Universal Coal Development 1 (Pty) Ltd

NOISE REPORT
FOR SCOPING

Development of the Kangala Extension Project

near Delmas, Mpumalanga

Study done for:

20 YEARS 1993 - 2013
Leaders in Environmental Management

ENVIRONMENTAL IMPACT MANAGEMENT SERVICES

Prepared by:

EAR
Enviro Acoustic Research

P.O. Box 2047, Garsfontein East, 0060
Tel: 012 – 004 0362, Fax: 086 – 621 0292, E-mail: info@eares.co.za

EXECUTIVE SUMMARY

Enviro-Acoustic Research (EARES) was contracted by Environmental Impact Management Services (the consultant) to determine the potential noise impact on the surrounding environment due to the Kangala Extension project. The proposed project is situated approximately 7 km south-west of Delmas, Mpumalanga.

Universal Coal Development 1 wishes to develop a new opencast coal mining operation covering an extent of 251 hectares (ha), adjacent to the existing Universal Coal's Kangala Colliery. The proposed Kangala Extension Project is anticipated to use a standard truck and shovel mining method based on strip mining design and layout. The existing Coal Handling and Processing Plant (CHPP) at the Kangala Colliery will be utilised for the proposed Kangala Extension Project. It is expected that no new surface infrastructure such as offices, dams, stores facility, workshops, or change house will be required for the project.

This report briefly assesses the potential noise impacts that such an operation may have on the surrounding environment, highlighting methodologies, potential issues to be investigated, as well as preliminary findings and recommendations. This study would consider local regulations and both local and international guidelines, using the terms of reference as proposed by SANS 10328:2008 to allow for a Scoping level Noise Impact Assessment.

Considering the noise levels that may be expected at certain distances from selected activities, there are a potential for a noise impact. A preliminary assessment of the information provides for a buffer area of approximately 500 meters from any noise-sensitive receptors to prevent noise impact of high significance for night-time activities (especially drilling operations).

A buffer area of approximately 200m is recommended from noise-sensitive receptors to prevent noise impact of medium (or higher) significance for daytime activities.

As little information is available conceptual noise propagation is used to estimate potential issues of concern. With the preliminary data as used, this assessment indicated that:

- Considering maximum noise emission levels, that the construction activities could be audible over a distance of more than 2,000 meters;

- Considering equivalent (average) noise emission levels, activities could influence the ambient sound levels over a distance greater than 2,000 meters.

A risk exist that a noise impact could occur and it is recommended that the noise impact be investigated in more detail during the Environmental Impact Assessment phase.

This report should be cited as:

De Jager, M (2018): "*Noise Report for Scoping – Development of the Kangala Extension Project near Delmas, Mpumalanga*". Enviro-Acoustic Research cc, Pretoria

Client:

Environmental Impact Management Services
for Universal Coal Development 1 (Pty) Ltd

Fernridge Office Park.
5 Hunter Road
P.O. Box 2083
Pinegowrie
2123

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Author:

M. de Jager *(B. Ing (Chem))*

Review:

Johan Maré *(MSc. Microbiology, PriSci Nat (400092/91))*

Date:

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GLOSSARY OF ABBREVIATIONS

AZSL	Acceptable Zone Sound Level (Rating Level)
EARES	Enviro Acoustic Research cc
ECA	Environment Conservation Act (Act 78 of 1989)
EIMS	Environmental Impact Management Services
EMP	Environmental Management Plan
FEL	Front End Loader
IFC	International Finance Corporation
LHD	Load haul dumper
mamsl	Meters above mean sea level
NEMA	National Environmental Management Act, 1998 (Act 107 of 1998)
NCR	Noise Control Regulations (under Section 25 of the ECA)
SABS	South African Bureau of Standards
SANS	South African National Standards
TLB	Tip Load Bucket
UCD1	Universal Coal Development 1 (Pty) Ltd
UTM	Universal Transverse Mercator
WHO	World Health Organisation

GLOSSARY OF UNITS

dB	Decibel (expression of the relative loudness of the un-weighted sound level)
dBA	Decibel (expression of the relative loudness of the A-weighted sound level)
Hz	Hertz (measurement of frequency)
kg/m^2	Surface density (measurement of surface density)
km	kilometre (measurement of distance)
m	Meter (measurement of distance)
m^2	Square meter (measurement of area)
m^3	Cubic meter (measurement of volume)
mamsl	Meters above mean sea level
m/s	Meter per second (measurement for velocity)
^oC	Degrees Celsius (measurement of temperature)
µPa	Micro pascal (measurement of pressure – in air in this document)

1 THE AUTHOR

The author started his career in the mining industry as a bursar Learner Official (JCI, Randfontein), working in the mining industry, doing various mining-related courses (Rock Mechanics, Surveying, Sampling, Safety and Health [Ventilation, noise, illumination etc]) and Metallurgy. He did work in both underground (Coal, Gold and Platinum) as well as opencast (Coal) for 4 years. He changed course from Mining Engineering to Chemical Engineering after his second year of his studies at the University of Pretoria.

After graduation, he worked as a Water Pollution Control Officer at the Department of Water Affairs and Forestry for two years (first year seconded from Wates, Meiring and Barnard), where duties included the perusal (evaluation, commenting and recommendation) of various regulatory required documents (such as EMPR's, Water Licence Applications and EIA's), auditing of licence conditions as well as the compilation of Technical Documents.

Since leaving the Department of Water Affairs, Morné has been in private consulting for the last 15 years, managing various projects for the mining and industrial sector, private developers, business, other environmental consulting firms as well as the Department of Water Affairs. During that period he has been involved in various projects, either as specialist, consultant, trainer or project manager, successfully completing these projects within budget and timeframe. During that period he gradually moved towards environmental acoustics, focusing on this field exclusively since 2007.

He has been interested in acoustics as from school days, doing projects mainly related to loudspeaker design. Interest in the matter brought him into the field of Environmental Noise Measurement, Prediction and Control. He has been doing work in this field for the past 9 years, and was involved with more than 250 noise studies in the last few years, including amongst others:

Wind Energy Facilities	*Full Environmental Noise Impact Assessments for - Bannf (Vidigenix), iNCa Gouda (Aurecon SA), Kangnas (Aurecon), Plateau East and West (Aurecon), Wolf (Aurecon), Outeniqwa (Aurecon), Umsinde Emoyeni (ARCUS) , Komsberg (ARCUS), Karee and Kolkies Wind Farms (ARCUS), Canyon Springs (Canyon Springs), Perdekraal (ERM), Zen (Savannah Environmental – SE), Goereesoe (SE), Springfontein (SE), Garob (SE), Project Blue (SE), ESKOM Kleinzee (SE), Walker Bay (SE), Oyster Bay (SE), Hidden Valley (SE), Happy Valley (SE), Deep River (SE), Tsitsikamma (SE), AB (SE), West Coast One (SE), Hopefield II (SE), Namakwa Sands (SE), VentuSA Gouda (SE), Dorper (SE), Amakhala Emoyeni (SE), Klipheuwel (SE), Cookhouse (SE), Cookhouse II (SE), Rheboksfontein (SE), Suurplaat (SE), Karoo Renewables (SE), Koningaas (SE), Eskom Aberdene (SE), Spitskop (SE), Castle (SE), Khai Ma (SE), Poortjies (SE), Korana (SE), IE Moorreesburg (SE), Gunstfontein (SE), Vredenburg (Terramanzi), Loeriesfontein (SiVEST), Rhenosterberg*

	(SiVEST), Noupoort (SiVEST), Prieska (SiVEST), Dwarsrug (SiVEST), Msenge Emoyeni (Windlab), Isivunguvungu Wind Farm (Aurecon), Graskoppies (SiVEST), Hartebeest Leegte (SiVEST), Ithemba (SiVEST), !Xha Boom (SiVEST), Kokerboom 1 (Aurecon), Kokerboom 2 (Aurecon), Teekloof (Mainstream), Sutherland (CSIR), Rietrug (CSIR), Sutherland 2 (CSIR), Spitskop West (Terramanzi)
Mining and Industry	*Full Environmental Noise Impact Assessments for – Delft Sand (AGES), BECSA – Middelburg (Golder Associates), Kromkrans Colliery (Geovicon Environmental), SASOL Borrow Pits Project (JMA Consulting), Lesego Platinum (AGES), Tweefontein Colliery (Cleanstream Environmental), Evraz Vametco Mine and Plant (JMA), Goedehoop Colliery (Geovicon), Hacra Project (Prescali Environmental), Der Brochen Platinum Project (J9 Environment), Brandbach Sand (AGES), Verkeerdepan Extension (CleanStream Environmental), Dwaalboom Limestone (AGES), Jagdlust Chrome (MENCO), WPB Coal (MENCO), Landau Expansion (CleanStream Environmental), Otjikoto Gold (AurexGold), Klipfontein Colliery (MENCO), Imbabala Coal (MENCO), ATCOM East Expansion (Jones and Wagner), IPP Waterberg Power Station (SE), Kangra Coal (ERM), Schoongesicht (CleanStream Environmental), EastPlats (CleanStream Environmental), Chapudi Coal (Jacana Environmental), Generaal Coal (JE), Mopane Coal (JE), Glencore Boshoek Chrome (JMA), Langpan Chrome (PE), Vlakpoort Chrome (PE), Sekoko Coal (SE), Frankford Power (REMIG), Strahrae Coal (Ferret Mining), Transalloys Power Station (Savannah), Pan Palladum Smelter, Iron and PGM Complex (Prescali Environmental), Fumani Gold (AGES), Leiden Coal (EIMS), Colenso Coal and Power Station (SiVEST/EcoPartners), Klippoortjie Coal (Gudani), Rietspruit Crushers (MENCO), Assen Iron (Tshikovha), Transalloys (SE), ESKOM Ankerlig (SE), Pofadder CSP (SE), Nooitgedacht Titano Project (EcoPartners), Algoa Oil Well (EIMS), Spitskop Chrome (EMAssistance), Vlakfontein South (Gudani), Leandra Coal (Jacana), Grazvalley and Zoetveld (Prescali), Tjate Chrome (Prescali), Langpan Chromite (Prescali), Vereeniging Recycling (Pro Roof), Meyerton Recycling (Pro Roof), Hammanskraal Billeting Plant 1 and 2 (Unica), Development of Altona Furnace, Limpopo Province (Prescali Environmental), Haakdoorndrift Opencast at Amandelbult Platinum (Aurecon), Landau Dragline relocation (Aurecon), Stuart Coal Opencast (CleanStream Environmental), Tetra4 Gas Field Development (EIMS), Kao Diamonds – Tiping Village Relocation (EIMS), Kao Diamonds – West Valley Tailings Deposit (EIMS), Upington Special Economic Zone (EOH), Arcellor Mittal CCGT Project near Saldanha (ERM), Malawi Sugar Mill Project (ERM), Proposed Mooifontein Colliery (Geovicon Environmental), Goedehoop North Residue Deposit Expansion (Geovicon Environmental), Mutsho 600MW Coal-Fired Power Plant (Jacana Environmentals), Tshivhaso Coal-Fired Power Plant (Savannah Environmental), Doornhoek Fluorspar Project (Exigo)*
Road and Railway	*K220 Road Extension (Urban smart), Boskop Road (MTO), Sekoko Mining (AGES), Davel-Swaziland-Richards Bay Rail Link (Aurecon), Moloto Transport Corridor Status Quo Report and Pre-Feasibility (SiVEST), Postmasburg Housing Development (SE), Tshwane Rapid Transport Project, Phase 1 and 2 (NRM Consulting/City of Tshwane), Transnet Apies-river Bridge Upgrade (Transnet), Gautrain Due-diligence (SiVest), N2 Piet Retief (SANRAL), Atterbury Extension, CoT (Bokomoso Environmental)*
Airport	*Oudtshoorn Noise Monitoring (AGES), Sandton Heliport (Alpine Aviation), Tete Airport Scoping (Aurecon)*
Noise monitoring and Audit Reports	*Peerboom Colliery (EcoPartners), Thabametsi (Digby Wells), Doxa Deo (Doxa Deo), Harties Dredging (Rand Water), Xstrata Coal – Witbank Regional (Xstrata), Sephaku Delmas (AGES), Amakhala Emoyeni WEF (Windlab Developments), Oyster Bay WEF (Renewable Energy Systems), Tsitsikamma WEF Ambient Sound Level study (Cennergi and SE), Hopefield WEF (Umoya), Wesley WEF (Innowind), Ncora WEF (Innowind), Boschmanspoort (Jones and Wagner), Nqamakwe WEF (Innowind), Hopefield WEF Noise Analysis (Umoya), Dassiesfontein WEF Noise Analysis (BioTherm), Transnet Noise Analysis (Aurecon), Jeffries Bay Wind Farm (Globeleq), Sephaku Aganang (Exigo), Sephaku Delmas (Exigo), Beira Audit (BP/GPT), Nacala Audit (BP/GPT), NATREF*

