainty at this stage as the final construction site layout, work programme, work *modus operandi* and type of equipment have not been finalised. Typical ambient noise conditions from a construction site are as indicated in Table 2.

TABLE 2: TYPICAL NOISE LEVELS GENERATED BY A CONSTRUCTION SITE

Noise Source	Typical Operational Noise Level at Given Offset (dBA)							
	100m	250m	500m	800	1000m	1500m	2000m	2500m
Construction site	64	56	49	44	41	36	32	29

- iii) There are likely to be noise disturbance effects on people living in the surrounding rural areas for up to 750 metres from the construction. Ideally the daytime outdoor ambient noise levels (as specified in SANS 10103) should not exceed 45dBA for the rural residents. The maximum short-term noise levels from general construction operations at the noise sensitive sites nearest to the construction could be of the order of 85dBA. This would be classed as a noise nuisance.
- iv) For all construction work, the construction workers working with or in close proximity to equipment will be exposed to high levels of noise as can be seen from Table C1a (refer to the 5 metre offset noise levels).

The nature of the noise impact from the road construction activities (internal roads and access roads) is likely to be as follows:

- i) The level and character of the construction noise will be highly variable as different activities with different plant/equipment take place at different times, over different periods, in different combinations, in different sequences and on different parts of the construction site.
- ii) As no specific construction details or possible locations of major ancillary activity sites are available at this stage, the anticipated noise from various types of construction activities

cannot be calculated accurately. In general at this stage, it can be said that the typical noise levels of construction equipment at a distance of 15 metres lie in the range of 75 decibels (dBA) to 100dBA. Refer also to Table C1a. Based on data from similar “linear” construction sites, a one-hour equivalent noise level of between 75dBA and 78dBA at a point 50 metres from the construction would be typical for the earthmoving phase.

From the details presently available, it appears that the construction noise impact is not likely to be severe at either of the Development Zone sites.

4.5. Assessment of the Operational Phase

This Section summarises the more detailed analysis, which is documented in Appendix C. The two alternative sites (Development Zones) for the new power station were evaluated on the basis of the noise impact from the proposed Witbank Area Power Station, the possible cumulative noise impact effects of both power stations, the noise impact from ancillary works (specifically the ash dump and coal stockpile yard), and the noise impact from traffic generated by the new Power Station. It was established that:

- i) The following ambient noise conditions around the Witbank Area Power Station (from the power station source only) are predicted at the given offset distances:
 - 58dBA at 1000 metres.
 - 52dBA at 2000 metres.
 - 46dBA at 3000 metres.
 - 42dBA at 4000 metres.
 - 38dBA at 5000 metres.
 - 34dBA at 6000 metres.
- ii) Noise sensitive areas within about 6000 metres of the proposed facility will experience ambient noise levels higher than considered acceptable. In particular the noise climate at night at rural residential homes within this range will be adversely affected. Refer to Figure 3 for the noise contours and noise sensitive areas around the proposed power station related to Development Zone X and to Figure 4 for the noise contours and noise sensitive areas around the proposed power station related to Development Zone Y
- iii) Noise impact from ancillary works and equipment (such as the conveyor belts) will in general be low and localised. The drive houses for the conveyor belt system will be sites of high noise levels. All the details and position of the conveyor routes (coal feed and waste ash) have not yet been finalised.

- iv) Noise impact from the new ash dump areas in general will not be significant but the noise from work at these sites could cause localised problems.

Figure 3

Figure 4

- v) The following traffic and traffic noise conditions are anticipated:
- a) For Development Zone X, the access road will be from Road D686 (R545) along the “Klipfontein Central” farm road. There are 3 noise sensitive sites along the access road. It has been predicted in the Traffic Impact Study that approximately 70% of the traffic will then route on Road D686 (R545) north to the N4 Freeway and thence on to Witbank and Bronkhorstspuit, and 30% will use the south section (D686 S) to the N12 at Kendal or to Ogies. There will a major impact at noise sensitive sites along the respective access road to the new power station. Refer to Table C2 (Appendix C). Note that most of the increase in noise level will be caused by the natural growth of the traffic. The power station traffic component of the increase on Road R686 will only about 0,6dBA.
 - b) For Development Zone Y, the access road will be from Road D960 (“Blesbokfontein Road”) which links back southwards to the N12 Freeway. There are 8 noise sensitive sites along Road D960 (South). It is estimated in the Traffic Impact Study that 50% of the traffic routed on the south section of Road D960 to the N12 Freeway will then travel eastwards on the N12 and 50% westwards. Approximately 35% of the site traffic will use Road D686. It is also estimated that some of the traffic will route on Road D960 (North) north-eastwards to Bronkhorstspuit. Refer to Table C3 (Appendix C). Note that most of the increase in noise level will be caused by the natural growth of the traffic. The power station traffic component of the increase on Road R686 will only be about 0,6dBA.
- vi) From a noise perspective it has been established that the better site for the construction of the Witbank Area Power Station is the Development Zone X option. Refer to Appendix C for details of the rating analyses for the power station site.

5. MITIGATING MEASURES

Potential noise mitigating measures for the project were assessed.

5.1. Pre-construction Phase

Local residents are to be notified of any potentially noisy field survey works or other works during the planning and design phase and these activities are to be undertaken at reasonable times of the day. These works should not take place at night or on weekends.

During this phase, consideration must be given to the noise mitigating measures required during the construction phase and which should be included in the tender document specifications and the design.

5.2. Construction Phase

The noise mitigating measures to be considered during the construction phase are as follows:

- i) Construction site yards, concrete batching plants, asphalt batching plants, construction worker camps and other noisy fixed facilities should be located well away from noise sensitive areas adjacent to the development site.
- ii) All construction vehicles and equipment are to be kept in good repair.
- iii) Construction activities, and particularly the noisy ones, are to be restricted to reasonable hours during the day and early evening.
- iv) With regard to unavoidable very noisy construction activities in the vicinity of noise sensitive areas, the contractor should liaise with local residents on how best to minimise impact.
- v) In general operations should meet the noise standard requirements of the Occupational Health and Safety Act (Act No 85 of 1993).
- vi) Construction staff working in areas where the 8-hour ambient noise levels exceed 75dBA should wear ear protection equipment.

5.3. Operational Phase

The following noise mitigating measures, which will need to be considered where appropriate, are preliminary indicators that may assist further in the selection of the best alternative site:

- i) The most effective measures to reduce noise levels are normally at source. The latest technology incorporating maximum noise mitigating measures for the power station components should be designed into the system. Stringent noise emission (sound power level) specifications need to be set for all machinery.
- ii) If practical, the orientation of the power station should face the condenser fan side of the main generator building away from the main clusters of noise sensitive areas.
- iii) Buildings housing noisy machinery will need to be appropriately insulated in order to minimise transmission of noise through the walls and roof. A properly designed building (acoustically) could reduce internal noise by at least 15dBA.
- iv) Means to shield-off the noise from the cooling fan superstructure and area below the fans should be investigated. Appropriate measures could achieve reductions of at least 10dBA. Mitigating measures cannot be to the detriment of required air flow capacity.

- v) The location and orientation of ancillary works, such as the coal stockyard, the ash dump, conveyor systems (and in particular the drive-houses) and the waste-water treatment plant need to be carefully selected. Stringent noise emission specifications need to be set for the ancillary plant and equipment.

It should be noted that any measures taken at the development site will limit the impacts in the specific areas designed for, and will not necessarily contribute to improving the degraded noise climates in adjacent areas where there is already a problem.

6. CONCLUSIONS

The following conclusions may be drawn from the foregoing analysis:

- i) Although some of the base data required was not available for the analysis, the assumptions made are considered adequate to give a meaningful analysis of the noise impact situation, taking into account the fact that the exercise was broad based to assess alternatives and that all alternatives were assessed on the same basis.
- ii) The area of serious impact around the proposed power station will be fairly small (contained within a radius of about 6 kilometres).
- iii) Both of the sites (Development Zones) being considered have advantages and disadvantages and either one of the two sites could be used. Development Zone X, however, is preferred, albeit marginally. Refer to the rating comparison of the sites in Section C5.5 of Appendix C.
- iv) The rating of Development Zone X as the preferred development site can be supported further from a qualitative perspective in the noise climate of Development Zone Y is slightly more pristine and if possible should be preserved.

7. RECOMMENDATIONS

The following are recommended:

- i) The Gauteng and the National Noise Control Regulations, and SANS 10103:2004 should be used as the main guidelines for addressing the potential noise impact on this project.
- ii) Once more information on the land use details is available, a check should be undertaken of the assumptions made in this analysis.
- iii) Although either of the two alternative sites could be selected for the construction of the new power station, preference should be given to construction in Development Zone X.

