

NOISE STUDY FOR ENVIRONMENTAL IMPACT ASSESSMENT

for the Proposed
Musina-Makhado Special Economic Zone Development
within the Vhembe District Municipality,
Limpopo Province



Study done for:



Prepared by:



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EXECUTIVE SUMMARY

INTRODUCTION

Enviro Acoustic Research cc (EARES) was commissioned by Gudani Consulting to determine the potential noise impact on the surrounding environment due to the development of certain components of the Musina-Makhado Special Economic Zone (MMSEZ).

PROJECT DESCRIPTION

The proposed MMSEZ is located across the Musina and Makhado Local Municipalities which fall under the Vhembe District Municipality in the Limpopo Province. The nearest towns are Makhado (located 31 km south) and Musina (located 36 km north) of the proposed MMSEZ site.

The MMSEZ will comprise an offering of mixed land uses and infrastructure provision to ensure the optimal manufacturing operations in the energy and metallurgical complex. It is envisaged that the energy and metallurgical complex shall comprise a number of land and ancillary uses.

The main land uses include a number of different heavy industrial manufacturing plants, as well as roads, waste management, substations, water treatment works, bulk water supply, water reservoirs and water distribution systems, that could include:

- Coal washery;
- Coking Plan;
- Heat recovery power generation;
- Thermal power plant;
- Ferrochrome Plant;
- Ferromanganese Plant;
- Silicomanganese Plant;
- Vanadium – titanium magnetite project;
- High Manganese steel;
- High - vanadium steel;
- Stainless steel Plant;
- Lime Plant;
- Cement Plant;
- Refractories Factory;
- Sewage Treatment Plant;
- Industrial domestic water Plant;
- Light Industrial Processing Zone;
- Machining Zone;
- Commercial residential area;
- Living area;
- Administrative Centre;
- Bonded area; and
- A logistics Centre

Ancillary uses to complement and support the energy and metallurgical complex include:

- Light industrial activities and developments (various service industries, steel product industries, workshops and yards, building materials factory, light industrial plants, packaging materials factory, warehouses);
- Intermodal facilities (transport terminus, diesel fuel station, mechanical repair plant, automobile logistics centre);
- Retail (shopping centre, farmers market, supermarket/neighbourhood centre, commercial banks);
- Business uses (administration buildings and offices, hotels);
- Staff facilities (hospital, government uses, library, crèche, religious facilities, community facilities, recreational areas); &
- Telecommunication masts.

This assessment however specifically focusses on the potential noise impact from the:

- Coal wash plant;
- A Coke Manufacturing with an associated Heat Recovery Steam Generator (HRSG); and
- A Ferrochrome Smelter.

SURROUNDING LAND USES

The area in the vicinity of the proposed development is currently classified as Vacant or Unspecified. Previous site visits revealed that the area is mainly wilderness with game ranches forming a large part of the agricultural activities (game and cattle farming). Some of the farm's focus on the tourism and hunting industry. The small town of Mopane is located to the north-west on the border of the focus area.

POTENTIAL NOISE-SENSITIVE RECEPTORS

An assessment of the site was done using available aerial images (GoogleEarth®) to identify potential dwellings that could be considered to be noise-sensitive receptors (NSR), supported by information gained during site visits in 4 – 5 July 2013, 23 – 25 January 2018 as well as 7 – 8 March 2019.

BASELINE SOUND LEVELS

Ambient sound levels were previously measured during 4 – 5 July 2013, 23 – 25 January 2018 as well as 7 – 8 March 2019, with the measurements including long-term semi-continuous as well as a number of short-term readings. These measurements are detailed

the report De Jager (2020), which was done for the larger MMSEZ project. These measurements resulted in more than 500 daytime as well as 288 night-time measurements. Based on the arithmetic average of these measurements:

- The impulse-weighted daytime sound levels was 43.8 dBA, with the fast-weighted daytime sound levels was 38.5 dBA; and
- The impulse-weighted night-time sound levels was 40.9 dBA, with the fast-weighted night-time sound levels was 35.8 dBA.

Considering the ambient sound levels measured onsite, as well as the developmental character of the area, the acceptable zone rating level would be typical of a **rural area** (35 dBA at night and 45 dBA during the day) as defined in SANS 10103:2008 for most of the area. Rating levels will be higher in an area up to 500m from the N1, mainly due to traffic noises from the national road. The rating levels would also be higher in the town of Mopane, due to the activities of the existing Syferfontein Dolomite quarry.