	(Nemai), Rappa Resources (Rayten), Measurement Report for Sephaku Delmas (Ages), Measurement Report for Sephaku Aganang (Ages), Development noise measurement protocol for Mamba Cement (Exigo), Measurement Report for Mamba Cement (Exigo), Measurement Report for Nokeng Fluorspar (Exigo), Tsitsikamma Community Wind Farm Pre-operation sound measurements (Cennergi), Waainek WEF Operational Noise Measurements (Innowind), Sedibeng Brewery Noise Measurements (MENCO), Tsitsikamma Community Wind Farm Operational noise measurements (Cennergi), Noupoort Wind Farm Operational noise measurements (Mainstream),
Small Noise Impact Assessments	*TCTA AMD Project Baseline (AECOM), NATREF (Nemai Consulting), Christian Life Church (UrbanSmart), Kosmosdale (UrbanSmart), Louwlardia K220 (UrbanSmart), Richards Bay Port Expansion (AECOM), Babalegi Steel Recycling (AGES), Safika Slag Milling Plant (AGES), Arcelor Mittal WEF (Aurecon), RVM Hydroplant (Aurecon), Grootvlei PS Oil Storage (SiVEST), Rhenosterberg WEF, (SiVEST), Concerto Estate (BPTrust), Ekuseni Youth Centre (MENCO), Kranskop Industrial Park (Cape South Developments), Pretoria Central Mosque (Noman Shaikh), Soshanguve Development (Maluleke Investments), Seshego-D Waste Disposal (Enviroxcellence), Zambesi Safari Equipment (Owner), Noise Annoyance Assessment due to the Operation of the Gautrain (Thornhill and Lakeside Residential Estate), Upington Solar (SE), Ilangalethu Solar (SE), Pofadder Solar (SE), Flagging Trees WEF (SE), Uyekraal WEF (SE), Ruuki Power Station (SE), Richards Bay Port Expansion 2 (AECOM), Babalegi Steel Recycling (AGES), Safika Ladium (AGES), Safika Cement Isando (AGES), RareCo (SE), Struisbaai WEF (SE), Perdekraal WEF (ERM), Kotula Tsatsi Energy (SE), Olievenhoutbosch Township (Nali), , HDMS Project (AECOM), Quarry extensions near Ermelo (Rietspruit Crushers), Proposed uMzimkhulu Landfill in KZN (nZingwe Consultancy), Linksfield Residential Development (Bokomoso Environmental), Rooihuiskraal Ext. Residential Development, CoT (Plandev Town Planners), Floating Power Plant and LNG Import Facility, Richards Bay (ERM), Floating Power Plant project, Saldanha (ERM), Vopak Growth 4 project (ERM), Elandspoort Ext 3 Residential Development (Gibb Engineering)*
Project reviews and amendment reports	*Loperberg (Savannah), Dorper (Savannah), Penhoek Pass (Savannah), Oyster Bay (RES), Tsitsikamma Community Wind Farm Noise Simulation project (Cennergi), Amakhala Emoyeni (Windlab), Spreeukloof (Savannah), Spinning Head (SE), Kangra Coal (ERM), West Coast One (Moyeng Energy), Rheboksfontein (Moyeng Energy), De Aar WEF (Holland), Quarterly Measurement Reports – Dangote Delmas (Exigo), Quarterly Measurement Reports – Dangote Lichtenburg (Exigo), Quarterly Measurement Reports – Mamba Cement (Exigo), Quarterly Measurement Reports – Dangote Delmas (Exigo) Quarterly Measurement Reports – Nokeng Fluorspar (Exigo), Proton Energy Limited Nigeria (ERM), Hartebeest WEF Update (Moorreesburg) (Savannah Environmental), Modderfontein WEF Opinion (Terramanzi), IPD Vredenburg WEF (IPD Power Vredenburg)*

2 DECLARATION OF INDEPENDENCE

I, Morné de Jager declare that:

- I act as the independent environmental practitioner in this application
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting environmental impact assessments, including knowledge of the National Environmental Management Act (107 of 1998), the Environmental Impact Assessment Regulations of 2010, and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, regulations and all other applicable legislation;
- I will take into account, to the extent possible, the matters listed in regulation 8 of the regulations when preparing the application and any report relating to the application;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- I will ensure that information containing all relevant facts in respect of the application is distributed or made available to interested and affected parties and the public and that participation by interested and affected parties is facilitated in such a manner that all interested and affected parties will be provided with a reasonable opportunity to participate and to provide comments on documents that are produced to support the application;
- I will ensure that the comments of all interested and affected parties are considered and recorded in reports that are submitted to the competent authority in respect of the application, provided that comments that are made by interested and affected parties in respect of a final report that will be submitted to the competent authority may be attached to the report without further amendment to the report;
- I will keep a register of all interested and affected parties that participated in a public participation process; and
- I will provide the competent authority with access to all information at my disposal regarding the application, whether such information is favourable to the applicant or not
- all the particulars furnished by me in this form are true and correct;
- will perform all other obligations as expected from an environmental assessment practitioner in terms of the Regulations; and
- I realise that a false declaration is an offence in terms of regulation 71 and is punishable in terms of section 24F of the Act.

Disclosure of Vested Interest

- I do not have and will not have any vested interest (either business, financial, personal or other) in the proposed activity proceeding other than remuneration for work performed in terms of the Environmental Impact Assessment Regulations, 2010.

_____
Signature of the environmental practitioner:

Enviro-Acoustic Research cc
Name of company:

_____
Date:

3 INTRODUCTION

3.1 INTRODUCTION AND PURPOSE

Enviro-Acoustic Research (EARES) was contracted by Environmental Impact Management Services (the consultant) to determine the potential noise impact on the surrounding environment due to the extension of the Kangala Colliery. This project is to be developed approximately 7 km south-west of Delmas in Mpumalanga.

This Scoping Report is the result of a first phase study of the potential noise impacts that such an operation may have on the surrounding environment, highlighting methodologies, potential issues to be investigated, as well as preliminary findings and recommendations. This study would consider local regulations and both local and international guidelines, using the terms of reference as proposed by SANS 10328:2008 to allow for a Scoping level Noise Impact Assessment.

3.2 BRIEF PROJECT DESCRIPTION

Universal Coal Development 1 (hereafter referred to as UCD1), a subsidiary of Universal Coal plc has appointed Environmental Impact Management Services (Pty) Ltd (EIMS) as the Environmental Assessment Practitioner (EAP) to assist with compiling the necessary reports and undertaking the statutory consultation processes, in support of the proposed development of a new coal mining operation - hereafter referred to as the proposed Kangala Extension Project.

UCD1 wishes to develop a new opencast coal mining operation covering an extent of 251 hectares (ha), adjacent to the existing Universal Coal's Kangala Colliery on various portions of the Farm Strypan 243 IR - herein referred to as the Kangala Extension Project. The proposed Kangala Extension Project is anticipated to use a standard truck and shovel mining method based on strip mining design and layout. The existing Coal Handling and Processing Plant (CHPP) at the Kangala Colliery will be utilised for the proposed Kangala Extension Project. It is expected that no new surface infrastructure such as offices, dams, stores facility, workshops, or change house will be required for the project.

3.3 STUDY AREA

The project footprint is in Victor Khanye Local Municipality, located within the Nkangala District Municipality, Mpumalanga Province. The project area covers portions 14, 16, 20, 23, 24, and RE of the Farm Strydpan 243 IR.

3.3.1 Surrounding Land Use

The surrounding land use is mainly agriculture, roads and mining. Mining activities in the area is significant and at times audible over large distances. Surrounding land use activities is expected to influence the surrounding soundscape.

3.3.2 Roads

The R42 road passes the study area in the south. There is a significant number of small gravel roads used by the farmers and the local communities, although traffic volumes are low on these smaller roads.

3.3.3 Residential areas

Excluding farm dwellings, there are no formal residential areas within 5,000m from the proposed activity, with the town of Eloff located at around 6 km. There are a number of small communities (farmers and their employees) living in the area (also see **Figure 3-1**).

3.3.4 Other industrial Activities

There are a number of mining and industrial projects within visible distance from the study area. The R42 is relatively busy due to the industries and the ancillary services that it supports.

3.3.5 Ground conditions and vegetation

The area falls within the Grassland biome, with the vegetation type being Turf Highveld[1] (Themeda Veld according to ENPATS). The mean annual evaporation ranges between 2000 - 2200 mm per annum, while mean annual precipitation is approximately 600 - 700 mm per annum[2].

Taking into consideration available information it is the opinion of the author that the ground surface is sufficiently covered to assume 50% hard ground conditions for modelling purposes. It should be noted that this factor is only relevant for air-borne waves being reflected from the ground surface, with certain frequencies slightly absorbed by the vegetation.

3.3.6 Existing Ambient Sound Levels

Ambient sound levels will be measured during the future Environmental Noise Impact Assessment (ENIA). Ambient sound levels was previously measured for other projects in

[1] Musina L. & Rutherford." The vegetation of South Africa, Lesotho and Swaziland". Strelitzia 19, South African National Biodiversity Institute, Pretoria. 2006.
[2] South African Water Research Commission, "*Water Resources of South Africa 2005 (WR2005).* WRC Report No.: K5/1491", South Africa: WRC Publications, 2009.

the area, including quarterly measurements done for Dangote Cement Delmas and an ENIA done for Stuart Coal. While this data is not applicable to the soundscape close to this project, it did allow the author the opportunity to visit the site and gauge the typical sound character of the area.

Mining and industry have changed the soundscape directly (due to the activities of the mines and industry) as well as indirectly (due to increased traffic). While most of the area has a rural developmental character, the increased industry (including agricultural activities such as poultry farming) did raise the ambient sound levels in the area, especially in the vicinity of the industry as well as the R42.

Taking a precautious stance, it will be assumed that the ambient sound levels are typical of a rural noise district at all receptors. This precautious stance will be reviewed during the ENIA phase.

3.4 POTENTIAL NOISE-SENSITIVE RECEPTORS AND NO-GO AREAS

Potentially sensitive receptors, also known as noise-sensitive developments (NSDs) were identified using Google Earth®. This will be supported with a site visit in the future to confirm the status of the identified dwellings.

The reason for the site visit, apart from sampling ambient sound levels, will be to confirm the presence/existence of derelict or abandoned dwellings that could possibly be seen as sensitive receptors, small dwellings that could not be identified on aerial images and dwellings that might have been constructed after the date of the aerial photograph. The status of the building (derelict, commercial, industrial or residential) needed to be established as well.

Potential receptors in and within approximately 2,000m around the proposed development activities were identified as **1** to **6** (presented in **Figure 3-1**). It should be noted that each of these dots may represent a small farming community, including the farmer and the various workers that stay on the farm (close to the main dwelling).

Based on the location of the proposed development and the potential noise-sensitive developments, there are a risk of a noise impact on these receptors. A preliminary sensitivity map is presented in **Figure 7-1**. This however can only be fully investigated during the Environmental Noise Impact Assessment study.

Figure 3-1: Aerial image indicating potentially noise-sensitive receptors

3.5 TERMS OF REFERENCE

A noise impact assessment must be completed for the following reasons:

- If there are potential noise-sensitive receptors staying within 1,000 m from industrial activities (SANS 10328:2008);
- It is a controlled activity in terms of the NEMA regulations and an ENIA is required, because:
    - It may cause a disturbing noise that is prohibited in terms of section 18(1) of the Government Notice 579 of 2010; and
- It is generally required by the local or district authority as part of the environmental authorisation or planning approval in terms of Regulation 2(d) of GN R154 of 1992 (Regulation 4(1) in terms of PN.200 of 2013 – Western Cape).

In addition, Appendix 6 of GN 982 of December 2014 (Gov. Gaz. 38282 – as amended on 1 April 2017), issued in terms of the National Environmental Management Act, No. 107 of 1998 also defines minimum information requirements for specialist reports.

In South Africa the document that addresses the issues specifically concerning environmental noise is SANS 10103:2008. It has been thoroughly revised and brought in line with the guidelines of the World Health Organisation (WHO) during 2006 - 2007. It provides the maximum average ambient noise levels during the day and night to which different types of developments may be exposed.