- iv) The noise mitigating measures at the power station will need to be investigated in more detail by an acoustical engineer. In particular the cooling fan shielding needs to be investigated.

8. REFERENCES

1. South African National Standard SANS 10103:2003, *The Measurement and Rating of Environmental Noise with Respect to Land Use, Health, Annoyance and to Speech Communication.*
2. South African National Standard SANS 10210 (SABS 0210), *Calculating and Predicting Road Traffic Noise.*
3. South African Bureau of Standards Code of Practice SANS 10328 (SABS 0328), *Methods for Environmental Noise Impact Assessments.*
4. South African National Standard SANS 10357 (SABS 0357), *The Calculation of Sound Propagation by the Concawe Method.*
5. National Noise Control Regulations.
6. Gauteng Provincial Noise Control Regulations.

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APPENDIX A

**GLOSSARY OF TERMS
AND
NOISE IMPACT CRITERIA**

APPENDIX A

A1. GLOSSARY OF TERMS

In order to ensure that there is a clear interpretation of this report the following meanings should be applied to the acoustic terminology:

- **Ambient sound level** or **ambient noise** means the totally encompassing sound in a given situation at a given time, and usually composed of sound from many sources, both near and far. Note that ambient noise includes the noise from the noise source under investigation. The use of the word *ambient* should however always be clearly defined (compare with *residual noise*).
- **A-weighted sound pressure, in Pascals:** The root-mean-square sound pressure determined by use of frequency-weighting network A.
- **A-weighted sound pressure level (SPL) (noise level) (L_{pA}), in decibels:** The sound pressure level of A-weighted sound pressure is given by the equation:

$$L_{pA} = 10 \log (p_A/p_0)^2 \quad \text{where:}$$

p_A is the A-weighted sound pressure, in Pascals; and

p_0 is the reference sound pressure ($p_0 = 20$ micro Pascals (μPa))

Note: The internationally accepted symbol for sound pressure level, dB(A), is used.

- **Controlled areas** as specified by the National Noise Control Regulations are areas where certain noise criteria are exceeded and actions to mitigate the noise are required to be taken. Controlled areas as related to roads, airports and factory areas are defined. These Regulations presently exclude the creation of *controlled areas* in relation to railway noise.
- **dB(A)** means the value of the sound pressure level in decibels, determined using a frequency weighting network A. (The “A”-weighted noise levels/ranges of noise levels that can be expected in some typical environments are given in Table A1 at the end of this appendix).
- **Disturbing noise** means a noise level that exceeds the outdoor equivalent continuous rating level for the time period and neighbourhood as given in Table 2 of SANS 10103:2003. For convenience, the latter table is reproduced in this appendix as Table A1.
- **Equivalent continuous A-weighted sound pressure level ($L_{Aeq,T}$)** means the value of the A-weighted sound pressure level of a continuous, steady sound that, within a specified time interval, has the same mean-square sound pressure as a sound under consideration whose level varies with time.
- **Equivalent continuous rating level ($L_{Req,T}$)** means the equivalent continuous A-weighted sound pressure level during a specified time interval, plus specified adjustments for tonal character and impulsiveness of the sound and the time of day.

- **Equivalent continuous day/night rating level ($L_{R,dn}$)** means the equivalent continuous A-weighted sound pressure level during a reference time interval of 24-hours, plus specified adjustments for tonal character and impulsiveness of the sound and the time of day. (An adjustment of 10dB is added to the night-time rating level).
- **Integrating sound level meter** means a device that integrates a function of the root mean square value of sound pressure over a period of time and indicates the result in dBA.
- **Noise** means any acoustic phenomenon producing any aural sensation perceived as disagreeable or disturbing by an individual or group. Noise may therefore be defined as any *unwanted* sound or sound that is *loud, unpleasant or unexpected*.
- **Noise climate** is a term used to describe the general character of the environment with regard to sound. As well as the ambient noise level (quantitative aspect), it includes the qualitative aspect and the character of the fluctuating noise component.
- **Noise Control Regulations** means the regulations as promulgated by the Department of Environmental Affairs and Tourism and to be used by the provincial authorities to prepare their specific regulations. The project lies on the boundary of Gauteng and Mpumalanga Provinces. This project could be governed by the Gauteng Noise Control Regulations and/or the National Noise Control Regulations (Mpumalanga Province has not yet promulgated its own regulations).
- **Noise impact criteria** means the standards applied for assessing noise impact.
- **Noise level** means the reading on an integrating impulse sound level meter taken at a measuring point in the presence of any alleged disturbing noise at the end of a total period of at least 10 minutes after such meter was put into operation, and, if the alleged disturbing noise has a discernible pitch, for example, a whistle, buzz, drone or music, to which 5dBA has been added. (The “A”-weighted noise levels/ranges of noise levels that can be expected in some typical environments are given in Table A2 at the end of this appendix).
- **Noise nuisance** means any sound which disturbs or impairs or may disturb or impair the convenience or peace of any reasonable person considering the location and time of day. This applies to a disturbance which is not quantitatively measurable such as barking dogs, etc. (compared with disturbing noise which is measurable).
- **Residual sound level** means the ambient noise that remains at a position in a given situation when one or more specific noises are suppressed (compare with *ambient noise*).
- **Sound exposure level or SEL** means the level of sound accumulated over a given time interval or event. Technically the sound exposure level is the level of the time-integrated mean square A-weighted sound for stated time or event, with a reference time of one second.
- **Sound (pressure) level** means the reading on a sound level meter taken at a measuring point.

- **SANS 10103** means the latest edition of the South African Bureau of Standards Code of Practice SANS 10103 titled *The Measurement and Rating of Environmental Noise with Respect to Land Use, Health, Annoyance and to Speech Communication*.
- **SABS 0210** means the latest edition of the South African Bureau of Standards Code of Practice SABS 0210 titled *Calculating and Predicting Road Traffic Noise*.
- **SANS 10328** means the latest edition of the South African Bureau of Standards Code of Practice SANS 10328 titled *Methods for Environmental Noise Impact Assessments*.
- **Sound** means the aural sensation caused by rapid, but very small, pressure variations in the air. In quantifying the subjective aural sensation, “loudness”, the letters dBA after a numeral denote two separate phenomena:
 - “dB”, short for *decibel*, is related to the human’s subjective response to the change in amplitude (or largeness) of the pressure variations.
 - The “A” denotes the ear’s different sensitivity to sounds at different frequencies. The ear is very much less sensitive to low (bass) frequency pressure variations compared to mid-frequencies.

The level of environmental sound usually varies continuously with time. A human’s subjective response to varying sounds is primarily governed by the total sound energy received. The total sound energy is the average level of the fluctuating sound, occurring during a period of time, multiplied by the total time period. In order to compare the effects of different fluctuating sounds, one compares the average sound level over the time period with the constant level of a steady, non-varying sound that will produce the same energy during the same time period. The average energy of sound varying in amplitude is thus equivalent to the continuous, non-varying sound. The two energies are equivalent.

Refer also to the various South African National Standards referenced above and the Noise Control Regulations for additional and, in some instances, more detailed definitions.