RATING LEVELS AND RECOMMENDED NOISE LIMITS

The development of the project will result in changes in the ambient sound levels during the construction and operational phases. Considering the developmental character of the area, this report will initially consider the requirements of the National Noise Control Regulations (NCR), which require that a project not change ambient sound levels with more than 7 dBA.

Based on the arithmetic average of ambient sound level measurements done in the area:

- The impulse-weighted daytime sound levels was 43.8 dBA, with the fast-weighted daytime sound levels was 38.5 dBA. This could set an upper daytime noise limit ranging between 45 and 50 dBA; and
- The impulse-weighted night-time sound levels was 40.9 dBA, with the fast-weighted night-time sound levels was 35.8 dBA. This could set an upper night-time noise limit ranging between 43 and 50 dBA.

In addition, the project must also consider the requirements of the World Health Organization (WHO) and the International Finance Corporation (IFC), with the IFC recommending upper noise limits of:

- 55 dBA for the daytime period; and
- 45 dBA for the night-time period.

Based on both the requirements of the NCR as well as the WHO and IFC, this assessment will recommend upper noise limits of:

- 50 dBA for the daytime period; and
- 45 dBA for the night-time period.

FINDINGS

Potential scenarios were conceptualized for the future proposed construction and operational phases, with the output of the modelling exercise indicating a potential noise impact of a:

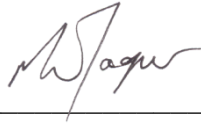
- of a **medium significance** for the daytime construction activities. This noise impact relates to high noise levels at NSR09, mostly due to construction activities associated with the Ferrochrome project. Mitigation is available, but mainly limited to the relocation of NSR09 due to the high noise levels associated with future operational activities at the Ferrochrome project;
- of a **high significance** for the night-time construction activities, even though there might be fewer night-time activities than daytime construction activities. This noise impact relates to high noise levels at NSRs 05 (potential worst-case construction activities associated with the Coal Wash and Coke & HRSG plants) and 09 (construction activities associated with the Ferrochrome project). Mitigation is available, but mainly limited to the relocation of NSRs 05 and 09 due to the potential high noise levels associated with future operational activities;
- of a **high significance** for the daytime operational activities. This noise impact relates to high noise levels at NSR 05 and 09. Mitigation is available that will reduce the significance of the noise impact to low; and
- of a **high significance** for the night-time operational activities. This noise impact relates to high noise levels at NSR 05 and 09, though noise levels may be elevated at the Mopane project. Mitigation is available that will reduce the significance of the noise impact to low.

RECOMMENDATIONS

Though there is a potential for a noise impact during the construction and operational phases, the noise impact can be mitigated to a **low** significance. This finding is only relevant to the Coal Wash, the Coke and HRSG as well as the Ferrochrome projects, and noise studies

should consider other activities associated with the MMSEZ project. Six-monthly noise monitoring is also recommended.

While the development of the MMSEZ project will elevate noise levels in the area, the noise impact can be mitigated and it is recommended that the Coal Wash, the Coke and HRSG as well as the Ferrochrome projects be authorized.



Signature of Specialist: 2025 – 05 – 14

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APPENDICES

Appendix A	Glossary of Acoustic Terms, Definitions and General Information
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GLOSSARY OF ABBREVIATIONS

AZSL	Acceptable Zone Sound Level (Rating Level)
dB	Decibel
EARES	Enviro-Acoustic Research cc
EMP	Environmental Management Programme
ENIA	Environmental Noise Impact Assessment
EP	Equator Principle
f	Fast setting
GG	Government Gazette
GN	Government Notice
HRSG	Heat Recovery Steam Generator
HRV	Heavy Road Vehicles
Hz	Hertz
i	Impulse setting
i.e.	that is
IEC	International Electrotechnical Commission