In addition, the South African National Standard (SANS) 10328:2008 (Edition 2) specifies the methodology to assess the potential noise impacts on the environment due to a proposed activity that might impact on the environment. This standard also stipulates the minimum requirements to be investigated for Scoping purposes. These minimum requirements are:

1. The purpose of the investigation;
2. A brief description of the planned development or proposed changes;
3. A brief description of the existing environment;
4. The identification of the noise sources that may affect the particular development, together with their respective estimated sound pressure levels or sound power levels (or both);
5. The identified noise sources that were not taken into account and the reasons why they were not investigated;
6. The identified noise-sensitive developments and the estimated impact on them;

7. Any assumptions made with regard to the estimated values used;
8. An explanation, either by a brief description or by reference, of the methods that were used to estimate the existing and predicted rating levels;
9. The location of the measurement or calculation points;
10. Estimation of the environmental noise impact;
11. Alternatives that were considered and the results of those that were investigated;
12. A list of all the interested or affected parties that offered any comments with respect to the environmental noise impact investigation;
13. A detailed summary of all the comments received from interested or affected parties as well as the procedures and discussions followed to deal with them;
14. Conclusions that were reached;
15. Recommendations, i.e. if there could be a significant impact, or if more information is needed, a recommendation that an ENIA be conducted.
16. If remedial measures will provide an acceptable solution which would prevent a significant impact, these remedial measures should be outlined in detail and included in the final record of decision if the approval is obtained from the relevant authority. If the remedial measures deteriorate after time and a follow-up auditing or maintenance programme (or both) is instituted, this programme should be included in the final recommendations and accepted in the record of decision if the approval is obtained from the relevant authority.

In addition, the Scoping report should contain sufficient information to allow the Environmental Assessment Practitioner (EAP) to compile the Plan of Study (PoS) for Environmental Impact Assessment (EIA), including the Noise component. In this regard the following is included to assist the EAP in the compilation of the PoS for the EIA:

- The potential impact will be evaluated (where possible) in terms of the nature (description of what causes the effect, what/who might be affected and how it/they might be affected) as well as the extent of the impact. This will be done by means of a site visit, where appropriate background ambient sound levels will be determined and the identification of potential sensitive areas.
- A statement regarding the potential significance of the identified issues based on the evaluation of the issues/impacts.
- The identification of issues to be investigated in more detail during the Environmental Impact Assessment phase,
- Details regarding the methodology followed to estimate and assess the potentially significant impacts during the EIA phase.

4 LEGAL CONTEXT, POLICIES AND GUIDELINES

4.1 THE ENVIRONMENT CONSERVATION ACT (ACT 73 OF 1989)

The Environment Conservation Act ("ECA") allows the Minister of Environmental Affairs and Tourism ("now the Ministry of Water and Environmental Affairs") to make regulations regarding noise, among other concerns. See also **section 4.1.1**.

4.1.1 Noise Control Regulations (GN R154 of 1992)

In terms of section 25 of the ECA, the national Noise Control Regulations (GN R154 in *Government Gazette* No. 13717 dated 10 January 1992) were promulgated. The NCRs were revised under Government Notice Number R. 55 of 14 January 1994 to make it obligatory for all authorities to apply the regulations.

Subsequently, in terms of Schedule 5 of the Constitution of South Africa of 1996 legislative responsibility for administering the noise control regulations was devolved to provincial and local authorities. Provincial Noise Control Regulations exists in the Free State, Gauteng and Western Cape provinces.

The National Noise Control Regulations (GN R154 1992) defines:

"**controlled area**" as:

a piece of land designated by a local authority where, in the case of--

c) industrial noise in the vicinity of an industry-

i. the reading on an integrating impulse sound level meter, taken outdoors at the end of a period of 24 hours while such meter is in operation, exceeds 61 dBA; or

ii. the calculated outdoor equivalent continuous "A"-weighted sound pressure level at a height of at least 1,2 meters, but not more than 1,4 meters, above the ground for a period of 24 hours, exceeds 61 dBA;

"**disturbing noise**" as:

noise level which exceeds the zone sound level or, if no zone sound level has been designated, a noise level which exceeds the ambient sound level at the same measuring point by 7 dBA or more.

"**zone sound level**" as:

a derived dBA value determined indirectly by means of a series of measurements, calculations or table readings and designated by a local authority for an area. This is the same as the Rating Level as defined in SANS 10103.

In addition:

In terms of Regulation 2 -

"A local authority may –

(c):" if a noise emanating from a building, premises, vehicle, recreational vehicle or street is a disturbing noise or noise nuisance, or may in the opinion of the local authority concerned be a disturbing noise or noise nuisance, instruct in writing the person causing such noise or who is responsible therefor, or the owner or occupant of such building or premises from which or from where such noise emanates or may emanate, or all such persons, to discontinue or cause to be discontinued such noise, or to take steps to lower the lever of the noise to a level conforming to the requirements of these Regulations within the period stipulated in the instruction: Provided that the provisions of this paragraph shall not apply in respect of a disturbing noise or noise nuisance caused by rail vehicles or aircraft which are not used as recreational vehicles;

(d): before changes are made to existing facilities or existing uses of land or buildings, or before new buildings are erected, in writing require that noise impact assessments or tests are conducted to the satisfaction of that local authority by the owner, developer, tenant or occupant of the facilities, land or buildings or that, for the purposes of regulation 3(b) or (c), reports or certificates in relation to the noise impact to the satisfaction of that local authority are submitted by the owner, developer, tenant or occupant to the local authority on written demand";

In terms of Regulation 4 of the Noise Control Regulations:

"No person shall make, produce or cause a disturbing noise, or allow it to be made, produced or caused by any person, machine, device or apparatus or any combination thereof".

Clause 7.(1) however exempts noise of the following activities, namely -

"The provisions of these regulations shall not apply, if -

(a) the emission of sound is for the purposes of warning people of a dangerous situation;

(b) the emission of sound takes place during an emergency."

4.2 NOISE STANDARDS

There are a few South African scientific standards (SABS) relevant to noise from mines, industry and roads. They are:

- SANS 10103:2008. 'The measurement and rating of environmental noise with respect to annoyance and to speech communication'.
- SANS 10210:2004. 'Calculating and predicting road traffic noise'.

- SANS 10328:2008. 'Methods for environmental noise impact assessments'.
- SANS 10357:2004. 'The calculation of sound propagation by the Concave method'.
- SANS 10181:2003. 'The Measurement of Noise Emitted by Road Vehicles when Stationary'.
- SANS 10205:2003. 'The Measurement of Noise Emitted by Motor Vehicles in Motion'.

The relevant standards use the equivalent continuous rating level as a basis for determining what is acceptable. The levels may take single event noise into account, but single event noise by itself does not determine whether noise levels are acceptable for land use purposes. With regards to SANS 10103:2008, the recommendations are likely to inform decisions by authorities, but non-compliance with the standard will not necessarily render an activity unlawful *per se.*

4.3 INTERNATIONAL GUIDELINES

While a number of international guidelines and standards exist, those selected below are used by numerous countries for environmental noise management.

4.3.1 Guidelines for Community Noise (WHO, 1999)

The World Health Organization's (WHO) document on the *Guidelines for Community Noise* is the outcome of the WHO- expert task force meeting held in London, United Kingdom, in April 1999. It is based on the document entitled "Community Noise" that was prepared for the World Health Organization and published in 1995 by the Stockholm University and Karolinska Institute.

The scope of WHO's effort to derive guidelines for community noise is to consolidate actual scientific knowledge on the health impacts of community noise and to provide guidance to environmental health authorities and professionals trying to protect people from the harmful effects of noise in non-industrial environments.

Guidance on the health effects of noise exposure of the population has already been given in an early publication of the series of Environmental Health Criteria. The health risk to humans from exposure to environmental noise was evaluated and guidelines values derived. The issue of noise control and health protection was briefly addressed.

The document uses the L_{Aeq} and $L_{A,max}$ noise descriptors to define noise levels. It should be noted that a follow-up document focusing on Night-time Noise Guidelines for Europe (WHO, 2009).

4.3.2 Night Noise Guidelines for Europe (WHO, 2009)

Refining previous Community Noise Guidelines issued in 1999, and incorporating more recent research, the World Health Organization has released a comprehensive report on the health effects of night time noise, along with new (non-mandatory) guidelines for use in Europe. Rather than a maximum of 30 dB inside at night (which equals 45-50 dB max outside), the WHO now recommends a maximum year-round outside night-time noise average of 40 db to avoid sleep disturbance and its related health effects.

While recommending the use of the average level, the report notes that some instantaneous effects occur in relation to specific maximum noise levels, but that the health effects of these "cannot be easily established."

4.3.3 Equator Principles

The **Equator Principles** (EPs) are a voluntary set of standards for determining, assessing and managing social and environmental risk in project financing. Equator Principles Financial Institutions (EPFIs) commit to not providing loans to projects where the borrower will not or is unable to comply with their respective social and environmental policies and procedures that implement the EPs.

The Equator Principles were developed by private sector banks and were launched in June 2003. Revision III of the EPs has been in place since June 2013. The banks chose to model the Equator Principles on the environmental standards of the World Bank and the social policies of the International Finance Corporation (IFC). Eighty-three financial institutions (2016) have adopted the Equator Principles, which have become the de facto standard for banks and investors on how to assess major development projects around the world. These standards are currently incorporated in the social policies of the IFC.

4.3.4 IFC: General EHS Guidelines – Environmental Noise Management

These guidelines are applicable to noise created beyond the property boundaries of a development that conforms to the Equator Principles. The environmental standards of the World Bank have been integrated into the social policies of the IFC since April 2007 as the International Finance Corporation Environmental, Health and Safety (EHS) Guidelines.

It states that noise prevention and mitigation measures should be applied where predicted or measured noise impacts from project facilities/operations exceed the applicable noise level guideline at the most sensitive point of reception. The preferred method for controlling noise from stationary sources is to implement noise control measures at source. It goes as far as to proposed methods for the prevention and control of noise emissions.

It sets noise level guidelines (see **Table 4-1**) as well as highlighting the certain monitoring requirements pre- and post-development. It adds another criterion in that the existing background ambient noise level should not rise by more than 3 dBA. This criterion will effectively sterilize large areas of any development. It is therefore the considered opinion that this criterion was introduced to address cases where the existing ambient noise level is already at, or in excess of the recommended limits.

Table 4-1: IFC Table .7.1-Noise Level Guidelines

Receptor type	One hour L_{Aeq} (dBA)	
	Daytime 07:00 - 22:00	Night-time 22:00 – 07:00
Residential; institutional; educational	55	45
Industrial; commercial	70	70

The document uses the $L_{Aeq,1\ hr}$ noise descriptors to define noise levels. It does not determine the detection period, but refers to the IEC standards, which requires the fast detector setting on the Sound Level Meter during measurements for Europe.

4.3.5 European Parliament Directive 200/14/EC

Directive 2000/14/EC relating to the noise emission in the environment by equipment for use outdoors was adopted by the European Parliament and the Council and first published in May 2000. The Directive was applied from January 3rd, 2002. The directive placed sound power limits on equipment to be used outdoors in a suburban or urban setting. Failure to comply with these regulations may result in products being prohibited from being placed on the EU market. Equipment list is vast and includes machinery such as compaction machineries, dozers, dumpers excavators etc. Manufacturers as a result started to consider noise emission levels from their products to ensure that their equipment will continue to have a market in most countries.

5 POTENTIAL NOISE SOURCES

5.1 EXISTING NOISE LEVELS

The proposed project is the extension of the existing Kangala operation. This includes:

- Surface preparation activities in front of the opencast pit(s) (vegetation stripping and topsoil removal);
- Opencast activities;
    - Excavation of soft overburden,
    - Drilling and blasting of hard overburden,
    - Coal ore excavation and loading,
    - Hauling of overburden and ROM.
- Rehabilitation activities in old disturbed areas. It should be noted that rehabilitation activities generally are not a constant activity and seldom takes place at night.
- Plant activities (crushing, screening, stockpiling and material movement);
- Hauling of product to markets.

Noise level contours will be developed during the ENIA phase.

5.2 POTENTIAL NOISE SOURCES: CONSTRUCTION PHASE

Being an operational colliery, there will be no clearly definable construction phase. The Construction Phase previously commenced with the establishment of access and haul roads, surface infrastructure and the construction of the initial box-cut of the Kangala Colliery. It effectively ended when the first load of coal was removed from the opencast pit. In terms of the project at hand, the Construction Phase will apply to the construction of new infrastructure (the overburden stockpiles) and associated water management infrastructure).

This phase will not be investigated as there is no specific construction phase as this is an existing colliery changing the location of existing operational activities.