TABLE A1: TYPICAL NOISE RATING LEVELS FOR AMBIENT NOISE IN DISTRICTS (NOISE ZONES)

Type of District	Equivalent Continuous Rating Level for Noise ($L_{Req,T}$) (dBA)					
	Outdoors			<u>Indoors with open windows</u>		
	Day-night ($L_{R,dn}$)	Daytime ($L_{Req,d}$)	Night-time ($L_{Req,n}$)	Day-night ($L_{R,dn}$)	Daytime ($L_{Req,d}$)	Night-time ($L_{Req,n}$)
RESIDENTIAL DISTRICTS						
a) Rural districts	45	45	35	35	35	25
b) Suburban districts (little road traffic)	50	50	40	40	40	30
c) Urban districts	55	55	45	45	45	35
NON RESIDENTIAL DISTRICTS						
d) Urban districts (some 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

TABLE A2: NOISE LEVELS/RANGES OF NOISE LEVELS THAT MAY BE EXPECTED IN SOME TYPICAL ENVIRONMENTS

Noise Level dB(A)	Typical Environment	Subjective Description
140	30m from jet aircraft during take-off	
130	Pneumatic chipping and riveting (operator's position)	Unbearable
>120	Hearing damage possible even for short exposure	
120	Large diesel power generator	
105-120	Low level military aircraft flight	
110-120	100 m from jet aircraft during take-off	
110	Metal workshop (grinding work), circular saw	
105-110	High speed train at 300 km/h (peak pass-by level at 7,5m)	
90-100	Printing press room	Very noisy
95-100	Passenger train at 200km/h (peak pass-by level at 7,5m).	Very noisy
95-100	Freight train at 100 km/h (peak pass-by level at 7,5 m)	Very noisy
90-100	Discotheque (indoors)	
75-100	7,5 m from passing motorcycle (50 km/h)	
75-80	10 m from edge of busy freeway (traffic travelling at 120 km/h)	
80-95	7,5 m from passing truck (50 km/h)	
80	Kerbside of busy street	
70	Blaring radio	Noisy
70	3 m from vacuum cleaner	Noisy
60-80	7,5 m from passing passenger car (50 km/h)	
65	Normal conversation	
65	Large busy office	
60	Supermarket/small office	
50	Average suburban home (day conditions)	Quiet
40	Library	
40-45	Average suburban home (night-time)	
30-35	Average rural home (night-time)	
25-30	Slight rustling of leaves	
20	Background in professional recording studio	Very quite
20	Forest (no wind)	
0-20	Experienced as complete quietness	
0	Threshold of hearing at 1000 Hz	

A2. NOISE IMPACT CRITERIA

The international tendency is to express noise exposure guidelines in terms of absolute noise levels. These guidelines imply that in order to ascertain an acceptable living environment, ambient noise in a given type of environment should not exceed a specified absolute level. This is the approach provided by the environmental guidelines of the World Bank and World Health Organisation, which specify 55 dBA during the day (06:00 to 22:00) and 45 dBA during the night (22:00 to 06:00) for residential purposes, determined over any hour. The standards for rural residential specify that 45dBA during the day and 35dBA during the night should not be exceeded. SANS 10103 conforms to the described international tendency. The recommended standards to be applied are summarised in Table A1.

Communities generally respond to a change in the ambient noise levels in their environment, and the guidelines set out in SANS 10103 provide a good indication for estimating their response to given increases in noise. The suggested severity criteria for the noise impacts are summarised in terms of the above guidelines in Table A3.

TABLE A3: CATEGORIES OF COMMUNITY/GROUP RESPONSE (CRITERIA FOR THE ASSESSMENT OF THE SEVERITY OF NOISE IMPACT)

Increase in Ambient Noise Level (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
Greater than 15dBA	Very strong	Vigorous community/group action

Changes in noise level are perceived as follows:

- **3dBA:** For a person with average hearing acuity, an increase in the general ambient noise level of 3dBA will be just detectable.
- **5dBA:** For a person with average hearing acuity an increase of 5dBA in the general ambient noise level will be significant, that is he or she will be able to identify the source of the intruding noise. According to SANS 10103 the community response for an increase of less than 5dBA will be 'little' with 'sporadic complaints'. For an increase of equal or more than 5dBA the response changes to 'medium' with 'widespread complaints'.
- **10dBA:** A person with average hearing will subjectively judge an increase of 10dBA as a doubling in the loudness of the noise. According to SANS 10103 the estimated community

reaction will change from 'medium' with 'widespread complaints' to 'strong' with 'threats of community action'.

In the Gauteng and the National Noise Control Regulations which are applicable for this project, an intruding noise is defined as 'disturbing' if it causes the ambient noise level to rise above the designated zone level, or if no zone noise level has been designated the typical rating levels for ambient noise in districts as indicated in SANS 10103. Refer to Table A1.

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

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

B1. GENERAL

The technical details of the noise measurement survey and general noise climate investigation related to the noise impact aspects for the assessment and comparison of two alternative potential development sites for the proposed Witbank Area Power Station near Kendal in Mpumalanga Province are dealt with in this Appendix. The alternative development zones (sites) are located in the area to the south of the N4 Freeway, to the north of the N12 Freeway and to the west of Road D686 (Route R545). The sites are:

- i) Development Zone X is the most easterly site.
- ii) Development Zone Y is the most westerly site.

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 at thirteen (13) main monitoring sites at appropriate locations to establish the existing ambient noise conditions around the study area. Measurements were taken at another three (3) sites where it was attempted to isolate the noise from the existing Kendal Power Station. These were taken at appropriate sites at varying distances from the power station.

Supplementary noise measurements to establish the baseline noise profiles of various plant/equipment to be used at the new power station were taken at Matimba Power Station and other existing operational sites.

B2. 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 10103:2004, *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 Brüel and Kjaer Model 2230 meter and a Larson Davis 824 were used for the noise measurements. Both meters were calibrated at the CSIR 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.

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 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.

B3. MEASUREMENT SITES

The thirteen main monitoring sites in the study area where the ambient noise conditions were established are defined by the main farm name, a specific farm name (where relevant) and by a road/ farm road name. The sites are:

- xiv) Site K1: At the entrance gate to Langgelegen (Kaia Thandi), Hartbeestfontein 537-JR on the southern side of the “Hartbeestfontein” farm road. The site is located on the north-eastern boundary of Development Zone X.
- xv) Site K2: At the entrance gate to Klipfontein (Swanepoel Boerdery), Klipfontein 566-JR on the western side of the “Klipfontein North” farm road. The site is located on the eastern boundary of Development Zone X.
- xvi) Site K3: In the central area of the old Wilge Power Station residential village (Voltargo).

- xvii) Site K4: At the entrance to Klipfontein, Klipfontein 566-JR on the northern side of the “Klipfontein Central” farm road. This is on the boundary with Klipfontein 588-JR. The site is located 1000 metres east of the south-eastern corner (boundary) of Development Zone X.
- xviii) Site K5: In the agricultural holdings on Klipfontein 588-JR on northern side of the “Klipfontein South” farm road. The site is 2900 metres west of Road D686 and 2150 metres due south of the south-eastern corner (boundary) of Development Zone X.
- xix) Site K6: On the farm Dwaalfontein 565-JR. The site is on the access road to the Hoeveld Camping Grounds and is approximately 1200 metres west of Road D960 (Blesbokfontein Road) and 1300 metres north of the N12 Freeway.
- xx) Site K7: At farmhouse on Dwaalfontein 565-JR on the western side of Road D960 (Blesbokfontein Road). The site is approximately 500 metres east of the eastern boundary of Development Zone Y.
- xxi) Site K8: At the Kelvin Primary School on the farm Witpoort 583-JR. The site is on the north-eastern boundary of Development Zone Y. It is approximately 800 metres south of Road D960 (Blesbokfontein Road).
- xxii) Site K9: At entrance to farmhouse on Blesbokfontein 558-JR on the northern side of Road D960 (Blesbokfontein Road). The site is on the north-western corner (boundary) of Development Zone Y and lies 1000 metres east of Road D961 (Dwarsfontein-Bronkhorstspruit Road).
- xxiii) Site K10: At the entrance to farmhouse on farm Brakfontein 559-JR. On the eastern side of Road D961 (Dwarsfontein-Bronkhorstspruit Road). The site is 2100 metres south-west of the south-western boundary of Development Zone Y.
- xxiv) Site K11: At the entrance to Bossemanskraal (Topigs), Bossemanskraal 538-JR on the eastern side of Road D2236 (Bosmanskraal Road). The site is 3500 metres west of the western boundary of Development Zone X.
- xxv) Site K12: At the entrance to Willows Farm (Dyke Feld Country Estate), Onverwacht 532-JR on the eastern side of Road D2236 (Bosmanskraal Road). The site is 3200 metres west of the north-western corner (boundary) of Development Zone X and 2000 metres south of the N4 Freeway.
- xxvi) Site K13: In the Kendal Forest Holdings. The site is 1600 metres west of Road D686 on the southern side of the road which accesses the Holdings from Road D686 opposite the entrance to the El Toro Conference Centre.

The three sites where the existing Kendal Power Station noise was isolated were

- i) SITE PS1: On the southern side of the power station, 100 metres north of the road to the Khutala Colliery. The site is approximately 900 metres south of the power station.
- ii) SITE PS2: On the southern side of the main access road to the power station. The site is approximately 600 metres north of the power station.
- iii) SITE PS3: On South Road (inside the power station grounds), 300 metres south of the power station.

B4. MEASUREMENT DATES/TIMES

General observation of the noise conditions in the areas around the two Development sites as well as the site specific sound pressure level (noise) measurements and observations were taken on Monday 14 August 2006 during the daytime period from 9h30 to 17h00 and during the evening period from 19h15 to 24h00 and up to 01h00 in the early hours of Tuesday 15 August 2006. Further measurements and observations were taken on morning of Tuesday 15 August 2006 from 09h00 to 11h00.