IFC	International Finance Corporation
km/h	kilometres per hour
LPG	Liquid Petroleum Gas
m	Meters
mamsl	Meters above mean sea level
MMSEZ	Musina-Makhado Special Economic Zone
MWp	Mega-Watt peak
NCR	Noise Control Regulations (under Section 25 of the ECA)
NEMA	National Environmental Management Act, 1998 (Act No. 107 of 1998)
NSR	Noise-Sensitive Receptors
PWL	Sound Power Levels
RPM	Revolutions per Minute
SABS	South African Bureau of Standards
SANS	South African National Standard
ToR	Terms of Reference
UTM	Universal Transverse Mercator
WHO	World Health Organisation

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 (Mining [stopping and development], 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, the last two during which he studied Mining Engineering. He used to be a holder of a temporary blasting certificate during the period he mined at JCI: Cook 2 shaft. He changed course from Mining Engineering to Chemical Engineering after the 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 a number of these projects. 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 as well as blasting impacts. Since 2007 he has completed more than 300 Environmental Noise Impact Assessments and Noise Monitoring Reports as well as various acoustic consulting services, including amongst others:

Wind Energy Facilities

Full Environmental Noise Impact Assessments for - Bannf (Vidigenix), iNca Gouda (Aurecon SA), Isivunguvungu (Aurecon), De Aar (Aurecon), Kokerboom 1 (Aurecon), Kokerboom 2 (Aurecon), Kokerboom 3 (Aurecon), Kangnas (Aurecon), Plateau East and West (Aurecon), Wolf (Aurecon), Outeniquwa (Aurecon), Umsinde Emoyeni (ARCUS), Komsberg (ARCUS), Karee (ARCUS), Kolkies (ARCUS), San Kraal (ARCUS), Phezukomoya (ARCUS), Canyon Springs (Canyon Springs), Perdekraal (ERM), Scarlet Ibis (CESNET), Albany (CESNET), Sutherland (CSIR), Kap Vley (CSIR), Kuruman (CSIR), Rietrug (CSIR), Sutherland 2 (CSIR), Perdekraal (ERM), Teekloof (Mainstream), Eskom Aberdene (SE), Dorper (SE), Spreukloof (SE), Loperberg (SE), Penhoek Pass (SE),