5.3 POTENTIAL NOISE SOURCES: OPERATIONAL PHASE

The Operational Phase commenced when the first load of coal was removed from the opencast pit and will end when the last load of coal is removed from the opencast pit. The following mining and related activities (actions and processes) are expected to occur during the remainder of the Operational Phase:

- *Mining activities*: Progressive development of opencast voids which amongst other includes the clearing of land, removal-, stockpiling and placement of topsoil,

removal and construction of temporary overburden stockpiles as mining progresses (this may include the drilling and blasting of hard overburden to expose the coal), the extraction and removal of coal, the progressive use of overburden as backfill once coal was extracted as part of rehabilitation of opencast voids (including sequential backfilling and levelling as well as distribution and shaping of soils and landscaping of backfilled areas), maintenance of in-pit roads etc.

- *Mining related activities*: Utilisation and management of existing surface infrastructure.

The level and character of the noise during this phase will be highly variable as different activities with different equipment take place at different times, for different periods of time (operating cycles), in different combinations, in different sequences and on different parts of the site.

There are a number of factors that determine the audibility as well as the potential of a noise impact on receptors. Maximum noises generated can be audible over a large distance, however, are generally of very short duration. If maximum noise levels however frequently exceed 65 dBA at a receptor, or if it is clearly audible with a significant number of instances where the noise level exceeds the prevailing ambient sound level with more than 15 dB, the noise can increase annoyance levels and may ultimately result in noise complaints. **Table 5-1** gives an indication of the maximum noise levels potentially generated by a variety of equipment. These are generally an indication of maximum noises, and, though while these transient sounds may be brief, it can be highly intrusive especially at night. Maximum noise levels may impact on sleeping patterns if surrounding receptors are exposed to levels exceeding 45 dBA.

Average or equivalent sound levels are another factor that impacts on the ambient sound levels and is the constant noise level that the receptor can experience. Typical sound power levels (and the potential extent) associated with various activities that may be found at an operational colliery are presented in **Table 5-2**.

5.3.1 Traffic

A source of noise during the operational phase will be traffic to and from the opencast and product transport. Traffic will not be considered in the scoping phase and only in the EIA phase once more details are available.

Table 5-1: Potential maximum noise levels generated by construction equipment

Equipment Description[3]	Impact Device?	Maximum Sound Power Levels (dBA)	Potential Maximum Noise Level at given distance considering potential maximum noise levels (dBA)											
			5 m	10 m	20 m	50 m	100 m	150 m	200 m	300 m	500 m	750 m	1000 m	2000 m
Auger Drill Rig	No	119.7	94.7	88.7	82.6	74.7	68.7	65.1	62.6	59.1	54.7	51.2	48.7	42.6
Backhoe	No	114.7	89.7	83.7	77.6	69.7	63.7	60.1	57.6	54.1	49.7	46.2	43.7	37.6
Compactor (ground)	No	114.7	89.7	83.7	77.6	69.7	63.7	60.1	57.6	54.1	49.7	46.2	43.7	37.6
Compressor (air)	No	114.7	89.7	83.7	77.6	69.7	63.7	60.1	57.6	54.1	49.7	46.2	43.7	37.6
Concrete Mixer Truck	No	119.7	94.7	88.7	82.6	74.7	68.7	65.1	62.6	59.1	54.7	51.2	48.7	42.6
Concrete Saw	No	124.7	99.7	93.7	87.6	79.7	73.7	70.1	67.6	64.1	59.7	56.2	53.7	47.6
Crane	No	119.7	94.7	88.7	82.6	74.7	68.7	65.1	62.6	59.1	54.7	51.2	48.7	42.6
Drill Rig Truck	No	118.7	93.7	87.7	81.6	73.7	67.7	64.1	61.6	58.1	53.7	50.2	47.7	41.6
Dump Truck	No	118.7	93.7	87.7	81.6	73.7	67.7	64.1	61.6	58.1	53.7	50.2	47.7	41.6
Excavator	No	119.7	94.7	88.7	82.6	74.7	68.7	65.1	62.6	59.1	54.7	51.2	48.7	42.6
Flat Bed Truck	No	118.7	93.7	87.7	81.6	73.7	67.7	64.1	61.6	58.1	53.7	50.2	47.7	41.6
Front End Loader	No	114.7	89.7	83.7	77.6	69.7	63.7	60.1	57.6	54.1	49.7	46.2	43.7	37.6
Generator	No	116.7	91.7	85.7	79.6	71.7	65.7	62.1	59.6	56.1	51.7	48.2	45.7	39.6
Grader	No	119.7	94.7	88.7	82.6	74.7	68.7	65.1	62.6	59.1	54.7	51.2	48.7	42.6
Impact Pile Driver	Yes	129.7	104.7	98.7	92.6	84.7	78.7	75.1	72.6	69.1	64.7	61.2	58.7	52.6
Mounted Impact Hammer	Yes	124.7	99.7	93.7	87.6	79.7	73.7	70.1	67.6	64.1	59.7	56.2	53.7	47.6
Rock Drill	No	119.7	94.7	88.7	82.6	74.7	68.7	65.1	62.6	59.1	54.7	51.2	48.7	42.6
Roller	No	119.7	94.7	88.7	82.6	74.7	68.7	65.1	62.6	59.1	54.7	51.2	48.7	42.6
Sand Blasting (single nozzle)	No	119.7	94.7	88.7	82.6	74.7	68.7	65.1	62.6	59.1	54.7	51.2	48.7	42.6
Slurry Trenching Machine	No	116.7	91.7	85.7	79.6	71.7	65.7	62.1	59.6	56.1	51.7	48.2	45.7	39.6
Soil Mix Drill Rig	No	114.7	89.7	83.7	77.6	69.7	63.7	60.1	57.6	54.1	49.7	46.2	43.7	37.6
Vibrating Hopper	No	119.7	94.7	88.7	82.6	74.7	68.7	65.1	62.6	59.1	54.7	51.2	48.7	42.6
Vibratory Pile Driver	No	129.7	104.7	98.7	92.6	84.7	78.7	75.1	72.6	69.1	64.7	61.2	58.7	52.6
Warning Horn	No	119.7	94.7	88.7	82.6	74.7	68.7	65.1	62.6	59.1	54.7	51.2	48.7	42.6

[3] Equipment list and Sound Power Level source: http://www.fhwa.dot.gov/environment/noise/construction_noise/handbook/handbook09.cfm

Table 5-2: Potential equivalent noise levels generated by various equipment

Equipment Description	Equivalent (average) Sound Levels (dBA)	Operational Noise Level at given distance considering equivalent (average) sound power emission levels (Cumulative as well as the mitigatory effect of potential barriers or other mitigation not included – simple noise propagation modelling only considering distance) (dBA)											
		5 m	10 m	20 m	50 m	100 m	150 m	200 m	300 m	500 m	750 m	1000 m	2000 m
Bulldozer CAT D11	113.3	88.4	82.3	76.3	68.4	62.3	58.8	56.3	52.8	48.4	44.8	42.3	36.3
Bulldozer CAT D5	107.4	82.4	76.4	70.4	62.4	56.4	52.9	50.4	46.9	42.4	38.9	36.4	30.4
Bulldozer Komatsu 375	114.0	89.0	83.0	77.0	69.0	63.0	59.5	57.0	53.4	49.0	45.5	43.0	37.0
Coal crushing plant (50 k tons)	114.5	89.5	83.5	77.5	69.5	63.5	60.0	57.5	54.0	49.5	46.0	43.5	37.5
Coal beneficiation plant	107.5	82.5	76.5	70.5	62.5	56.5	53.0	50.5	46.9	42.5	39.0	36.5	30.5
Coal silo (Material Transfer)	103.2	78.3	72.2	66.2	58.3	52.2	48.7	46.2	42.7	38.3	34.7	32.2	26.2
Coal Yard Equipment	106.8	81.8	75.8	69.8	61.8	55.8	52.3	49.8	46.3	41.8	38.3	35.8	29.8
Coal Screen	105.1	80.1	74.1	68.1	60.1	54.1	50.6	48.1	44.6	40.1	36.6	34.1	28.1
Diesel Generator (Large - mobile)	106.1	81.2	75.1	69.1	61.2	55.1	51.6	49.1	45.6	41.2	37.6	35.1	29.1
Drilling Machine	109.6	84.6	78.6	72.6	64.6	58.6	55.1	52.6	49.1	44.6	41.1	38.6	32.6
Dumper/Haul truck - CAT 700	115.9	91.0	85.0	78.9	71.0	65.0	61.4	58.9	55.4	51.0	47.5	45.0	38.9
Dumper/Haul truck - Bell 25 ton (B25D)	108.4	83.5	77.5	71.4	63.5	57.5	53.9	51.4	47.9	43.5	40.0	37.5	31.4
Excavator - Hitachi EX1200	113.1	88.1	82.1	76.1	68.1	62.1	58.6	56.1	52.6	48.1	44.6	42.1	36.1
Excavator - Hitachi 270 (30 t)	104.5	79.6	73.5	67.5	59.6	53.5	50.0	47.5	44.0	39.6	36.0	33.5	27.5
FEL - Bell L1806C	102.7	77.7	71.7	65.7	57.7	51.7	48.2	45.7	42.1	37.7	34.2	31.7	25.7
FEL - CAT 950G	102.1	77.2	71.2	65.1	57.2	51.2	47.6	45.1	41.6	37.2	33.7	31.2	25.1
FEL - Komatsu WA380	100.7	75.7	69.7	63.7	55.7	49.7	46.2	43.7	40.1	35.7	32.2	29.7	23.7
General noise	108.8	83.8	77.8	71.8	63.8	57.8	54.2	51.8	48.2	43.8	40.3	37.8	31.8
General Noise - Construction (commercial)	96.5	71.6	65.6	59.5	51.6	45.6	42.0	39.5	36.0	31.6	28.1	25.6	19.5
Grader	110.9	85.9	79.9	73.9	65.9	59.9	56.4	53.9	50.3	45.9	42.4	39.9	33.9
Road Transport Reversing/Idling	108.2	83.3	77.2	71.2	63.3	57.2	53.7	51.2	47.7	43.3	39.7	37.2	31.2
Road Truck average	109.6	84.7	78.7	72.6	64.7	58.7	55.1	52.6	49.1	44.7	41.1	38.7	32.6
Screening plant (approx 50k tons)	105.5	80.6	74.6	68.5	60.6	54.6	51.0	48.5	45.0	40.6	37.0	34.6	28.5
Vibrating roller	106.3	81.3	75.3	69.3	61.3	55.3	51.8	49.3	45.8	41.3	37.8	35.3	29.3
Water Dozer, CAT	113.8	88.8	82.8	76.8	68.8	62.8	59.3	56.8	53.3	48.8	45.3	42.8	36.8

5.4 POTENTIAL NOISE SOURCES: DECOMMISSIONING AND CLOSURE PHASE

The decommissioning of the facility would take place in some undetermined time in the future and could include:

- Demolishing and removal of infrastructure;
- Loading, hauling, placing, filling and shaping of previously disturbed areas;
- Loading, hauling, placing and shaping of topsoil (all disturbed areas);
- Seeding of topsoil;
- Ripping and seeding of unnecessary roads; and
- Continued maintenance activities.

Decommissioning will however not be considered during the Scoping phase, and only discussed in general during the EIA phase. This is because the noise impacts associated with the decommissioning phase is normally significantly less than both the construction and operational phases.

5.5 POTENTIAL NOISE SOURCES: CLOSURE PHASE

Closure relate to maintenance and care activities after the completion of decommissioning phase. Typical closure activities include:

- Continued monitoring (surface and groundwater);
- Maintenance and care of rehabilitated areas;
- Potential rehabilitation with ground subsidence.

As with the Decommissioning Phase, Closure noises will not be considered during the Scoping phase and only discussed in general during the ENIA phase. This is because the noise impacts associated with the closure phase is very low.

6 METHODS: NOISE IMPACT ASSESSMENT AND SIGNIFICANCE

6.1 NOISE IMPACT ON ANIMALS[4]

A great deal of research was conducted in the 1960's and 1970's on the effects of aircraft noise on animals. While aircraft noise have a specific characteristic that might not be comparable with industrial noise, the findings should be relevant to most noise sources.

Overall, the research suggests that species differ in their response to:

- Various types of noise
- Durations of noise
- Sources of noise

A general animal behavioural reaction to aircraft noise is the startle response. However, the strength and length of the startle response appears to be dependent on:

- which species is exposed
- whether there is one animal or a group
- whether there have been some previous exposures

Unfortunately, there are numerous other factors in the environment of animals that also influence the effects of noise. These include predators, weather, changing prey/food base and ground-based disturbance, especially anthropogenic. This hinders the ability to define the real impact of noise on animals.