B5. NOISE MEASUREMENT DETAILS

B5.1. 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 B1: EXISTING (YEAR 2006) NOISE LEVELS IN THE AREAS OF THE ALTERNATIVE SITES FOR THE PLANNED WITBANK AREA 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 K1	39.3	57.8	26.6	41.6	58.9	28.2
Site K2	41.2	58.3	24.1	38.1	52.6	26.1
Site K3	51.7	70.6	40.6	38.7	44.2	30.6
Site K4	41.6	52.2	30.1	31.7	42.1	23.6
Site K5	46.6	62.4	31.3	38.2	46.1	29.3
Site K6	37.5	54.6	27.7	35.9	47.6	28.4
Site K7	46.6	57.4	35.9	33.7	47.1	21.2
Site K8	39.4	50.4	25.7	34.1	45.9	23.6
Site K9	47.2	54.0	39.5	33.2	46.8	24.1
Site K10	40.6	54.9	27.2	36.8	47.7	28.2
Site K11	38.4	50.4	26.3	33.2	48.1	27.2
Site K12	44.4	57.1	35.8	35.4	47.1	28.4
Site K13	42.4	54.4	33.0	39.9	48.9	37.5

B5.2. Noise from Kendal Power Station

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

Table B2.

TABLE B2: NOISE COMPONENT FROM KENDAL POWER STATION

Site	Distance from Kendal (m)	Noise Level (dBA)	Comment
Site PS1	900	51	Wind blowing towards meter from power station
Site PS2	600	45	Wind blowing away from meter towards power station
Site PS3	300	57	Wind blowing towards meter from power station

B5.3. Measurements of Other Main Noise Generators

Measurements were also taken at the following other main noise generators related to the power station operation. These were taken at Matimba Power Station.

- 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.

B5.3.1. 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.

B5.3.2. Conveyor Belt Drive House

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

B5.3.3. 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.

B5.3.4. 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.

B5.4. 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 the N4 Freeway, the N12 Freeway, Road D686 (R545) and Road P29/1 (R555) were 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 Mpumalanga Roads Department and the consulting engineers that monitor the road traffic for SANRAL.

The noise levels at various offsets from the centreline of the specified roads are summarised in Table B3. The noise descriptors used are those prescribed in SANS 10103:2004, 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).

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 B3: EXISTING NOISE CLIMATE ADJACENT TO MAIN ROADS (YEAR 2006)

Road	Noise Levels Alongside Roads at Given Offset from Centreline (SANS 10103 Indicator) (dBA)							
	100m Offset		250m Offset		500m Offset		1000m Offset	
	L_d	L_n	L_d	L_n	L_d	L_n	L_d	L_n
N4 Freeway	62.5	53.7	58.5	49.7	55.5	46.7	52.5	43.7
N12 Freeway	62.1	53.4	58.1	49.4	55.1	46.4	52.1	43.4

Road D686 N (R545)	57.0	48.2	53.0	44.2	50.0	41.2	47.0	38.2
Road D686 S	55.0	46.2	51.0	42.2	48.0	39.2	45.0	36.2
Road P29/1 (R555)	54.0	45.2	50.0	41.2	47.0	38.2	44.0	35.2

B5.5. Railway Traffic

There are two main railway lines through the study area:

- iii) The Pretoria-Witbank line to the north of National Road N4 and Road R104. There are 12 trains per day along this line.
- iv) The Johannesburg-Witbank line to the south of National Road N12 and which passes through Kendal. There are 11 trains per day along this line.

These train movements have only a minor influence on the general noise climate of the area except at noise sensitive sites very close to the respective railway lines.

B5.6. Prevailing Noise Climate

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

- ix) The main sources of noise in the area are from traffic on the main roads, Kendal Power Station, power station infrastructure remote from the facility (such as the ash dump) the Pretoria-Witbank and the Johannesburg-Witbank railway lines, and Khutala Colliery.
- x) The areas relatively far from the main roads and Kendal Power Station are generally very quiet. Most of the area has a typical rural *noise climate*.
- xi) The minor farm roads that penetrate the study area carry small volumes of traffic and the impact of traffic noise from these facilities is minimal.
- xii) The noise climate close to the main roads is severely degraded and adjacent to the following roads for the distances shown from the road the noise levels exceed acceptable rural residential living conditions as specified in SANS 10103:2004.
 - N4 Freeway - 3000 metres
 - N12 Freeway - 3000 metres
 - Road D686 North (Route R545) - 1500 metres
 - Road D686 South - 1200 metres
 - Road P29/1 (Route R555) - 1000 metres

- xiii) Ideally the ambient noise level should not exceed 45dBA during the daytime period (06h00 to 22h00) and 35dBA during the night-time period (22h00 to 06h00). Refer to the SANS 10103:2004 standards as given in Appendix A.
- xiv) Noise levels from Kendal Power Station adversely affect the daytime noise climate at many residences in the surrounding area for up to a distance of approximately 1000 metres around the facility (based on the rural standards that need to be applied for this area). At night the radius of impact increases to approximately 2300 metres.

PROPOSED COAL-FIRED POWER STATION AND ASSOCIATED INFRASTRUCTURE IN
THE WITBANK GEOGRAPHICAL AREA: NOISE IMPACT ASSESSMENT
ALTERNATIVE SITE EVALUATION

APPENDIX C
ASSESSMENT OF NOISE IMPACT

APPENDIX C: ASSESSMENT OF NOISE IMPACT

C1. GENERAL

C1.1. Background Details

Two alternative sites (Development Zones) for the proposed Witbank Area Power Station are being evaluated Eskom. These are:

- iii) Alternative X: Portions of the farms Hartebeesfontein 537-JR and Klipfontein 566-JR. The western boundary of this Development Zone lies parallel to and approximately 2500 metres west of Road D686 (Route R545).
- iv) Alternative Y: Portions of the farms Blesbokfontein 558-JR, Witpoort 563-JR, Nooitgedacht 564-JR and Dwaalfontein 55 –JR. This Development Zone lies to the south-west of Development Zone X.

The likely position and orientation of the proposed Power Station buildings and ancillary works on each of the two alternative Development Zones have not been finalised by Eskom and the analysis has thus been undertaken on a worst scenario basis based on provisional layouts by Eskom.

For convenience in this report, Road D686, the main provincial road from Balmoral to Kendal has been divided into two sections called the following:

- Road D686 North (Route R545): from the N4 Balmoral interchange south to the intersection with Road D1955 (where Route R545 turns eastwards to Ogies).
- Road D686 South: from the intersection with Road D1955 (where Route R545 turns eastwards to Ogies) southwards to Kendal.

The assessment of the noise impact was guided by the requirements of the South African National Standard SANS 10328 (SABS 0328) titled *Methods for Environmental Noise Impact Assessments* and the Noise Control Regulations. A comprehensive assessment using the appropriate noise impact descriptors (standards) has been undertaken. The noise impact criteria used in this investigation specifically take into account those as specified in the South African National Standard SANS 10103:2004, *The Measurement and Rating of Environmental Noise with Respect to Land Use, Health, Annoyance and Speech Communication*, as well as those in the National Noise Control Regulations. Relevant aspects of these Regulations and SANS 10103:2004 are provided in Appendix A.

C1.2. Noise Sensitive Areas/Sites

One aspect that has limited a final comprehensive assessment of noise impact has been that the current details of all the farmhouses, farm labourer dwellings and other noise sensitive sites in the area that are potentially affected are not yet available. The specific land use (type of farming activity) and position of the all the farmhouses, labourers' houses and other habitations have not been confirmed. For this study, the position of houses/dwellings on the farms was taken off 1:50 000 topographical cadastral maps. Even though the latest editions were used, the relevant maps are 3 to 11 years out of date and there may be new dwellings and/or some of the existing shown buildings may be derelict. During the field survey for the noise measurement survey, such aspects were noted where possible. The following 1:50 000 topographical cadastral maps were used:

- SOUTH AFRICA 1:50 000 Sheet 2528DC BRONKHORSTSPRUIT Fifth Edition, 2003.
- SOUTH AFRICA 1:50 000 Sheet 2528DD BALMORAL Fourth Edition, 1995.
- SOUTH AFRICA 1:50 000 Sheet 2529CC WITBANK Third Edition, 1996.
- SOUTH AFRICA 1:50 000 Sheet 2628BA DELMAS Third Edition, 1995.
- SOUTH AFRICA 1:50 000 Sheet 2628BB KENDAL Third Edition, 1995.
- SOUTH AFRICA 1:50 000 Sheet 2629AA OGIES Third Edition, 1995.