	Amakhala Emoyeni (SE), Zen (Savannah Environmental – SE), Goereesoe (SE), Springfontein (SE), Garob (SE), Project Blue (SE), ESKOM Kleinsee (SE), Namas (SE), Zonnequa (SE), Walker Bay (SE), Oyster Bay (SE), Hidden Valley (SE), Deep River (SE), Tsitsikamma (SE), AB (SE), West Coast One (SE), Hopefield II (SE), Namakwa Sands (SE), VentuSA Gouda (SE), Dorper (SE), Klipheuwel (SE), INCA Swellendam (SE), Cookhouse (SE), Iziduli (SE), Msenge (SE), Cookhouse II (SE), Rhebokfontein (SE), Suurplaat (SE), Karoo Renewables (SE), Koningaas (SE), Spitskop (SE), Castle (SE), Khai Ma (SE), Poortjies (SE), Korana (SE), IE Moorreesburg (SE), Gunstfontein (SE), Boulders (SE), Vredenburg (Terramanzi), Loeriesfontein (SiVEST), Rhenosterberg (SiVEST), Noupoot (SiVEST), Prieska (SiVEST), Dwarsrug (SiVEST), Graskoppies (SiVEST), Philco (SiVEST), Hartebeest Leegte (SiVEST), Ithemba (SiVEST), !Xha Boom (SiVEST), Spitskop West (Terramanzi), Haga Haga (Terramanzi), Vredenburg (Terramanzi), Msenge Emoyeni (Windlab), Wobben (IWP), Trakas (SiVEST), Beaufort West (SiVEST), Pienaarspoort 1 and 2 (SE), Kokerboom 3 (Zutari), Mphepo Zambia (SLR)
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 Boshoeck Chrome (JMA), Langan 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 (Tshikova), Transalloys (SE), ESKOM Ankerlig (SE), Nootgedacht Titano Project (EcoPartners), Algoa Oil Well (EIMS), Spitskop Chrome (EMAssistance), Vlakfontein South (Gudani), Leandra Coal (Jacana), Grazvalley and Zoetveld (Prescali), Tjate Chrome (Prescali), Langan 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), Haakdoordrift Opencast at Amandelbult Platinum (Aurecon), Landau Dragline relocation (Aurecon), Stuart Coal Opencast (CleanStream Environmental), Tetra4 Gas Field Development (EIMS), Kao Diamonds – Tipping 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 Environmental), Tshivhaso Coal-Fired Power Plant (Savannah Environmental), Doornhoek Fluorspar Project (Exigo), Royal Sheba Project (Cabanga Environmental), Rietkol Silica (Jacana), Gruisfontein Colliery (Jacana), Lehlabile Colliery (Jaco-K Consulting), Bloemendal Colliery (Enviro-Insight), Rondevly Colliery (REC), Welgedacht Colliery (REC), Kalabasfontein Extension (EIMS), Waltloo Power Generation Project (EScience), Buffalo Colliery (Marang), Balgarthen Colliery (Rayten), Kusipongo Block C (Rayten), Zandheuwel (Exigo), NamPower Walvis Bay (GPT), Eloff Phase 3 (EIMS), Dunbar (Enviro-Insight), Smokey Hills (Prescali), Bierspruit (Aurecon), ECM Lannex (Prescali), ECM Tweefontein (Prescali), Smokey Hills (Prescali), Dalyshope (Digby Wells), Eland Platinum Mine (JEMS), Tweefontein (Prescali), Lannex (Prescali), Salene Manganese (Prescali), Baberton Gas to Power (Rayten)
Road and Railway	K220 Road Extension (Urbansmart), 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), Riverfarm Development (Terramanzi), Conakry to Kindia Toll Road (Rayten)
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 (Cennergis 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), Bank of Botswana measurements (Linspace), Skukuza Noise Measurements (Concor), 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 (Cennergis), Waainek WEF Operational Noise Measurements (Innowind), Sedibeng Brewery Noise Measurements (MENCO), Tsitsikamma Community Wind Farm Operational noise measurements (Cennergis), Noupoot Wind Farm Operational noise measurements (Mainstream), Twisdraai Colliery (Lefatshe Minerals), SASOL Prospecting (Lefatshe Minerals), South32 Klipspruit (Rayten), Sibanye Stillwater Kroondal (Rayten), Rooiberg Asphalt (Rooiberg Asphalt), SASOL Shondoni (Lefatshe), SASOL Twisdraai (Lefatshe), Anglo Mototolo (Exigo), Heineken Inyaniga (AECOM), Glencore Izimbiwa (Cleanstream) Glencore Impunzi (Cleanstream), Black Chrome Mine (Prescali) Sibanye Stillwater Ezulwini (Aurecon), Sibanye Stillwater Beatrix (Aurecon), Bank of Botswana (Linspace), Lakeside (Linspace), Skukuza (SiVEST), Rietvlei Colliery (Jaco-K Consulting)
Small Noise Impact Assessments	TCTA AMD Project Baseline (AECOM), NATREF (Nemai Consulting), Christian Life Church (UrbanSmart), Kosmosdale (UrbanSmart), Louwlandia 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 (BPTTrust), Ekuseni Youth Centre (MENCO), Kranskop Industrial Park (Cape South Developments), Pretoria Central Mosque (Noman Shaikh), Soshanguve Development (Maluleke Investments), Seshego-D Waste Disposal (Enviroexcellence), Zambesi Safari Equipment (Owner), Noise Annoyance Assessment due to the Operation of the Gautrain (Thornhill and Lakeside Residential Estate), Upington Solar (SE), Ilangaletu 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), Tiegerpoort Wedding Venue (Henwood Environmental), Monavoni Development (Marindzini), Rezoning of Portion 1 (Primo Properties), Tswaing Mega City (Makole), Mabopane Church (EP Architects), ERGO Soweto Cluster (Kongile), Fabio Chains (Marang), GIDZ JMP (Marang), Temple Complex (KWP Create), Germiston Metals (Dorean), Sebenza Metals (Dorean)
Noise Compliance Statements	Dwarsrug BESS (SiVEST), Hyperion BESS (SE), Loeriesfontein BESS (SiVEST), Platsjambok East and West BESS (SiVEST), Waaihoek BESS (CESNET)

**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), Paul Puts WEF (ARCUS), Juno WEF (ARCUS), Rheboksfontein WEF (ERM), Umzinde WEF (Zutari), Kokerboom 4 (Zutari), etc.