From these and other studies the following can be concluded:

- Animals respond to impulsive (sudden) noises (higher than 90 dBA) by running away. If the noises continue, animals would try to relocate.
- Animals of most species exhibit adaptation with noise, including aircraft noise and sonic booms.
- More sensitive species would relocate to a more quiet area, especially species that depend on hearing to hunt or evade prey, or species that makes use of sound/hearing to locate a suitable mate.
- Noises associated with helicopters, motor- and quad bikes significantly impact on animals.

6.1.1 Domestic Animals

It has been observed that most domestic animals are generally not bothered by noise, excluding most impulsive noises.

[4]Report to Congressional Requesters, 2005; USEPA, 1971; Autumn, 2007; Noise quest, 2010

6.1.2 Wildlife

Studies showed that most animals adapt to noises, and would even return to a site after an initial disturbance, even if the noise is continuous. The more sensitive animals that might be impacted by noise would most likely relocate to a quieter area. Noise impacts are therefore very highly species dependent.

6.2 WHY NOISE CONCERNS COMMUNITIES[5]

Noise can be defined as "unwanted sound", and an audible acoustic energy that adversely affects the physiological and/or psychological well-being of people, or which disturbs or impairs the convenience or peace of any person. One can generalise by saying that sound becomes unwanted when it:

- Hinders speech communication;
- Impedes the thinking process;
- Interferes with concentration;
- Obstructs activities (work, leisure and sleeping); and
- Presents a health risk due to hearing damage.

However, it is important to remember that whether a given sound is "noise" depends on the listener or hearer. The driver playing loud rock music on their car radio hears only music, but the person in the traffic behind them hears nothing but noise.

Response to noise is unfortunately not an empirical absolute, as it is seen as a multi-faceted psychological concept, including behavioural and evaluative aspects. For instance, in some cases, annoyance is seen as an outcome of disturbances, in other cases it is seen as an indication of the degree of helplessness with respect to the noise source.

Noise does not need to be loud to be considered "disturbing". One can refer to a dripping tap in the quiet of the night, or the irritating "thump-thump" of the music from a neighbouring house at night when one would like to sleep.

Severity of the annoyance depends on factors such as:

- Background sound levels, and the background sound levels the receptor is used to;
- The manner in which the receptor can control the noise (helplessness);

[5]World Health Organization, 1999; Noise quest, 2010; Journal of Acoustical Society of America, 2009

- The time, unpredictability, frequency distribution, duration, and intensity of the noise;
- The physiological state of the receptor; and
- The attitude of the receptor about the emitter (noise source).

6.3 IMPACT ASSESSMENT CRITERIA

6.3.1 Overview: The common characteristics

The word "noise" is generally used to convey a negative response or attitude to the sound received by a listener. There are four common characteristics of sound, any or all of which determine listener response and the subsequent definition of the sound as "noise". These characteristics are:

- Intensity;
- Loudness;
- Annoyance; and
- Offensiveness.

Of the four common characteristics of sound, intensity is the only one which is not subjective and can be quantified. Loudness is a subjective measure of the effect sound has on the human ear. As a quantity it is therefore complicated, but has been defined by experimentation on subjects known to have normal hearing.

The annoyance and offensive characteristics of noise are also subjective. Whether or not a noise causes annoyance mostly depends upon its reception by an individual, the environment in which it is heard, the type of activity and mood of the person and how acclimatised or familiar that person is to the sound.

6.3.2 Noise criteria of concern

The criteria used in this report were drawn from the criteria for the description and assessment of environmental impacts from the EIA Regulations, published by the Department of Environmental Affairs (June 2006) in terms of the NEMA, SANS 10103:2008 as well as guidelines from the World Health Organization.

There are a number of criteria that are of concern for the assessment of noise impacts. These can be summarised in the following manner:

- *Increase in noise levels:* People or communities often react to an increase in the ambient noise level they are used to, which is caused by a new source of noise. With

regards to the Noise Control Regulations (promulgated in terms of the ECA), an increase of more than 7 dBA is considered a disturbing noise. See also **Figure 6-1**.

- *Zone Sound Levels:* Previously referred to as the acceptable rating levels, it sets acceptable noise levels for various areas. See also **Table 6-1**.
- *Absolute or total noise levels:* Depending on their activities, people generally are tolerant to noise up to a certain absolute level, e.g. 65 dBA. Anything above this level will be considered unacceptable.

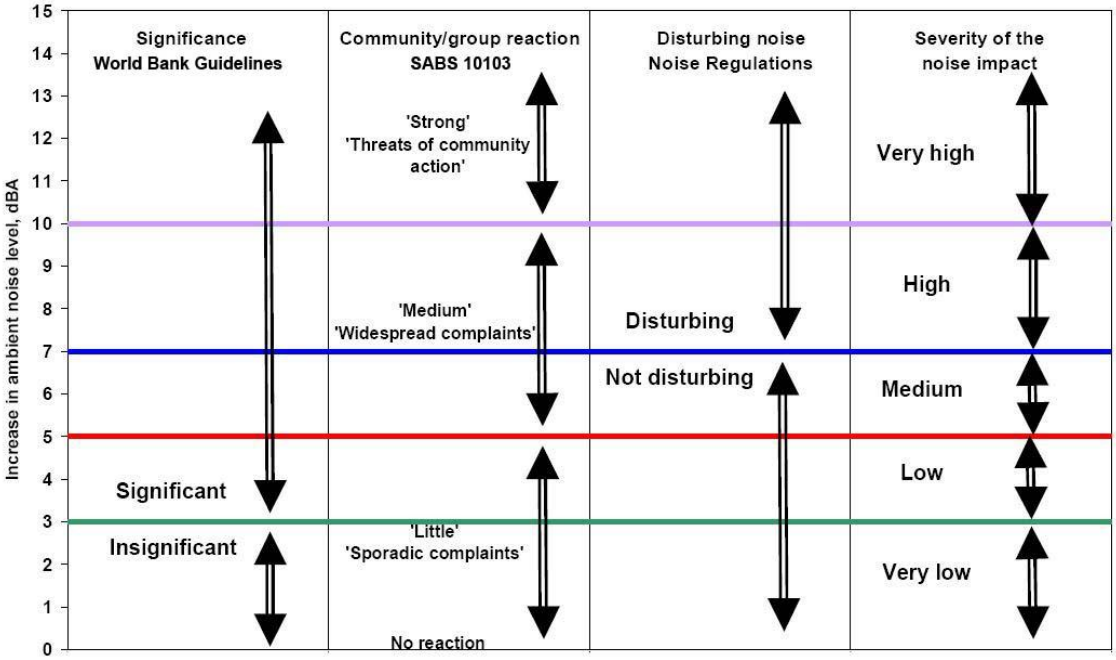

Figure 6-1: Criteria to assess the significance of impacts stemming from noise

In South Africa, the document that addresses the issues concerning environmental noise is SANS 10103:2008 (See also **Table 6-1**). It provides the equivalent ambient noise levels (referred to as Rating Levels), $L_{Req,d}$ and $L_{Req,n}$, during the day and night respectively to which different types of developments may be exposed. As the site was not yet visited, it was selected to use the rural noise district rating for this Scoping Level assessment, not considering the potential impact from mining, industry and agricultural activities.

SANS 10103:2008 also provides a guideline for estimating community response to an increase in the general ambient noise level caused by an intruding noise. If Δ is the increase in sound level, the following criteria are of relevance:

- **Δ ≤ 3 dBA:** An increase of 3 dBA or less will not cause any response from a community. It should be noted that for a person with average hearing acuity an

increase of less than 3 dBA in the general ambient noise level would not be noticeable.

- **3 < Δ ≤ 5 dBA:** An increase of between 3 dBA and 5 dBA will elicit 'little' community response with 'sporadic complaints'. People will just be able to notice a change in the sound character in the area.
- **5 < Δ ≤ 15 dBA:** An increase of between 5 dBA and 15 dBA will elicit a 'medium' community response with 'widespread complaints'. In addition, an increase of 10 dBA is subjectively perceived as a doubling in the loudness of a noise. For an increase of more than 15 dBA the community reaction will be 'strong' with 'threats of community action'.

Note that an increase of more than 7 dBA is defined as a disturbing noise and prohibited (National and Provincial Noise Control Regulations).

Table 6-1: Acceptable Zone Sound Levels for noise in districts (SANS 10103:2008)

1	2	3	4	5	6	7
Type of district	**Equivalent continuous rating level ($L_{Req.T}$) for noise** dBA					
	Outdoors			**Indoors, with open windows**		
	Day/night $L_{R,dn}$ [a]	**Daytime $L_{Req,d}$** [b]	**Night-time $L_{Req,n}$** [b]	**Day/night $L_{R,dn}$** [a]	**Daytime $L_{Req,d}$** [b]	**Night-time $L_{Req,n}$** [b]
a) Rural districts	45	45	35	35	35	25
b) Suburban districts with little road traffic	50	50	40	40	40	30
c) Urban districts	55	55	45	45	45	35
d) Urban districts with one or more of the following: workshops; business premises; and main roads	60	60	50	50	50	40
e) Central business districts	65	65	55	55	55	45
f) Industrial districts	70	70	60	60	60	50

6.3.3 Other noise sources of significance

In addition, other noise sources that may be present should also be considered. During the day, people are generally bombarded with the sounds from numerous sources considered "normal", such as animal sounds, conversation, amenities and appliances (TV/Radio/CD playing in background, computer(s), freezers/fridges, etc.). This excludes activities that may generate additional noise associated with normal work.

At night, sounds that are present are natural sounds from animals, wind as well as other sounds we consider "normal", such as the hum from a variety of appliances (magnetostriction) drawing standby power, freezers and fridges.

Figure 6-2 illustrates the sound levels associated with some equipment or in certain rooms. This is however more for illustrative purposes, as there are many manufacturers with different equipment, each with a different noise emission character.

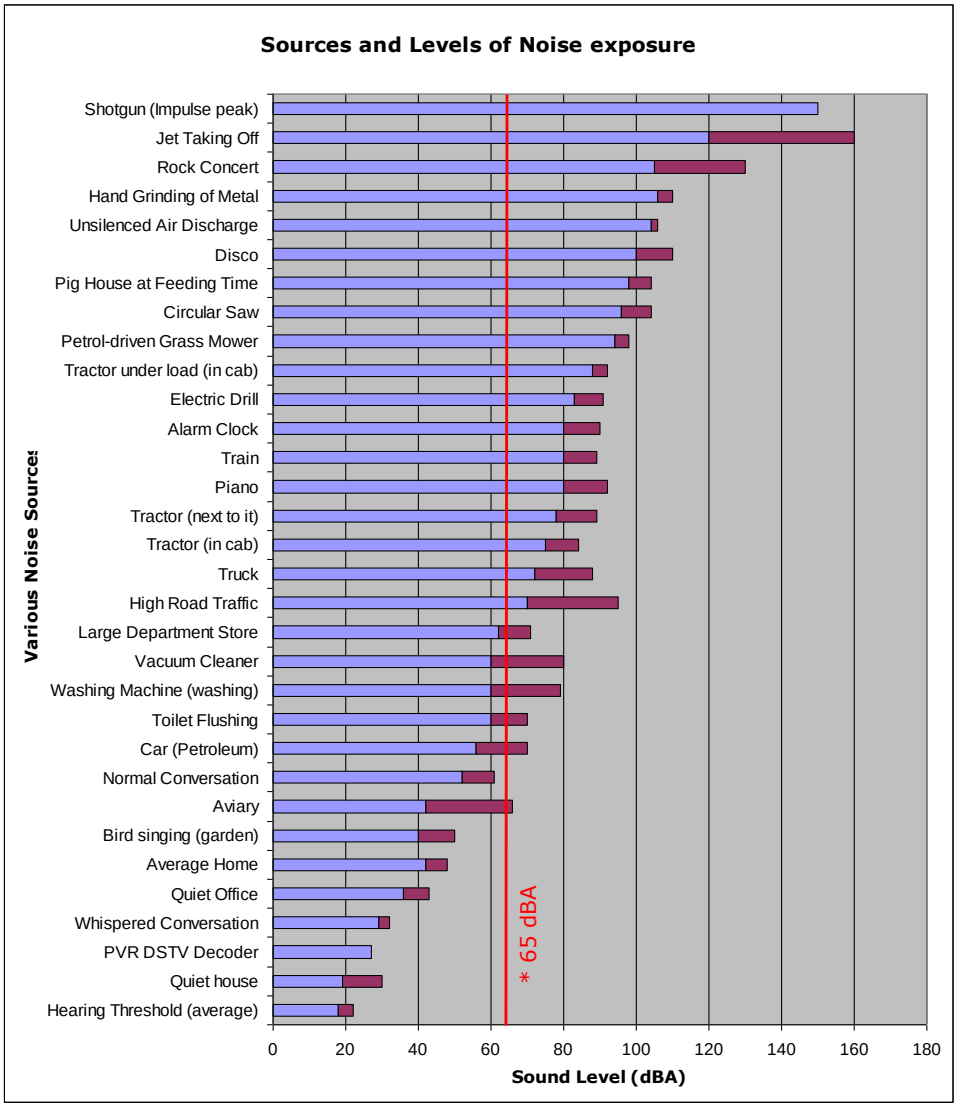

Figure 6-2: Typical Noise Sources and associated Sound Pressure Level

6.3.4 Determining the Significance of the Noise Impact

The impact assessment methodology is guided by the requirements of the NEMA EIA Regulations (2010). The broad approach to the significance rating methodology is to determine the environmental risk (ER) by considering the consequence (C) of each impact (comprising Nature, Extent, Duration, Magnitude, and Reversibility) and relate

this to the probability/likelihood (P) of the impact occurring. This determines the environmental risk. In addition other factors, including cumulative impacts, public concern, and potential for irreplaceable loss of resources, are used to determine a prioritisation factor (PF) which is applied to the ER to determine the overall significance (S). Please note that the impact assessment must apply to the identified Sub Station alternatives as well as the identified Transmission line routes.