The main noise sensitive sites in the study area are:

C2. ASSESSMENT OF THE PRE-CONSTRUCTION PHASE

Activities during the planning and design stages that have possible impact implications in the study area are related to field surveys (such as seismic testing and geological test borehole drilling for large building foundation investigations). As these survey activities will be of short duration and take place during the day, they are unlikely to cause any noise impact.

C3. ASSESSMENT OF THE CONSTRUCTION PHASE

C3.1. General

The potential noise climate was established in general for the construction of the new power station inclusive of appurtenant works such as the conveyor belt systems, internal road system, new sewage works and the construction of new access roads. Although many of the details of the proposed Development's buildings have not yet been finalised, general concepts have been used in the noise impact evaluation and these are adequate to provide a sound basis for the analysis of typical noise conditions and impacts that are likely to prevail on the project. Data related to

construction have been sourced from various consultants and the experience that JKA has had working on similar sites.

C3.3. Construction Noise Conditions

Construction will likely be carried out during the day only from 07h00 to 18h00 or 20h00. It should however be noted that certain activities may occasionally extend into the late evening period, while others such as de-watering operations may need to take place over a 24-hour period. Some of the activities such as the construction of the chimney stacks could take place continuously (24-hours a day) over a number of weeks if a continuous sliding shutter concreting operation is used. It is estimated that the development of the project will take place over a period of 6 to 7 years.

C3.3.1. Sources of Noise

The following are likely to be the main construction related sources of noise for the power station and its infrastructure:

- i) Construction camp establishment. This will be for the site offices, workshops and possibly the accommodation camp for the workers on site.
- ii) Activities related to the relocation of services.
- iii) Excavation of building basements and service trenches. Blasting may be required in places but in general pneumatic breakers will be used where rock is encountered.
- iv) Piling operations for large buildings.
- v) Erection of shuttering for concrete.
- vi) Fixing of steel reinforcing.
- vii) Placing and vibration of concrete. Poker vibrators will be used.
- viii) Stripping of shuttering after concrete pour.
- ix) Erection of structural steelwork.
- x) Finishing operations on buildings. Cladding, services installation, etc.
- xi) Installation of generating plant and ancillary plant.
- xii) General movement of heavy vehicles such as concrete delivery vehicles, mobile cranes, mechanical dumpers and water trucks (dust suppression) around the site.
- xiii) De-watering pumps. A 24-hour operation may sometimes be necessary.
- xiv) Road construction equipment. Scrapers, dozers, compactors, etc. (Construction of the internal road system and the upgrading of access roads).
- xv) Construction site fabrication workshops and plant maintenance workshops.
- xvi) Construction material and equipment delivery vehicles.
- xvii) Concrete batching plant and asphalt batching plant on site.

The level and character of the construction noise will be highly variable as different activities with different plant/equipment take place at different times, over different periods, in different combinations, in different sequences and on different parts of the construction site. Typical noise levels generated by the various types of construction equipment are given in Table C1a.

TABLE C1a. TYPICAL NOISE LEVELS GENERATED BY CONSTRUCTION EQUIPMENT

Plant/Equipment	Typical Operational Noise Level at Given Offset (dBA)							
	5m	10m	25m	50m	100m	250m	500m	1000m
Air compressor	91	85	77	71	65	57	51	46
Compactor	92	86	78	72	66	58	52	46
Concrete mixer	95	89	81	75	69	61	55	49
Concrete vibrator	86	80	72	66	60	52	46	40
Conveyor belt	77	71	63	57	51	43	37	32
Crusher (aggregate)	90	84	76	70	64	56	50	44
Crane (mobile)	93	87	79	73	67	59	53	47
Dozer	95	89	81	75	69	61	55	49
Loader	95	89	81	75	69	61	55	49
Mechanical shovel	98	92	84	78	72	64	58	52
Pile driver	110	104	97	91	85	77	71	65
Pump	86	80	72	66	60	52	46	40
Pneumatic breaker	98	92	84	78	72	64	58	52
Rock drill	108	102	94	88	82	74	68	62
Roller	84	78	70	64	58	50	44	38
Trucks	-	81	73	67	64	60	57	54

These noise levels assume that the equipment is maintained in good order. Conservative attenuation conditions (related to intervening ground conditions and screening) have been applied.

C3.3.2. *Noise Impact*

The nature of the noise impact from general activities on large construction sites such as the power station contract is likely to be as follows:

- v) Source noise levels from many of the construction activities will be high. Noise levels from all work areas will vary constantly and in many instances significantly over short periods during any day working period.

- vi) Exact daytime period and night-time period continuous equivalent sound pressure levels are not possible to calculate with certainty at this stage as the final construction site layout, work programme, work *modus operandi* and type of equipment have not been finalised. Typical ambient noise conditions from a construction site are as indicated in Table C1b.

TABLE C1b: TYPICAL NOISE LEVELS GENERATED BY A CONSTRUCTION SITE

Noise Source	Typical Operational Noise Level at Given Offset (dBA)							
	100m	250m	500m	800	1000m	1500m	2000m	2500m
Construction site	64	56	49	44	41	36	32	29

- vii) There are likely to be noise disturbance effects on people living in the surrounding rural areas for up to 750 metres from the construction. Ideally the daytime outdoor ambient noise levels (as specified in SANS 10103) should not exceed 45dBA for the rural residents. The maximum short-term noise levels from general construction operations at the noise sensitive sites nearest to the construction could be of the order of 85dBA. This would be classed as a noise nuisance.
- viii) For all construction work, the construction workers working with or in close proximity to equipment will be exposed to high levels of noise as can be seen from Table C1a (refer to the 5 metre offset noise levels).

The nature of the noise impact from the road construction activities (internal roads and access roads) is likely to be as follows:

- iii) The level and character of the construction noise will be highly variable as different activities with different plant/equipment take place at different times, over different periods, in different combinations, in different sequences and on different parts of the construction site.
- iv) As no specific construction details or possible locations of major ancillary activity sites are available at this stage, the anticipated noise from various types of construction activities cannot be calculated accurately. In general at this stage, it can be said that the typical noise levels of construction equipment at a distance of 15 metres lie in the range of 75 decibels (dBA) to 100dBA. Refer also to Table C1a. Based on data from similar “linear” construction sites, a one-hour equivalent noise level of between 75dBA and 78dBA at a point 50 metres from the construction would be typical for the earthmoving phase.

C3.3.3. Noise from Construction Traffic

The predicted traffic data for the operational conditions during construction were supplied by Ninham Shand Consulting Services. It has been estimated that the construction activities at the new power station will generate about 2350 vehicle trips daily. In general the construction traffic will have a relative minor effect on the noise climate alongside the main external roads especially alongside those that already carry significant traffic.

- i) For the Development Zone X scenario, ambient noise levels adjacent to the N4 Freeway and N12 Freeway will only increase by 0,5dBA. Noise levels along the R686 (R545) north of the access road to the power station to the Balmoral N4 interchange will increase by about 2dBA, while south of the access road, noise levels will only increase by 0,7dBA.
- ii) For the Development Zone Y scenario, ambient noise levels adjacent to the N4 Freeway and N12 Freeway will only increase by 0,5dBA. Noise levels along the R686 (R545) north of the R545 intersection (road to Ogies) will increase by about 0,8dBA, while south of the intersection, noise levels on Road D686 will increase by 1,3dBA.

For both the two alternative scenarios, there will a major impact at noise sensitive sites along the respective access road to the new power station. For Development Zone X, the access road will be from Road D686 (R545) along the "Klipfontein Central" farm road. For Development Zone Y, the access road will be from Road D960 ("Blesbokfontein Road") which links back southwards to the N12 Freeway. Traffic volumes will increase significantly along the respective access roads and the daytime ambient noise will increase accordingly by about 17dBA.

C4. ASSESSMENT OF THE OPERATIONAL PHASE

C4.1. General

The main sources of noise in the future when the new power station is commissioned will be from:

- i) Road traffic.
- ii) The new Witbank Area Power Station.
- iii) Kendal Power Station.
- iv) Rail traffic.

The two alternative sites for the new power station were evaluated on the following basis:

- i) Noise impact from the new Witbank Area Power Station.
- ii) Cumulative noise impact effects of the new power station and Kendal power station.
- iii) Noise impact from ancillary works at the new power station.