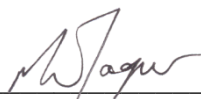
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2 DECLARATION OF INDEPENDENCE

I, Morné de Jager declare that:

- I act as the independent specialist in this application
- I will perform the work relating to this study in an objective manner, even if this results in views and findings that are not favourable to the applicant/developer
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting environmental noise impact assessments, including knowledge of the National Environmental Management Act (107 of 1998), the Environmental Impact Assessment Regulations of 2014, and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- 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/developer or not;
- all the particulars furnished by me in this form are true and correct;
- 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, and;
- 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, 2014.



Signature of the Specialist:

Name of company:

Enviro-Acoustic Research cc

Date:

2025 – 05 – 14

3 CHECKLIST: GG43110 MINIMUM REQUIREMENTS

The National Web based Environmental Screening Tool¹ was used to screen the proposed site for the noise environmental sensitivity as per the requirements of GNR320 (20 March 2020), considering the site location illustrated in **Figure 4-1**. The screening report generated by the Screening Tool indicate that a noise study would be required for the development.

Potential noise sensitive areas was obtained from the Utilities Infrastructure => Electricity => Generation => Renewable => Wind category, with the online tool indicating that most of the larger area is considered to be of a "Very High" Noise sensitivity. While there are a number of areas with a "Very High" noise sensitivity, there are no noise-sensitive activities associated with these areas. The site visit however did identify a few noise-sensitive activities, and as a result, this assessment will take the form of a Noise Specialist Study.

In terms of GNR320 (20 March 2020), a Noise Study must contain, as a minimum, the following information:

Clause	Requirement	Comment / Reference
2.5.1	Contact details of the environmental assessment practitioner or noise specialist, their relevant qualifications and expertise in preparing the statement, and a curriculum vitae	Section 1
2.5.2	a signed statement of independence by the environmental assessment practitioner or noise specialist.	Section 2
2.5.3	The duration and date of the site inspection and the relevance of the season and weather condition to the outcome of the assessment	Section 4.4
2.5.4	A description of the methodology used to undertake the on-site assessment, inclusive of the equipment and models used, as relevant, together with the results of the noise assessment	Section 4.4
2.5.5	a map showing the proposed development footprint (including supporting infrastructure) overlaid on the noise sensitivity map generated by the screening tool	Figure 4-3. The Screening tool considers the larger area to be of "very high" noise sensitivity
2.5.6	confirmation that all reasonable measures have been taken through micro- siting to minimize disturbance to receptors	Site limited to the availability of land for development as well as

¹ <https://screening.environment.gov.za/screeningtool/#/pages/welcome>

		the proximity to rail and road networks.
2.5.7	a substantiated statement from the specialist on the acceptability, or not, of the proposed development and a recommendation on the approval, or not, of the proposed development	Section 14
2.5.8	any conditions to which this statement is subjected	Section 9.6
2.5.9	the assessment must identify alternative development footprints within the preferred site which would be of a "low" sensitivity as identified by the screening tool and verified through the site sensitivity verification and which were not considered	Site limited to the availability of land for development as well as the proximity to rail and road networks.
2.5.10	A motivation must be provided if there were development footprints identified as per paragraph 2.5.9 above that were identified as having a "low" noise sensitivity and that were not considered appropriate	
2.5.11	where required, proposed impact management outcomes, mitigation measures for noise emissions during the construction and commissioning phases that may be of relative short duration, or any monitoring requirements for inclusion in the Environmental Management Programme (EMPr), and	Section 12 and 13
2.5.12	a description of the assumptions made and any uncertainties or gaps in knowledge or data as well as a statement of the timing and intensity of site inspection observations	Section 9

4 INTRODUCTION

4.1 INTRODUCTION AND PURPOSE

Enviro Acoustic Research cc (EARES) was commissioned by Gudani Consulting to determine the potential noise impact on the surrounding environment due to the development of certain components of the Musina-Makhado Special Economic Zone (MMSEZ).

This report describes the potential noise impact that the operation might have on potential noise-sensitive areas, highlighting the methods used, potential issues identified, findings and recommendations. The Terms of Reference (ToR) for this study is in the guidelines provided by SANS 10103:2008, SANS 10328:2008, the procedures defined in Government Gazette 43110 of 20 March 2020 (GNR 320) and the National Noise Control Regulations GN R154 of 1992. The study also considers the noise limits as proposed by the International Finance Corporation (IFC) for a residential area which is based on studies completed by the World Health Organization (WHO).