Determination of Environmental Risk:

The significance (S) of an impact is determined by applying a prioritisation factor (PF) to the environmental risk (ER). The environmental risk is dependent on the consequence (C) of the particular impact and the probability (P) of the impact occurring. Consequence is determined through the consideration of the Nature (N), Extent (E), Duration (D), Magnitude (M), and reversibility (R) applicable to the specific impact. For the purpose of this methodology the consequence of the impact is represented by:

$$C = \frac{(E+D+M+R)}{4} \times N$$

Each individual aspect in the determination of the consequence is represented by a rating scale as defined in **Table 6-2**.

Table 6-2: Criteria for Determining Impact Consequence

Aspect	Score	Definition
Nature	- 1	Likely to result in a negative/ detrimental impact
	+1	Likely to result in a positive/ beneficial impact
Extent	1	Activity (i.e. limited to the area applicable to the specific activity)
	2	Site (i.e. within the development property boundary),
	3	Local (i.e. the area within 5 km of the site),
	4	Regional (i.e. extends between 5 and 50 km from the site
	5	Provincial / National (i.e. extends beyond 50 km from the site)
Duration	1	Immediate (<1 year)
	2	Short term (1-5 years),
	3	Medium term (6-15 years),
	4	Long term (the impact will cease after the operational life span of the project),
	5	Permanent (no mitigation measure of natural process will reduce the impact after construction).
Magnitude/ Intensity	1	Minor (where the impact affects the environment in such a way that natural, cultural and social functions and processes are not affected),

Aspect	Score	Definition
	2	Low (where the impact affects the environment in such a way that natural, cultural and social functions and processes are slightly affected),
	3	Moderate (where the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way),
	4	High (where natural, cultural or social functions or processes are altered to the extent that it will temporarily cease), or
	5	Very high / don't know (where natural, cultural or social functions or processes are altered to the extent that it will permanently cease).
Reversibility	1	Impact is reversible without any time and cost.
	2	Impact is reversible without incurring significant time and cost.
	3	Impact is reversible only by incurring significant time and cost.
	4	Impact is reversible only by incurring prohibitively high time and cost.
	5	Irreversible Impact

Once the C has been determined the ER is determined in accordance with the standard risk assessment relationship by multiplying the C and the P (refer to following table). Probability is rated/scored as per **Table 6-3**.

Table 6-3: Probability Scoring

Probability	1	Improbable (the possibility of the impact materialising is very low as a result of design, historic experience, or implementation of adequate corrective actions; <25%),
	2	Low probability (there is a possibility that the impact will occur; >25% and <50%),
	3	Medium probability (the impact may occur; >50% and <75%),
	4	High probability (it is most likely that the impact will occur- > 75% probability), or
	5	Definite (the impact will occur),

The result is a qualitative representation of relative ER associated with the impact. ER is therefore calculated as follows:

ER= C x P

Table 6-4: Determination of Environmental Risk

Consequence	5	5	10	15	20	25
	4	4	8	12	16	20
	3	3	6	9	12	15

	2	2	4	6	8	10
	1	1	2	3	4	5
		1	2	3	4	5
	Probability					

The outcome of the environmental risk assessment will result in a range of scores, ranging from 1 through to 25. These ER scores are then grouped into respective classes as described in **Table 6-5**.

Table 6-5: Significance Classes

Environmental Risk Score	
Value	**Description**
< 9	Low (i.e. where this impact is unlikely to be a significant environmental risk),
≥9; <17	Medium (i.e. where the impact could have a significant environmental risk),
≥ 17	High (i.e. where the impact will have a significant environmental risk).

The impact ER will be determined for each impact without relevant management and mitigation measures (pre-mitigation), as well as post implementation of relevant management and mitigation measures (post-mitigation). This allows for a prediction in the degree to which the impact can be managed/mitigated.

Impact Prioritisation:

In accordance with the requirements of Regulation 31 (2)(l) of the EIA Regulations (GNR 543), and further to the assessment criteria presented in the Section above it is necessary to assess each potentially significant impact in terms of:

- Cumulative impacts; and
- The degree to which the impact may cause irreplaceable loss of resources.

In addition it is important that the public opinion and sentiment regarding a prospective development and consequent potential impacts is considered in the decision making process.

In an effort to ensure that these factors are considered, an impact prioritisation factor (PF) will be applied to each impact ER (post-mitigation). This prioritisation factor does not aim to detract from the risk ratings but rather to focus the attention of the decision-making authority on the higher priority/significance issues and impacts. The PF will be applied to the ER score based on the assumption that relevant suggested management/mitigation impacts are implemented.

Table 6-6: Criteria for Determining Prioritisation

Public response (PR)	Low (1)	Issue not raised in public response.
	Medium (2)	Issue has received a meaningful and justifiable public response.
	High (3)	Issue has received an intense meaningful and justifiable public response.
Cumulative Impact (CI)	Low (1)	Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is unlikely that the impact will result in spatial and temporal cumulative change.
	Medium (2)	Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is probable that the impact will result in spatial and temporal cumulative change.
	High (3)	Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is highly probable/definite that the impact will result in spatial and temporal cumulative change.
Irreplaceable loss of resources (LR)	Low (1)	Where the impact is unlikely to result in irreplaceable loss of resources.
	Medium (2)	Where the impact may result in the irreplaceable loss (cannot be replaced or substituted) of resources but the value (services and/or functions) of these resources is limited.
	High (3)	Where the impact may result in the irreplaceable loss of resources of high value (services and/or functions).

The value for the final impact priority is represented as a single consolidated priority, determined as the sum of each individual criteria represented in **Table 6-6**. The impact priority is therefore determined as follows:

Priority = PR + CI + LR

The result is a priority score which ranges from 3 to 9 and a consequent PF ranging from 1 to 2 (Refer to **Table 6-6** and **Table 6-7**).

Table 6-7: Determination of Prioritisation Factor

Priority	Ranking	Prioritisation Factor
3	Low	1
4	Medium	1.17
5	Medium	1.33

6	Medium	1.5
7	Medium	1.67
8	Medium	1.83
9	High	2

In order to determine the final impact significance the PF is multiplied by the ER of the post mitigation scoring. The ultimate aim of the PF is to be able to increase the post mitigation environmental risk rating by a full ranking class, if all the priority attributes are high (i.e. if an impact comes out with a medium environmental risk after the conventional impact rating, but there is significant cumulative impact potential, significant public response, and significant potential for irreplaceable loss of resources, then the net result would be to upscale the impact to a high significance).

Table 6-8: Final Environmental Significance Rating

Environmental Significance Rating	
Value	**Description**
< 10	Low (i.e. where this impact would not have a direct influence on the decision to develop in the area),
≥10 <20	Medium (i.e. where the impact could influence the decision to develop in the area),
≥ 20	High (i.e. where the impact must have an influence on the decision process to develop in the area).

7 PRELIMINARY IMPACT ASSESSMENT

7.1 ALTERNATIVE 1 – NO-GO OPTION

The ambient sound levels will remain as is. The impact will not change.

7.2 ALTERNATIVE 2 – MAXIMUM PRODUCTION

In this alternative, the mining operations will extend to the new section. This alternative will impact on NSD03, and potentially on the other receptors in the area.

7.2.1 Operational phase

The noise impact significance during the operational phase of the project is presented in **Table 7-1** and **Table 7-2** focusing on the most significant noise generating activities.

Table 7-1: Noise impact significance – Mining operation during the day

Impact Name	**Increase in noise levels at surrounding receptors due to operational mining activities in the day**				
Alternative	**Alternative 2**				
Phase	**Operation**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature of Impact	-1	-1	Magnitude of Impact	5	2
Extent of Impact	3	3	Reversibility of Impact	5	2
Duration of Impact	4	4	Probability	5	1
Environmental Risk (Pre-mitigation)					-21.25
Mitigation Measures					
• Relocation of NSD03 • Environmental awareness training for employees/drivers • Use of topsoil and overburden dumps as noise management berms (between proposed activities and NSD)					
Environmental Risk (Post-mitigation)					-2.75
Degree of confidence in impact prediction:					Medium
Impact Prioritisation					
Public Response					1
Low: Issue not raised in public responses					
Cumulative Impacts					2
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is probable that the impact will result in spatial and temporal cumulative change.					
Degree of potential irreplaceable loss of resources					1
The impact is unlikely to result in irreplaceable loss of resources.					
Prioritisation Factor					1.17
Final Significance					-3.21

Table 7-2: Noise impact significance – Mining operation at night

Impact Name	**Increase in noise levels at surrounding receptors due to operational mining activities at night**				
Alternative	**Alternative 2**				
Phase	**Operation**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature of Impact	-1	-1	Magnitude of Impact	5	3
Extent of Impact	3	3	Reversibility of Impact	5	2
Duration of Impact	4	4	Probability	5	3
Environmental Risk (Pre-mitigation)					-21.25
Mitigation Measures					
• Relocation of NSD03 • Minimize night-time activities when operating within 500 m from NSD • Minimize the transport of coal between 10 PM and 6 Am • Environmental awareness training for employees/drivers • Minimal use of hooters and alarms at night • Use of topsoil and overburden dumps as noise management berms (between proposed activities and NSD)					
Environmental Risk (Post-mitigation)					-9.00
Degree of confidence in impact prediction:					Medium
Impact Prioritisation					
Public Response					1
Low: Issue not raised in public responses					
Cumulative Impacts					2
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is probable that the impact will result in spatial and temporal cumulative change.					
Degree of potential irreplaceable loss of resources					1
The impact is unlikely to result in irreplaceable loss of resources.					
Prioritisation Factor					1.17
Final Significance					-10.50

7.2.2 Decommissioning phase

The noise impact significance during the decommissioning phase of the project is presented in **Table 7-3**.

Table 7-3: Noise impact significance – Decommissioning activities during the day

Impact Name	**Increase in noise levels at surrounding receptors due to decommissioning activities during the day**				
Alternative	**Alternative 2**				
Phase	**Decommissioning**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature of Impact	-1	-1	Magnitude of Impact	5	5
Extent of Impact	3	3	Reversibility of	2	2

			Impact		
Duration of Impact	2	2	Probability	2	2
Environmental Risk (Pre-mitigation)					-6.00
Mitigation Measures					
Mitigation is not required					
Environmental Risk (Post-mitigation)					-6.00
Degree of confidence in impact prediction:					Medium
Impact Prioritisation					
Public Response					1
Low: Issue not raised in public responses					
Cumulative Impacts					2
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is probable that the impact will result in spatial and temporal cumulative change.					
Degree of potential irreplaceable loss of resources					1
The impact is unlikely to result in irreplaceable loss of resources.					
Prioritisation Factor					1.17
Final Significance					-7.00

7.2.3 Decommissioning phase

The noise impact significance during the decommissioning phase of the project is presented in **Table 7-4**.