- iv) Noise impact from traffic generated by the new Power Station.
- v) Noise from the railway traffic.
- vi) Features of acoustical significance.

C4.2. Predicted Noise Conditions Related to the New Power Station

The planned generating capacity of the proposed Witbank Area Power Station will be of the order of 5 400 Mega-watts (MW) from six generator units. Eskom have indicated that the new power station will be similar to the proposed Matimba B Power Station, which is also being planned at present. The main noise source from the power station will be the cooling fans, which are installed on one side only of the Power Station. Eskom estimate that the Witbank Area Power Station will require 72 cooling fans per generating unit, namely a total of 432 fans. The main orientation of the power station will be south-west to north-east with the fans on the north-western side. The condenser fan platform at fan level will be about 50 metres above ground level. This configuration of fans is likely to result in approximately the following ambient noise conditions around the Witbank Area Power Station (from power station source only):

- 58dBA at 1000 metres.
- 52dBA at 2000 metres.
- 46dBA at 3000 metres.
- 42dBA at 4000 metres.
- 38dBA at 5000 metres.
- 34dBA at 6000 metres.

Noise levels on the far side of the power station building to the fans will be slightly quieter due to shielding from the building.

The noise levels given are the unmitigated values. A conservative approach has been taken in that a hard intervening ground condition has been modelled. There will 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.

C4.3. Noise Conditions Related to Kendal Power Station

Based on calculation and measurements, the following noise levels from Kendal Power Station may be expected at the given offsets from the power station:

- At 1000 metres - 50,5dBA.
- At 2000 metres - 42,5dBA.

- At 3000 metres - 37,5dBA.

C4.4. General Noise Conditions Related to Ancillary Works

C4.4.1. Conveyor Belt Systems

For the details of the noise levels from a conveyor belt system at various offset distances refer to Table C1a. The noise levels from an intermediate drive house for a conveyor belt will be of the order of:

- 51dBA at a 500 metres offset.
- 46dBA at a 1000 metres offset.
- 41dBA at a 2000 metres offset.

The exact position of the conveyor systems has not yet been finalised.

C4.4.2. Ash Dump Spreader Operations

The maximum noise levels from the ash spreading operations at an ash dump will be of the order of:

- 55dBA at a 500 metres offset.
- 49dBA at a 1000 metres offset.
- 43dBA at a 2000 metres offset.

C4.4.3. Sewage Works Operation

When the aeration rotors are working the ambient noise level will be 40dBA at a 300 metres offset.

The position of the sewage works has not yet been identified.

C4.5. Witbank Area Power Station Generated Traffic

The predicted traffic data for the operational conditions once the proposed Power Station is commissioned were supplied by Ninham Shand Consulting Services. It has been estimated that the proposed Power Station will generate about 900 vehicle trips daily.

The future ambient noise situations along the main roads were calculated using the South African National Standard SANS 10210 (SABS 0210), *Calculating and Predicting Road Traffic Noise*. The noise levels at various offsets from the centreline of these roads were established for the two Development Zone alternatives and these data are summarised in Table C2 (Development Zone X) and Table C3 (Development Zone Y). The noise descriptors used are those prescribed in SANS 10103:2004, namely:

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

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

The following traffic and traffic noise conditions are anticipated:

- i) For Development Zone X, the access road will be from Road D686 (R545) along the “Klipfontein Central” farm road. There are 3 noise sensitive sites along the access road. It has been predicted that approximately 70% of the traffic will then route on Road D686 (R545) north to the N4 Freeway and thence on to Witbank and Bronkhorstspuit, and 30% will use the south section (D686 S) to the N12 at Kendal or to Ogies. There will a major impact at noise sensitive sites along the respective access road to the new power station. Refer to Table C2 and compare with Table B3. Note that most of the increase in noise level will be caused by the natural growth of the traffic. The power station traffic component of the increase on Road R686 will only about 0,6dBA.

TABLE C2: DEVELOPMENT ZONE X SCENARIO: PREDICTED NOISE CLIMATE ADJACENT TO MAIN ROADS AT COMMISSIONING OF THE WITBANK AREA POWER STATION (YEAR 2015)

Road	Noise Levels Alongside Roads at Given Offset from Centreline (SANS 10103 Indicator) (dBA)							
	100m Offset		250m Offset		500m Offset		1000m Offset	
	L_d	L_n	L_d	L_n	L_d	L_n	L_d	L_n
N4 Freeway	64.9	56.1	60.9	52.1	57.9	49.1	54.9	46.1
N12 Freeway	64.4	55.6	60.4	51.6	57.4	48.6	54.4	45.6
Road D686 N (R545)	59.0	50.2	55.0	46.2	52.0	43.2	49.0	40.2
Road D686 S	56.9	48.2	52.9	44.2	49.9	41.2	46.9	38.2
Road P29/1 (R555)	55.2	46.4	51.2	42.4	48.2	39.4	45.2	36.4
Access Road	49.7	42.4	45.7	38.4	42.7	35.4	39.7	32.4

- ii) For Development Zone Y, the access road will be from Road D960 (“Blesbokfotein Road”) which links back southwards to the N12 Freeway. There are 8 noise sensitive sites along Road D960 (South). It is estimated that 50% of the traffic routed on the south section of Road D960 to the N12 Freeway will then travel eastwards on the N12 and 50% westwards. Approximately 35% of the site traffic will use Road D686. It is also estimated that some of the traffic will route on Road D960 (North) north-eastwards to Bronkhorstspuit. Refer to Table C3 and compare with Table B3. Note that most of the increase in noise level will be caused by the natural growth of the traffic. The power station traffic component of the increase on Road R686 will only be about 0,6dBA.

TABLE C3: DEVELOPMENT ZONE Y SCENARIO: PREDICTED NOISE CLIMATE ADJACENT TO MAIN ROADS AT COMMISSIONING OF THE WITBANK AREA POWER STATION (YEAR 2015)

Road	Noise Levels Alongside Roads at Given Offset from Centreline (SANS 10103 Indicator) (dBA)							
	100m Offset		250m Offset		500m Offset		1000m Offset	
	L _d	L _n	L _d	L _n	L _d	L _n	L _d	L _n
N4 Freeway	64.9	56.1	60.9	52.1	57.9	49.1	54.9	46.1
N12 Freeway	64.4	55.6	60.4	51.6	57.4	48.6	54.4	45.6
Road D686 N (R545)	59.4	50.6	55.4	46.6	52.4	43.6	49.4	40.6
Road D686 S	56.8	48.0	52.8	44.0	49.8	41.0	46.8	38.0
Road P29/1 (R555)	55.2	46.4	51.2	42.4	48.2	39.4	45.2	36.4
Access Road	49.7	42.4	45.7	38.4	42.7	35.4	39.7	32.4

C4.6. Railway Noise

Spoornet have not been able to provide any estimate of the likely growth of rail traffic on the two main railway lines through the area. It is most likely that growth will be small and the noise impact from this source will remain insignificant except close to the railway lines. Noise from the pass-by of a freight train (drawn by a diesel locomotive) will peak in the vicinity of 92dBA at a 30 metres offset from the track. A maximum sound pressure level of approximately 70dBA will be experienced at an offset of 350 metres with the pass-by of each train.

C4.7. Features of Acoustical Significance in the Area

C4.7.1. Wind

The wind blows mainly from the north-western quadrant 39% of the time during the day, and from the eastern quadrant 42% of the time during the night. There are “still” periods 7% of the time during the day and 13% of the time at night.

C4.7.2. Topography

The terrain in the study area is flat to gently undulating (*moderately undulating plains*). There will be little attenuation of noise due to terrain restraints.

C4.7.3. Vegetation

The vegetation type in the area is highveld grassland.

C5. EVALUATION OF THE ALTERNATIVE SITES

The analysis has been made with the following assumptions:

- i) The layouts of the two alternative development sites indicating preliminary possible positions of the power station, ash dump and coal stockyard that have been analysed are as indicated in Figure C1 (Development Zone X) and Figure C2 (Development Zone Y).
- ii) The orientation of the new power station will be such that the bank of condenser fans will be located on the north-western side of the generator buildings.
- iii) Noise sensitive sites within the boundaries of the Development Zones have not been taken into account as it has been assumed that all these residences will be expropriated. Only those sites outside the Development Zone but within 6000 metres of the proposed power station have been assessed.