4.2 BRIEF PROJECT DESCRIPTION

The proposed MMSEZ is located across the Musina and Makhado Local Municipalities which fall under the Vhembe District Municipality in the Limpopo Province. The nearest towns are Makhado (located 31 km south) and Musina (located 36 km north) of the proposed MMSEZ site (location depicted in **Figure 4-1**).

The MMSEZ will comprise an offering of mixed land uses and infrastructure provision to ensure the optimal manufacturing operations in the energy and metallurgical complex. It is envisaged that the energy and metallurgical complex shall comprise a number of land and ancillary uses.

The main land uses include a number of different heavy industrial manufacturing plants, as well as roads, waste management, substations, water treatment works, bulk water supply, water reservoirs and water distribution systems, that could include:

- Coal washery;
- Coking Plant;
- Heat recovery power generation;
- Thermal power plant;
- Ferrochrome Plant;
- Ferromanganese Plant;
- Silicomanganese Plant;
- Vanadium – titanium magnetite project;
- High Manganese steel;
- High - vanadium steel;
- Stainless steel Plant;
- Lime Plant;
- Cement Plant;

- Refractories Factory;
- Sewage Treatment Plant;
- Industrial domestic water Plant;
- Light Industrial Processing Zone;
- Machining Zone;
- Commercial residential area;
- Living area;
- Administrative Centre;
- Bonded area; and
- A logistics Centre.

Ancillary uses to complement and support the energy and metallurgical complex include:

- Light industrial activities and developments (various service industries, steel product industries, workshops and yards, building materials factory, light industrial plants, packaging materials factory, warehouses);
- Intermodal facilities (transport terminus, diesel fuel station, mechanical repair plant, automobile logistics centre);
- Retail (shopping centre, farmers market, supermarket/neighbourhood centre, commercial banks);
- Business uses (administration buildings and offices, hotels);
- Staff facilities (hospital, government uses, library, crèche, religious facilities, community facilities, recreational areas); &
- Telecommunication masts.

This assessment however specifically focusses on the potential noise impact from the:

- Coal wash plant;
- A Coke Manufacturing with an associated Heat Recovery Steam Generator (HRSG); and
- A Ferrochrome Smelter.

4.3 STUDY AREA

The proposed MMSEZ will be located within the Vhembe District Municipality. The Project Focus Area (PFA) is an area selected to enclose the main noise generating infrastructure up to 4,000 m from the proposed project infrastructure (where activities or equipment may be located that may generate significant noise). The regional location of the PFA is illustrated in **Figure 4-1**. The site is further described in terms of environmental components that may contribute or change the sound character in the area.

4.3.1 Topography

ENPAT² (1998) describes the topography as "*irregular plains*" with little natural features that could act as noise barriers considering practical distances at which sound propagates.

² Van Riet, W. Claassen, P. van Rensburg, J. van Viegen & L. du Plessis, "Environmental Potential Atlas for South Africa", Pretoria, 1998.

4.3.2 Surrounding Land Use

The area in the vicinity of the proposed development is currently classified as Vacant or Unspecified. Previous site visits revealed that the area is mainly wilderness with game ranches forming a large part of the agricultural activities (game and cattle farming). Some of the farm's focus on the tourism and hunting industry. The small town of Mopane is located to the north-west on the border of the focus area.

4.3.3 Roads

The focus area is roughly enclosed by the N1 Musina - Makhado, the D1021 on the south, the Musina – Makhado Railway Line and the D744 road (running parallel to the railway line) to the west and the R525 to the north. The railway line is aligned in a north-south direction and reported to carry 4 trains per day.

4.3.4 Other Industrial Activities

The Syferfontein Dolomite operates a quarry just south of Mopane, north-west of the focus area. The site visit indicated that this quarry also operates at night.

4.3.5 Ground conditions and vegetation

The area falls within the Savannah biome with the vegetation types being Limpopo Ridge Bushveld and Musina Mopane Bushveld. The natural veldt has been significantly disturbed in areas due to agriculture and game farming. The ground surface is generally covered with grasses, shrubs and trees. It is the opinion of the author that the ground surface is sufficiently covered to assume 50% soft ground conditions for modelling purposes. It should be noted that this factor is only relevant for sound waves being reflected from the ground surface, with certain frequencies slightly absorbed by the vegetation.