Table 7-4: Noise impact significance – Closure activities during the day

Impact Name	**Increase in noise levels at surrounding receptors due to closure activities**				
Alternative	**Alternative 2**				
Phase	**Rehab and closure**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature of Impact	-1	-1	Magnitude of Impact	5	5
Extent of Impact	3	3	Reversibility of Impact	2	2
Duration of Impact	2	2	Probability	1	1
Environmental Risk (Pre-mitigation)					-3.00
Mitigation Measures					
Mitigation is not required					
Environmental Risk (Post-mitigation)					-3.00
Degree of confidence in impact prediction:					Medium
Impact Prioritisation					
Public Response					1
Low: Issue not raised in public responses					
Cumulative Impacts					2
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is probable that the impact will result in spatial and temporal cumulative change.					
Degree of potential irreplaceable loss of resources					1
The impact is unlikely to result in irreplaceable loss of resources.					

Prioritisation Factor	1.17
Final Significance	-3.50

Figure 7-1: Areas of potential high concern of a noise impact – daytime construction and operation

Figure 7-2: Areas of potential high concern of a noise impact – night-time construction and operation

8 METHODS: CALCULATION OF FUTURE NOISE EMISSIONS DUE TO PROPOSED PROJECT

8.1 NOISE EMISSIONS INTO THE SURROUNDING ENVIRONMENT[6]

The noise emissions from various sources, as defined by the project developer will be calculated during the ENIA in detail by using the sound propagation models described by SANS 10357:2004 or a similar noise propagation model.

The following will be considered:

- The octave band sound power levels of processes/equipment;
- The distance of the receiver from the noise sources;
- The impact of atmospheric absorption;
- The operational details of the proposed project;
- Topographical layout; and
- Acoustical characteristics of the ground.

The noise emission into the environment due to road traffic will be calculated using the sound propagation model described in SANS 10210:2004 or a similar noise propagation model. Calculated corrections such as the following will be considered:

- Distance of receptor from the road;
- Road construction material;
- Average speeds of travel;
- Types of vehicles used;
- Road gradient;
- Ground acoustical conditions.

[6] SANS 10357:2004 The calculation of sound propagation by the Concave method', SANS 10210:2004. 'Calculating and predicting road traffic noise'

9 LIMITATIONS OF THIS STUDY

Limitations relating this this Noise Study for Scoping are:

- Ambient sound levels are the cumulative effects of innumerable sounds generated at various instances both far and near. High measurements may not necessarily mean that noise levels in the area are high. Similarly, a low sound level measurement will not necessarily mean that the area is always quiet, as sound levels will vary over seasons, time of the day, faunal characteristics, vegetation in the area and meteorological conditions (especially wind). This is excluding the potential effect of sounds from anthropogenic origin. It is impossible to quantify and identify the numerous sources that influenced one 10-minute measurement using the reading result at the end of the measurement. Therefore trying to define ambient sound levels using the result of one 10-minute measurement will be very inaccurate (very low confidence level in the results) for the reasons mentioned above. The more measurements that can be collected at a location the higher the confidence levels in the ambient sound level determined. The more complex the sound environment, the longer the required measurement (especially when at a community or house. This study did collect measurements at one location for approximately 2 full night-time periods in 10-minute bins. It is assumed that the measurement location represents other residential dwellings in the area (similar environment), yet, in practice this can be highly erroneous as there are numerous factors that can impact on ambient sound levels, including;
    - the distance to closest trees, number and type of trees as well as the height of trees;
    - available habitat and food for birds and other animals;
    - distance to residential dwelling, type of equipment used at dwelling (compressors, aircons);
    - general maintenance condition of house (especially during windy conditions);
    - number and type of animals kept in the vicinity of the measurement locations.
- Determination of existing road traffic and other noise sources of significance are important (traffic counts etc.). Traffic however is highly dependent on the time of day as well as seasonal differences. Traffic is a major noise source in locations close to main roads.
- Measurements over wind speeds of 3 m/s could provide data influenced by wind-induced noises. While the windshields used limits the effect of fluctuating pressure across the microphone diaphragm, the effect of wind-induced noises in the trees in

the vicinity of the microphone did impact on the ambient sound levels. The site visit unfortunately coincided with a relatively windy period;

- Ambient sound levels are dependant not only on time of day and meteorological conditions, but also change due to seasonal differences. Ambient sound levels are generally higher in summer months when faunal activity is higher and lower during the winter due to reduced faunal activity. Winter months unfortunately also coincide with lower temperatures and very stable atmospheric conditions, ideal conditions for propagation of noise;
- Ambient sound levels recorded near rivers, streams, wetlands, trees and bushy areas can be high. This is due to faunal activity which can dominate the sound levels around the measurement location.

10 CONCLUSIONS AND RECOMMENDATIONS

This report is a Scoping Noise Assessment of the predicted noise environment due to the Kangala Extension project south of Delmas, Mpumalanga.

Considering the noise levels that may be expected at certain distances from selected activities, there are a potential for a noise impact. A preliminary assessment of the information provides for a buffer area of approximately 500 meters from any noise-sensitive receptors to prevent noise impact of high significance for night-time activities (especially drilling operations).

A buffer area of approximately 200m is recommended from noise-sensitive receptors to prevent noise impact of medium (or higher) significance for daytime activities.

As little information is available conceptual noise propagation is used to estimate potential issues of concern. With the preliminary data as used, this assessment indicated that:

- Considering maximum noise emission levels, that the construction activities could be audible over a distance of more than 2,000 meters (refer **Table 5-1**);
- Considering equivalent (average) noise emission levels, activities could influence the ambient sound levels over a distance greater than 2,000 meters (refer **Table 5-2**).

A risk exist that a noise impact could occur and it is recommended that the noise impact be investigated in more detail during the Environmental Impact Assessment phase.

11 TERMS OF REFERENCE FOR THE ENVIRONMENTAL NOISE IMPACT PHASE

Work that will take place during the Environmental Noise Impact Assessment phase is defined in section 8 of SANS 10328:2008.

11.1 PURPOSE OF THE ENVIRONMENTAL NOISE IMPACT ASSESSMENT

The purpose of an environmental noise impact investigation and assessment is to determine and quantify the acoustical impact of, or on a proposed development.

11.2 PLAN OF STUDY FOR ENVIRONMENTAL NOISE IMPACT INVESTIGATION AND ASSESSMENT

In this regard the following will be included to assist the EAP in the compilation of the Plan of Study (PoS) for the EIA:

- Site visit to confirm the status of the identified NSD.
- Site visit to measure the ambient sound levels.
- Data (location of equipment/activities, type of equipment/noise-generation activities, number of equipment or activities that simultaneously could generate noise) as received from the developer will be used to model the potential noise impact.
- The potential impact will be evaluated (where possible) in terms of the nature (description of what causes the effect, what/who might be affected and how it/they might be affected) as well as the extent of the impact.
- The potential significance of the identified issues will be calculated based on the evaluation of the issues/impacts.
- The development of an Environmental Management Plan and a proposal of potential mitigation measures (if required).
- Recommendations.

11.3 ENVIRONMENTAL NOISE IMPACT INVESTIGATION

11.3.1 Sound emission from the identified noise sources

Sound emission data of equipment as provided by the developer would be used to calculate the potential noise emissions. In the instance that this data is unavailable, worst-case sound emission data as measured or available from databases will be used.

The operating cycle and nature of the sound emission (impulsiveness, tonal character or potential low frequencies) would, where relevant, be considered when the expected rating level in the target area is calculated.

11.3.2 Determination of Rating levels

The Concawe noise propagation model defined in SANS 10357:2004 (or a similar propagation model) will be used to model the noise levels for both the construction and operational phases. Input parameters used would be as defined by the client (based on equipment projected to be used) or data available via internet resources.

11.3.3 Assessment of the noise impact: No mitigation

The significance will be determined considering the defined magnitude of the noise level, the extent as well as the duration of the projected noise impact, as well as the probability that this impact may take place.

The magnitude of the noise impact will be assessed by considering:

- The total projected cumulative noise level compared to the appropriate acceptable rating levels as defined in table 2 of SANS 10103:2008.
- The potential community response from table 5 of SANS 10103:2008. In addition, other relevant and suitable literature may be consulted as defined in the scoping report. In particular the likely ambient sound levels due to wind induced noises will be estimated at the wind speed under investigation and considered.
- Projected noise levels considering the likely and projected ambient sound levels.

11.3.4 Assessment of the noise impact: Implementation of mitigation measures

Should the significance of the impact be high, the potential significance will be recalculated considering that the developer would be implementing reasonable mitigation measures.

11.4 ENVIRONMENTAL NOISE IMPACT REPORT

The Environmental Noise Impact Report will cover the following points:

- the purpose of the investigation;
- a brief description of the planned development or the changes that are being considered;
- a brief description of the existing environment including, where relevant, the topography, surface conditions and meteorological conditions during measurements;

- the identified noise sources together with their respective sound pressure levels or sound power levels (or both) and, where applicable, the operating cycles, the nature of sound emission, the spectral composition and the directional characteristics;
- the identified noise sources that were not taken into account and the reasons as to why they were not investigated;
- the identified Potentially Sensitive Receptors and the noise impact on them;
- where applicable, any assumptions, with references, made with regard to any calculations or determination of source and propagation characteristics;
- an explanation, either by a brief description or by reference, of all measuring and calculation procedures that were followed, as well as any possible adjustments to existing measuring methods that had to be made, together with the results of calculations;
- an explanation, either by description or by reference, of all measuring or calculation methods (or both) that were used to determine existing and predicted rating levels, as well as other relevant information, including a statement of how the data were obtained and applied to determine the rating level for the area in question;
- the location of measuring or calculating points in a sketch or on a map;
- quantification of the noise impact with, where relevant, reference to the literature consulted and the assumptions made;
- alternatives that were considered and the results of those that were investigated;
- a list of all the interested or affected parties that offered any comments with respect to the environmental noise impact investigation (if comments are received);
- a detailed summary of all the comments received from interested or affected parties as well as the procedures and discussions followed to deal with them (if comments are received);
- conclusions that were reached;
- proposed recommendations including potential mitigation measures;
- any follow-up investigation which should be conducted at completion of the project as well as at regular intervals after the commissioning of the project so as to ensure that the recommendations of this report will be maintained in the future.

12 REFERENCES

In this report reference was made to the following documentation:

1. SANS 10103:2008. 'The measurement and rating of environmental noise with respect to annoyance and to speech communication'.
2. SANS 10210:2004. 'Calculating and predicting road traffic noise'.
3. SANS 10328:2008. 'Methods for environmental noise impact assessments'.
4. SANS 10357:2004 The calculation of sound propagation by the Concave method'.
5. USEPA, 1971: *Effects of Noise on Wildlife and other animals.*
6. World Health Organization, 2009, '*Night Noise Guidelines for Europe.*
7. World Health Organization, 1999, '*Protection of the Human Environment; Guidelines for Community Noise*'.
8. World Health Organization, 1999; 'Noise quest, 2010; Journal of Acoustical Society of America, 2009'.
9. Environmental Protection Department, 'Government of the Hong Kong SAR Second Issue, January 2003'.
10. A Paradoxical Problem. Can bush crickets discriminate frequency?, J.C Hartley, University of Nottingham.
11. Short Communication. The Scaling of song Frequency in Cicadas, H.C Bennet-Clark (1994).
12. Equipment list and Sound Power Level source: http://www.fhwa.dot.gov/environment/noise/construction_noise/handbook/handbook09.cfm