Figure C1

Figure C2

The following noise related issues were ascertained for the two alternative proposed Witbank Area Power Station development sites:

C5.1 Development Zone X

- i) The existing noise levels (residual levels) in the area are relatively low and are representative of a rural/farming environment.
- ii) The noise climate on three sides of the Development Zone is degraded to some degree due to extraneous noise sources. Noise sensitive sites close to the northern boundary of the Development Zone are significantly affected by traffic noise from the N4 Freeway. Those sites close to the eastern boundary are moderately affected by traffic noise from Road D686, and those close to the southern boundary are only marginally affected by the traffic noise from the N12 Freeway.
- iii) Construction noise is not expected to be a problem.
- iv) The construction traffic for the new power station will raise the present ambient noise levels along the main roads in the area only marginally. Noise levels along the access road ("Klipfontein Central" farm road) will increase significantly. Two noise sensitive sites are affected.
- v) There will be a significant increase in noise in the area predominantly from the power station, and noise sensitive sites in a 360 degree arc around the facility and up to a range of 6000 metres will be affected. 34 sites will be affected to some degree. The noise impact will be the most severe over the 180 degree arc to the north-west of the site.
- vi) The additional traffic generated by the Witbank Area Power Station will raise the present ambient noise levels along the main roads in the area only marginally. Houses close to the roads are already significantly impacted particularly at night. Noise levels along the access road ("Klipfontein Central" farm road) will increase significantly. Two noise sensitive sites are affected.
- vii) The site of the power station itself lies approximately 20 500 metres south-east of Bronkhorstspuit. It will have no impact on this urban area.
- viii) The site of the power station itself lies approximately 18 000 metres north north-west of the existing Kendal Power Station. There will be no cumulative noise effects from these two facilities.
- ix) The site is 8500 metres from old Wilge Power Station Village (Voltago). There will be no impact from the new power station.

- x) Noise impact from the ash dump operations on the surrounding noise sensitive sites is expected to be low in general but there could be nuisance effects at times. Relatively few sites are affected.
- xi) The prevailing winds will not significantly improve or worsen the basic noise situation from the new power station. Generally in the daytime, noise to the south-east will be enhanced while at night area to the west will experience slightly louder noise levels.

C5.2 Development Zone Y

- i) The existing noise levels (residual levels) in the area are relatively low and are representative of a rural/farming environment.
- ii) The noise climate on one side of the Development Zone is degraded to some degree due to extraneous noise sources. Noise sensitive sites close to the southern boundary of the Development Zone are significantly affected by traffic noise from the N12 Freeway.
- iii) Construction noise is not expected to be a problem.
- iv) The construction traffic for the proposed power station will raise the present ambient noise levels along the main roads in the area only marginally. Noise levels along the access road will increase significantly. Noise levels along the access road (Road D960) will increase significantly. Nine noise sensitive sites are affected.
- v) There will be a significant increase in noise in the area predominantly from the power station, and noise sensitive sites in a 360 degree arc around the facility and up to a range of 6000 metres will be affected. 40 sites will be affected to some degree. The noise impact will be the most severe over the 180 degree arc to the north-west of the site.
- vi) The additional traffic generated by the Witbank Area Power Station will raise the present ambient noise levels along the main roads in the area only marginally. Houses close to the roads are already significantly impacted particularly at night. Noise levels along the access road (Road D960) will increase significantly. Nine noise sensitive sites are affected.
- vii) The site of the power station itself lies approximately 18 500 metres south-east of Bronkhorstspuit. It will have no impact on this urban area.
- viii) The site of the power station itself lies approximately 18 500 metres north-west of the existing Kendal Power Station. There will be no cumulative noise effects from these two facilities.
- ix) The site is 20 000 metres from old Wilge Power Station Village (Voltago). There will be no impact from the new power station.

- x) Noise impact from the ash dump operations on the surrounding noise sensitive sites is expected to be low in general but there could be nuisance effects at times. Relatively few sites are affected.
- xi) The prevailing winds will not significantly improve or worsen the basic noise situation from the new power station. Generally in the daytime, noise to the south-east will be enhanced while at night area to the west will experience slightly louder noise levels.

C5.5. Comparison of the Alternative Sites

A five point rating system (positive rating) was applied was applied to various noise aspects in order to compare the four alternative sites:

- 1 = not suitable for development (Impact of very high significance – negative).
- 2 = not preferred (Impact of high significance – negative).
- 3 = acceptable (Impact of moderate significance – negative).
- 4 = preferred (Impact of low or negligible significance – negative).
- 5 = ideal for development or positive impact.

The details of the rating analysis of the two Development Zones (power station sites and their respective appurtenant infrastructure sites) are summarised in Table C4.

TABLE C4: RATING COMPARISON OF THE TWO ALTERNATIVE DEVELOPMENT ZONES FOR THE PLANNED WITBANK AREA POWER STATION

Aspect for Rating	Rating for Alternative	
	Development Zone X	Development Zone Y
Acceptability of zone for project in relation to existing noise climate	4	3
Impact of construction noise	4	4
General impact of construction traffic	4	4
Impact of construction traffic along access road	4	3
Operational phase: impact on surrounding noise sensitive sites	3	2
General impact of operational phase traffic	4	4
Impact of operational phase traffic along access road	4	3
Impact on Bronkhorstspruit	4	4
Impact on Voltago Village	4	4
Cumulative effects with Kendal Power Station	4	4
Impact of the ash dump operations	3	4
Impact of the coal stockyard	4	3
Total	46	42

The analysis indicates that, on the basis of noise, the better site for development of the Witbank Area Power Station is Development Zone X. This is marginal.

PROPOSED COAL-FIRED POWER STATION AND ASSOCIATED INFRASTRUCTURE IN
THE WITBANK GEOGRAPHICAL AREA: NOISE IMPACT ASSESSMENT
ALTERNATIVE SITE EVALUATION

APPENDIX D

**ASSESSMENT OF THE POTENTIAL NOISE IMPACT
FROM THE SERVICE CORRIDORS**

APPENDIX D: ASSESSMENT OF THE POTENTIAL NNOISE IMPACT FROM THE PLANNED SERVICE CORRIDORS

D1. INTRODUCTION

The Final Draft of this Noise Impact Report was submitted on 13 October 2006. On 20 October 2006, an additional plan, which indicated the corridors where various services to and from the proposed Witbank Area Power Station, was received by Jongens Keet Associates for comment. The assessment of the potential noise impact from the infrastructure planned in these service corridors is documented in this Appendix.

The details for this assessment have been taken from the unnumbered Eskom drawing titled “Project Bravo” and dated August 2006. This drawing, which is a base map of the Anglo Coal Project Services’ New Largo and Zondagsfontein West Resources and Prospecting Rights, also indicates the planned corridors for various ancillary services for the proposed power station. The relevant services in these corridors that potentially will have a noise impact are:

- Roads. These are the possible access roads (along new alignments) to the power station.
- Industrial spur railway lines. These are the corridors to nearby stations/railway sidings on the two main railway lines through the area. Note that these corridors are indicated on the drawing as a “railway line or road”.
- Coal conveyor systems.
- Water pipelines.

Note that these corridors were not considered in the original Noise Impact Assessment Report.

The proposed power station will be supplied with coal from, *inter alia*, Anglo Coal’s New Largo Colliery No 4 Seam workings which lie just to the east of Development Zone X.

Anglo Coal’s New Largo Colliery No 4 seam workings underlie Road D686 (Route R545) and sections of the road will have to be re-aligned around the coal ore body. No details of the new alignment have been provided at this stage and the re-alignment has not been included in the noise impact assessment.

D2. DETAILS OF THE SERVICES CORRIDORS

D2.1. General

For convenience and where relevant in this Appendix, the respective service corridor has been named in a manner that indicates:

- i) The type of service:
 - R - road.
 - RL - railway line (industrial spur line).
 - CS - conveyor system.
 - WP - water pipeline.
- ii) The Development Zone it will service, namely X or Y.
- iii) The direction from which the service will approach the power station site, namely from the north (N), south (S), etc.

The “railway” corridors are planned to link an existing station/siding to the proposed power station in order to facilitate the delivery of sorbent. There are three options being considered for delivering the sorbent supply to site, two of which relate to the “railway” corridor. These are:

- i) Option 1: Rail to site.
- ii) Option 2: Rail to an existing siding and then truck to site via either a dedicated haul road or the available road network.

The third option would be to truck the sorbent to site entirely sby road. In this case, the planned access roads to the power station would be used.

The road and /or rail traffic that would be generated by this operation is estimated by Eskom to be as follows:

- i) Option 1: One train per day on industrial spur line from the relevant station/siding to the power station.
- ii) Option 2: Sixty-one (61) road-truck loads per train as delivered to the main line station/siding. There will be approximately 22 trains per month. Trucks will route along the new haul road from the relevant station/siding to the power station.
- iii) Option 3: Forty-five (45) road-truck loads per day along the existing road network and new access road(s) to the power station.