4.4 EXISTING AMBIENT SOUND AND NOISE LEVELS

Ambient sound levels were previously measured during 4 – 5 July 2013, 23 – 25 January 2018 as well as 7 – 8 March 2019, with the measurements including long-term semi-continuous as well as a number of short-term readings. These measurements are detailed in the report De Jager (2020), which was done for the larger MMSEZ project, with the sound levels summarized in **Figure 4-2**. These measurements resulted in more than 500 daytime as well as 288 night-time measurements. Based on the arithmetic average of these measurements:

- The impulse-weighted daytime sound levels was 43.8 dBA, with the fast-weighted daytime sound levels was 38.5 dBA; and
- The impulse-weighted night-time sound levels was 40.9 dBA, with the fast-weighted night-time sound levels was 35.8 dBA.

Considering the ambient sound levels measured onsite, as well as the developmental character of the area, the acceptable zone rating level would be typical of a **rural area** (35 dBA at night and 45 dBA during the day) as defined in SANS 10103:2008 for most of the area. Rating levels will be higher in an area up to 500m from the N1, mainly due to traffic noises from the national road. The rating levels would also be higher in the town of Mopane, due to the activities of the existing Syferfontein Dolomite quarry.

4.5 RATING LEVELS AND RECOMMENDED NOISE LIMITS

The development of the project will result in changes in the ambient sound levels during the construction and operational phases. Considering the developmental character of the area, this report will initially consider the requirements of the National Noise Control Regulations (NCR) (see **section 5.3.1**), requiring that a project not change ambient sound levels with more than 7 dBA.

Based on the arithmetic average of these measurements:

- The impulse-weighted daytime sound levels was 43.8 dBA, with the fast-weighted daytime sound levels was 38.5 dBA. This could set an upper daytime noise limit ranging between 45 and 50 dBA; and
- The impulse-weighted night-time sound levels was 40.9 dBA, with the fast-weighted night-time sound levels was 35.8 dBA. This could set an upper night-time noise limit ranging between 43 and 50 dBA.

In addition, the project must also consider the requirements of the World Health Organization ("WHO" – see **section 5.5.1 & 5.5.2**) and the International Finance Corporation ("IFC" – see **section 5.5.4**), with the IFC recommending upper noise limits of:

- 55 dBA for the daytime period; and
- 45 dBA for the night-time period.

Based on both the requirements of the NCR as well as the WHO and IFC, this assessment will recommend upper noise limits of:

- 50 dBA for the daytime period; and

- 45 dBA for the night-time period.

4.6 ENVIRONMENTAL SENSITIVITY – NOISE THEME

The project site was assessed in terms of the Noise Sensitivity Theme using the online Environmental Screening Tool³.

Potential noise-sensitive areas with a “very high” sensitivity were obtained from the online screening tool using the Utilities Infrastructure => Electricity => Generation => Renewable => Wind category, with the potential noise-sensitive areas illustrated on **Figure 4-3**.

For the most part, noise sensitivities in the area as mapped by the Screening Tool were verified on site. This Noise Specialist Study has been undertaken in accordance with the requirements of GNR320 as part of the EIA.

4.7 POTENTIAL NOISE-SENSITIVE RECEPTORS (DEVELOPMENTS) AND NO-GO AREAS

An assessment of the site was done using available aerial images (GoogleEarth®) to identify potential dwellings that could be considered to be noise-sensitive receptors (NSR), supported by information gained during site visits in 4 – 5 July 2013, 23 – 25 January 2018 as well as 7 – 8 March 2019. Identified NSR are depicted in **Figure 4-4** and **Figure 4-5**.

Generally, noises from typical industrial projects (noise-generating infrastructure):

- Could be significant within 500 m, with any NSR⁴ staying within 500m from such activities being subject to noises that may be of a sufficient level to be considered disturbing both day at night. There is one NSR staying within this 500 m buffer area (NSR09);
- Could be high up to a distance of 1,000 m from project infrastructure, and noise levels may be sufficiently high to be considered disturbing at night. There is one NSR staying within this buffer area (NSR05); and
- Could be clearly audible at a distance of approximately 2,000m from project infrastructure at night, though the noise level is unlikely to be considered disturbing or annoying. There are a number of NSR staying further than 1,000m, but within 2,000m from project activities.