APPENDIX A

Glossary of Acoustic Terms, Definitions and General Information

1/3-Octave Band	A filter with a bandwidth of one-third of an octave representing four semitones, or notes on the musical scale. This relationship is applied to both the width of the band, and the centre frequency of the band. See also definition of octave band.
A – Weighting	An internationally standardised frequency weighting that approximates the frequency response of the human ear and gives an objective reading that therefore agrees with the subjective human response to that sound.
Air Absorption	The phenomena of attenuation of sound waves with distance propagated in air, due to dissipative interaction within the gas molecules.
Alternatives	A possible course of action, in place of another, that would meet the same purpose and need (of proposal). Alternatives can refer to any of the following, but are not limited hereto: alternative sites for development, alternative site layouts, alternative designs, alternative processes and materials. In Integrated Environmental Management the so-called "no go" alternative refers to the option of not allowing the development and may also require investigation in certain circumstances.
Ambient	The conditions surrounding an organism or area.
Ambient Noise	The all-encompassing sound at a point being composed of sounds from many sources both near and far. It includes the noise from the noise source under investigation.
Ambient Sound	The all-encompassing sound at a point being composite of sounds from near and far.
Ambient Sound Level	Means the reading on an integrating impulse sound level meter taken at a measuring point in the absence of any alleged disturbing noise at the end of a total period of at least 10 minutes after such a meter was put into operation. In this report the term Background Ambient Sound Level will be used.
Amplitude Modulated Sound	A sound that noticeably fluctuates in loudness over time.
Applicant	Any person who applies for an authorisation to undertake a listed activity or to cause such activity in terms of the relevant environmental legislation.
Assessment	The process of collecting, organising, analysing, interpreting and communicating data that is relevant to some decision.
Attenuation	Term used to indicate reduction of noise or vibration, by whatever method necessary, usually expressed in decibels.
Audible frequency Range	Generally assumed to be the range from about 20 Hz to 20,000 Hz, the range of frequencies that our ears perceive as sound.
Ambient Sound Level	The level of the ambient sound indicated on a sound level meter in the absence of the sound under investigation (e.g. sound from a particular noise source or sound generated for test purposes). Ambient sound level as per Noise Control Regulations.
Broadband Noise	Spectrum consisting of a large number of frequency components, none of which is individually dominant.
C-Weighting	This is an international standard filter, which can be applied to a pressure signal or to a *SPL* or *PWL* spectrum, and which is essentially a pass-band filter in the frequency range of approximately 63 to 4000 Hz. This filter provides a more constant, flatter, frequency response, providing significantly less adjustment than the A-scale filter for frequencies less than 1000 Hz.
Controlled area (as per National Noise Control Regulations)	a piece of land designated by a local authority where, in the case of- (a) road transport noise in the vicinity of a road- (i) the reading on an integrating impulse sound level meter, taken outdoors at the end of a period extending from 06:00 to 24:00 while such meter is in operation, exceeds 65 dBA; or (ii) the equivalent continuous "A"-weighted sound pressure level at a height of at least 1,2 metres, but not more than 1,4 metres, above the ground for a period extending from 06:00 to 24:00 as calculated in accordance with SABS 0210-1986, titled: "Code of Practice for calculating and predicting road traffic noise", published under Government Notice No. 358 of 20 February 1987, and projected for a

	period of 15 years following the date on which the local authority has made such designation, exceeds 65 dBA; (b) aircraft noise in the vicinity of an airfield, the calculated noisiness index, projected for a period of 15 years following the date on which the local authority has made such designation, exceeds 65 dBA; or (c) industrial noise in the vicinity of an industry- (i) the reading on an integrating impulse sound level meter, taken outdoors at the end of a period of 24 hours while such meter is in operation, exceeds 61 dBA; or (ii) the calculated outdoor equivalent continuous "A"-weighted sound pressure level at a height of at least 1,2 metres, but not more than 1,4 metres, above the ground for a period of 24 hours, exceeds 61 dBA;
dB(A)	Sound Pressure Level in decibel that has been A-weighted, or filtered, to match the response of the human ear.
Decibel (db)	A logarithmic scale for sound corresponding to a multiple of 10 of the threshold of hearing. Decibels for sound levels in air are referenced to an atmospheric pressure of 20 μ Pa.
Diffraction	The process whereby an acoustic wave is disturbed and its energy redistributed in space as a result of an obstacle in its path, Reflection and refraction are special cases of diffraction.
Direction of Propagation	The direction of flow of energy associated with a wave.
Disturbing noise	Means a noise level that exceeds the zone sound level or, if no zone sound level has been designated, a noise level that exceeds the ambient sound level at the same measuring point by 7 dBA or more.
Environment	The external circumstances, conditions and objects that affect the existence and development of an individual, organism or group; these circumstances include biophysical, social, economic, historical, cultural and political aspects.
Environmental Control Officer	Independent Officer employed by the applicant to ensure the implementation of the Environmental Management Plan (EMP) and manages any further environmental issues that may arise.
Environmental impact	A change resulting from the effect of an activity on the environment, whether desirable or undesirable. Impacts may be the direct consequence of an organisation's activities or may be indirectly caused by them.
Environmental Impact Assessment	An Environmental Impact Assessment (EIA) refers to the process of identifying, predicting and assessing the potential positive and negative social, economic and biophysical impacts of any proposed project, plan, programme or policy that requires authorisation of permission by law and that may significantly affect the environment. The EIA includes an evaluation of alternatives, as well as recommendations for appropriate mitigation measures for minimising or avoiding negative impacts, measures for enhancing the positive aspects of the proposal, and environmental management and monitoring measures.
Environmental issue	A concern felt by one or more parties about some existing, potential or perceived environmental impact.
Equivalent continuous A-weighted sound exposure level ($L_{Aeq,T}$)	The value of the average A-weighted sound pressure level measured continuously within a reference time interval *T*, which have the same mean-square sound pressure as a sound under consideration for which the level varies with time.
Equivalent continuous A-weighted rating level ($L_{Req,T}$)	The Equivalent continuous A-weighted sound exposure level *($L_{Aeq,T}$)* to which various adjustments has been added. More commonly used as ($L_{Req,d}$) over a time interval 06:00 – 22:00 (T=16 hours) and ($L_{Req,n}$) over a time interval of 22:00 – 06:00 (T=8 hours). It is a calculated value.
F (fast) time weighting	(1) Averaging detection time used in sound level meters. (2) Fast setting has a time constant of 125 milliseconds and provides a fast reacting display response allowing the user to follow and measure not too rapidly fluctuating sound.
Footprint area	Area to be used for the construction of the proposed development, which does

	not include the total study area.
Free Field Condition	An environment where there is no reflective surfaces.
Frequency	The rate of oscillation of a sound, measured in units of Hertz (Hz) or kiloHertz (kHz). One hundred Hz is a rate of one hundred times per second. The frequency of a sound is the property perceived as pitch: a low-frequency sound (such as a bass note) oscillates at a relatively slow rate, and a high-frequency sound (such as a treble note) oscillates at a relatively high rate.
Green field	A parcel of land not previously developed beyond that of agriculture or forestry use; virgin land. The opposite of Greenfield is Brownfield, which is a site previously developed and used by an enterprise, especially for a manufacturing or processing operation. The term Brownfield suggests that an investigation should be made to determine if environmental damage exists.
G-Weighting	An International Standard filter used to represent the infrasonic components of a sound spectrum.
Harmonics	Any of a series of musical tones for which the frequencies are integral multiples of the frequency of a fundamental tone.
I (impulse) time weighting	(1) Averaging detection time used in sound level meters as per South African standards and Regulations. (2) Impulse setting has a time constant of 35 milliseconds when the signal is increasing (sound pressure level rising) and a time constant of 1,500 milliseconds while the signal is decreasing.
Impulsive sound	A sound characterized by brief excursions of sound pressure (transient signal) that significantly exceed the ambient sound level.
Infrasound	Sound with a frequency content below the threshold of hearing, generally held to be about 20 Hz. Infrasonic sound with sufficiently large amplitude can be perceived, and is both heard and felt as vibration. Natural sources of infrasound are waves, thunder and wind.
Integrated Development Plan	A participatory planning process aimed at developing a strategic development plan to guide and inform all planning, budgeting, management and decision-making in a Local Authority, in terms of the requirements of Chapter 5 of the Municipal Systems Act, 2000 (Act 32 of 2000).
Integrated Environmental Management	IEM provides an integrated approach for environmental assessment, management, and decision-making and to promote sustainable development and the equitable use of resources. Principles underlying IEM provide for a democratic, participatory, holistic, sustainable, equitable and accountable approach.
Interested and affected parties	Individuals or groups concerned with or affected by an activity and its consequences. These include the authorities, local communities, investors, work force, consumers, environmental interest groups and the general public.
Key issue	An issue raised during the Scoping process that has not received an adequate response and that requires further investigation before it can be resolved.
L_{A90}	the sound level exceeded for the 90% of the time under consideration
Listed activities	Development actions that is likely to result in significant environmental impacts as identified by the delegated authority (formerly the Minister of Environmental Affairs and Tourism) in terms of Section 21 of the Environment Conservation Act.
L_{AMin} *and* L_{AMax}	Is the RMS (root mean squared) minimum or maximum level of a noise source.
Loudness	The attribute of an auditory sensation that describes the listener's ranking of sound in terms of its audibility.
Magnitude of impact	Magnitude of impact means the combination of the intensity, duration and extent of an impact occurring.
Masking	The raising of a listener's threshold of hearing for a given sound due to the presence of another sound.
Mitigation	To cause to become less harsh or hostile.
Negative impact	A change that reduces the quality of the environment (for example, by reducing species diversity and the reproductive capacity of the ecosystem, by

	damaging health, or by causing nuisance).
Noise	a. Sound that a listener does not wish to hear (unwanted sounds). b. Sound from sources other than the one emitting the sound it is desired to receive, measure or record. c. A class of sound of an erratic, intermittent or statistically random nature.
Noise Level	The term used in lieu of sound level when the sound concerned is being measured or ranked for its undesirability in the contextual circumstances.
Noise-sensitive development	developments that could be influenced by noise such as: a) districts (see table 2 of SANS 10103:2008) 1. rural districts, 2. suburban districts with little road traffic, 3. urban districts, 4. urban districts with some workshops, with business premises, and with main roads, 5. central business districts, and 6. industrial districts; b) educational, residential, office and health care buildings and their surroundings; c) churches and their surroundings; d) auditoriums and concert halls and their surroundings; e) recreational areas; and f) nature reserves. In this report Noise-sensitive developments is also referred to as a Potential Sensitive Receptor
Octave Band	A filter with a bandwidth of one octave, or twelve semi-tones on the musical scale representing a doubling of frequency.
Positive impact	A change that improves the quality of life of affected people or the quality of the environment.
Property	Any piece of land indicated on a diagram or general plan approved by the Surveyor-General intended for registration as a separate unit in terms of the Deeds Registries Act and includes an erf, a site and a farm portion as well as the buildings erected thereon
Public Participation Process	A process of involving the public in order to identify needs, address concerns, choose options, plan and monitor in terms of a proposed project, programme or development
Reflection	Redirection of sound waves.
Refraction	Change in direction of sound waves caused by changes in the sound wave velocity, typically when sound wave propagates in a medium of different density.
Reverberant Sound	The sound in an enclosure which results from repeated reflections from the boundaries.
Reverberation	The persistence, after emission of a sound has stopped, of a sound field within an enclosure.
Significant Impact	An impact can be deemed significant if consultation with the relevant authorities and other interested and affected parties, on the context and intensity of its effects, provides reasonable grounds for mitigating measures to be included in the environmental management report. The onus will be on the applicant to include the relevant authorities and other interested and affected parties in the consultation process. Present and potential future, cumulative and synergistic effects should all be taken into account.
S (slow) time weighting	(1) Averaging times used in sound level meters. (2) Time constant of one [1] second that gives a slower response which helps average out the display fluctuations.
Sound Level	The level of the frequency and time weighted sound pressure as determined by a sound level meter, i.e. A-weighted sound level.
Sound Power	Of a source, the total sound energy radiated per unit time.
Sound Pressure Level (SPL)	Of a sound, 20 times the logarithm to the base 10 of the ratio of the RMS sound pressure level to the reference sound pressure level. International values for the reference sound pressure level are 20 micropascals in air and 100 millipascals in water. SPL is reported as L_p in dB (not weighted) or in various other weightings.

Soundscape	Sound or a combination of sounds that forms or arises from an immersive environment. The study of soundscape is the subject of acoustic ecology. The idea of soundscape refers to both the natural acoustic environment, consisting of natural sounds, including animal vocalizations and, for instance, the sounds of weather and other natural elements; and environmental sounds created by humans, through musical composition, sound design, and other ordinary human activities including conversation, work, and sounds of mechanical origin resulting from use of industrial technology. The disruption of these acoustic environments results in noise pollution.
Study area	Refers to the entire study area encompassing all the alternative routes as indicated on the study area map.
Sustainable Development	Development that meets the needs of the present without compromising the ability of future generations to meet their own needs. It contains within it two key concepts: the concept of "needs", in particular the essential needs of the world's poor, to which overriding priority should be given; and the idea of limitations imposed by the state of technology and social organization on the environment's ability to meet present and the future needs (Brundtland Commission, 1987).
Tread braked	The traditional form of wheel brake consisting of a block of friction material (which could be cast iron, wood or nowadays a composition material) hung from a lever and being pressed against the wheel tread by air pressure (in the air brake) or atmospheric pressure in the case of the vacuum brake.
Zone of Potential Influence	The area defined as the radius about an object, or objects beyond which the noise impact will be insignificant.
Zone Sound Level	Means a derived dBA value determined indirectly by means of a series of measurements, calculations or table readings and designated by a local authority for an area. This is similar to the Rating Level as defined in SANS 10103:2008.

End of Report