D2.2. Development Zone X

The corridors for ancillary services that are being considered to service Development Zone X are as follows:

D2.2.1. Roads

- i) Alternative 1: Road R/X/NW. This new road will link south-eastwards from Road D2236 (from a point just south of the “Bossemanskraal” interchange on the N4 Freeway) to the north-western corner of Development Zone X, from where it will follow the western boundary of the Zone to the power station. Note that this alternative may only be considered for access to Development Zone Y. Refer to Section D2.3.1.i.
- ii) Alternative 2: Road R/X/NE. This new road will link from Road D686 at its intersection with Road P104 (eastern leg) just south of the “Balmoral” interchange on the N4 Freeway south-westwards to the north-eastern corner of Development Zone X.

D2.2.2. *Railway Lines*

One of the following alternative corridors between the power station and the respective railway station is being considered. Both corridors are indicated on the drawing as a “railway line or road”:

- i) Alternative 1: Railway RL/X/SW. This new spur railway line will link from Kendal Station on the Johannesburg-Witbank main line. It will be aligned northwards from the station to a point where it will cross the N12 Freeway and then be aligned in an east-west direction parallel to the freeway to a point in the vicinity of Road D960 from where it will curve to the north-east towards the Development Zone X power station.
- ii) Alternative 2: Railway line RL/X/NW. This new spur railway line will link from the Crown Douglas siding on the Pretoria-Witbank main line. It will be aligned southwards from the siding to a point where it will cross the N4 Freeway and then will be aligned along the northern and eastern boundaries of Development Zone X to the power station.

D2.2.3. *Coal Supply Conveyor System*

- i) Conveyor CS/X/E: The conveyor will be aligned in an east-west direction from the north-western side of the No 4 Seam workings area to the coal stockyard on the eastern side of Development Zone X.

D2.2.4. *Water Pipelines*

- i) Pipeline WP/X/SW. The water pipeline corridor is planned from the Kendal power station area. It will run in a south-east to north-west direction to cross the N12 Freeway in the area of the Road D960 interchange, and from where it will continue north-eastwards to the Development Zone X power station. There is no indication at present whether or not additional pump stations will be required or where they may be located along the pipeline.

D2.3. Development Zone Y

The corridors for ancillary services that are being considered to service Development Zone Y are as follows:

D2.3.1. Roads

- i) Alternative 1: Road R/Y/N. This new road will link from Road D2236 just south of the “Bossemanskraal” interchange on the N4 Freeway south-eastwards to the north-western corner of Development Zone X, from where it will follow the western boundary of the Zone to Road D960 and then follow the latter to the power station. The northern section of the alignment is the same as Road R/X/NW.

It is most likely that Road D960 will also be an access from the N12 Freeway in the south

D2.3.2. Railway Lines

The following corridor between the power station and the respective station is indicated on the drawing as a “railway line or road”:

- i) Alternative 1: Railway RL/Y/SE. This new spur railway line will link from Kendal Station on the Johannesburg-Witbank main line. It will be aligned northwards from the station to a point where it will cross the N12 Freeway and then be aligned in an east-west direction parallel to the freeway to a point in the vicinity of Road D960 from where it will curve to the north-west towards the Development Zone Y power station.

D2.3.3. Coal Supply Conveyor System

- i) Conveyor CS/Y/E: The conveyor will be aligned in an east-west direction from the north-western side of the No 4 Seam workings area to the coal stockyard on the eastern side of Development Zone Y.

D2.3.4. Water Pipelines

- i) Pipeline WP/Y/SE. The water pipeline corridor is planned from the Kendal power station area. It will run in a south-east to north-west direction to cross the N12 Freeway in the area of the Road D960 interchange, and from where it will turn north-westwards to the Development Zone Y power station. There is no indication at present whether or not additional pump stations will be required or where they may be located along the pipeline.

D3. IMPACT OF THE SERVICE CORRIDORS

D3.1. Access Roads

The predicted traffic data for the operational conditions once the proposed Power Station is commissioned were supplied by Ninham Shand Consulting Services. It has been estimated that the proposed Power Station will generate about 900 vehicle trips daily. If the sorbent is delivered by road, this volume of traffic could be of the order of 1000 vehicles

The number of noise sensitive sites which are potentially affected by the respective planned railway corridors is:

- i) Along Road R/X/NW - 7.
- ii) Along Road R/X/NE - 6.
- iii) Along Road R/Y/N - 9.

There will be a significant impact at the noise sensitive sites near to the access road corridors.

D3.2. Railway Lines

The number of noise sensitive sites which are potentially affected by the respective planned railway corridors is:

- i) Along Railway RL/X/SW - 16.
- ii) Along Railway RL/X/NW - 8.
- iii) Along Railway RL/Y/SE - 18.

There could be several more noise sensitive sites affected if the line from Kendal Station is routed through or close to the Kendal Forest Holdings.

The estimated train traffic of no more than 1 train per day will have minor impact on the noise sensitive sites along the respective railway industrial spur line corridor. Noise from a passing freight train (drawn by a diesel locomotive) reaches a peak level in the vicinity of 92dBA at a 30 metre offset from the track. A maximum sound pressure level of approximately 70dBA will be experienced at an offset of 350 metres with the pass-by of each train. A number of level crossings may be necessary along the relevant railway line where it will be mandatory that the trains sound a warning horn. Noise from these horn soundings can be as loud as 105dBA at 30 metres and 84dBA at 350 metres from the train.

If these corridors are used for a dedicated truck haul road from station to power station the noise impact of up to 61 trucks per day (122 two-way trips) on the noise sensitive sites close to the corridor will be fairly severe.

D3.3. Coal Supply Conveyor System

D3.3.1. Sources of Noise

For the details of the noise levels from a conveyor belt system at various offset distances refer to Table C1a. The noise levels from the main or an intermediate drive house for the conveyor belt will be of the order of:

- 51dBA at a 500 metres offset.
- 46dBA at a 1000 metres offset.
- 41dBA at a 2000 metres offset.

D3.3.2. Impact of Development Zone X Corridor

There is only one noise sensitive site within and close to the corridor that is potentially impacted by the noise from the conveyor system.

D3.3.3. Impact of Development Zone Y Corridor

There are several noise sensitive sites within and close to the corridor that are potentially impacted by the noise from the conveyor system.

D3.4. Water Pipelines

D3.4.1. Sources of Noise

The main sources of noise during the operational phase are anticipated to be:

- The pump stations, if relevant. The main noise, as heard externally, will be from the ventilation intake fans for the building housing the pumps. Typical worst noise levels in the vicinity of the type of pump station that is likely to be built for the project are as given in Table D1. The average noise level over one hour (L_{Aeq}) and the day-night equivalent continuous rating (noise) level ($L_{R,dn}$) are indicated. The latter is for a situation where pumping operations will be continuous over any 24-hour period. These are the unmitigated values. The nature of the sound from the pump house will be that of a continuous “swishing” noise of virtually unvarying intensity.

TABLE D1: TYPICAL NOISE LEVELS AT A PUMP STATION

Descriptor	Noise Level at given Offset (dBA)				
	10m	25m	50m	100m	200m
L_{Aeq}	69	62	56	50	44

L _{R,dn}	75	67	61	56	50
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Noise sensitive sites within a radius of 500 metres of a pump station could be adversely affected by the noise if no mitigating measures are taken.

- ii) Water-hammer in the pipelines when the pumps are switched on. These effects are intermittent (when pumps are switched on and off) and are unlikely to be a problem.
- iii) Pressure relief valves at high points along the pipeline. These are unlikely to be a problem.
- iv) Routine maintenance. As this will normally be undertaken during the day, no significant impact is anticipated.

D3.4.2. *Impact of Development Zone X Corridor*

There are several noise sensitive sites within and close to the corridor that are potentially impacted by the noise from a pump house.

D3.4.3. *Impact of Development Zone Y Corridor*

There are several noise sensitive sites within and close to the corridor that are potentially impacted by the noise from a pump house.

D4. CONCLUSIONS

The following were concluded from the analysis of the service corridors:

- i) There are potentially noise impacts from the various service corridors that will need to be mitigated.
- ii) These impacts will need to be analysed in more detail once a preferred site for the power station is selected and more technical details of the proposed facility and its ancillary works are known.
- iii) Mitigating measures are possible to reduce the potential impacts from the various service corridors reviewed.