³ <https://screening.environment.gov.za/screeningtool/#/pages/welcome>

⁴ Depending on the size of the project as well as the specific PWL of equipment and activities

It should be noted that these buffer distances may not be valid with very large mining or industrial operations, or in areas with very low or high ambient sound levels.

4.8 COMMENTS RECEIVED DURING THE EIA

The author is not aware of any comments raised (relating to acoustics) by the authorities or interested and affected parties at the date this report was compiled.

4.9 TERMS OF REFERENCE

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

- It was identified as an environmental theme needing further investigation i.t.o. the National Screening Tool as per the procedures of Government Gazette 43110 of 20 March 2020 (GNR320 of 2020);
- A change in land use as highlighted in SANS 10328:2008, section 5.3;
- if a proposed plant is to be developed on a site that is situated within 200 m of a noise-sensitive development (SANS 10328:2008 [5.4 (a)]) *or visa versa* (SANS 10328:2008 [5.4 (b)]);
- If a new road or railway line is to be established within 500 m (or, in the case of a busy thoroughway, 1 000 m) of a road or railway line (SANS 10328:2008 [5.4 (c)]) *or visa versa* (SANS 10328:2008 [5.4 (c)]);
- If a noise sensitive development is to be established within 1,000 m from an industry (SANS 10328:2008 [5.4 (g)]);
- If an industry (500 m for light industry as per SANS 10328:2008 [6.3.3 (g)]) is to be established within 1,000 m from a potential noise sensitive development (SANS 10328:2008 [5.4 (h)]);
- If a wind farm (wind turbines - SANS 10328:2008 [5.4 (i)]) or a source of low-frequency noise (such as cooling or ventilation fans - SANS 10328:2008 [5.4 (l)]) is to be established within 2,000 m from a potential noise sensitive development *or visa versa*;
- 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;
- It is generally required by the local or district authority as part of the environmental authorization or planning approval in terms of Regulation 2(d) or GN R154 of 1992;

4.9.1 Requirements as per GNR 320 of 2020

The Department of Environmental Affairs also promulgated Government Notice Regulation (GNR) 320, dated 20 March 2020 as published in Government Gazette No. 43110. The Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes in Terms of Sections 24(5)(a) and (h) and 44 of the National Environmental Management Act, 1998, when applying for Environmental Authorisation would be applicable to this project.

This regulation defines the requirements for undertaking a site sensitivity verification, specialist assessment and the minimum report content requirements for environmental impact where a specialist assessment is required but no protocol has been prescribed. It requires that the current land use be considered using the national web based environmental screening tool to confirm the site sensitivity available at: <https://screening.environment.gov.za>.

If an applicant/developer intending to undertake an activity identified in the scope of this protocol for which a specialist assessment has been identified on the screening tool on a site identified as being of:

- "very high" sensitivity for noise, must submit a Noise Specialist Assessment; or
- "low" sensitivity for noise, must submit a Noise Compliance Statement.

On a site where the information gathered from the site sensitivity verification differs from the designation of "very high" sensitivity on the screening tool and it is found to be of a "low" sensitivity, a Noise Compliance Statement must be submitted.

On a site where the information gathered from the initial site sensitivity verification differs from the designation of "low" sensitivity on the screening tool and it is found to be of a "very high" sensitivity, a Noise Specialist Assessment must be submitted.

If any part of the proposed development footprint falls within an area of "very high" sensitivity, the assessment and reporting requirements prescribed for the "very high" sensitivity apply to the entire footprint excluding linear activities for which noise impacts are associated with construction activities only and the noise levels return to the current levels after the completion of construction activities, in which case a compliance statement applies. In the context of this protocol, development footprint means the area on which the proposed development will take place and includes any area that will be disturbed.

With a number of potential noise-sensitive receptors living within 1,000m from the proposed power generation activities, this assessment will be comprehensive and submit a Noise Specialist Assessment.

The minimum requirements for a Noise Specialist Study are also covered in **Section 3** in the form of a checklist.

4.9.2 Requirements as per South African National Standards

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

In addition, SANS 10328:2008 (Edition 3) 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 EIA purposes. These minimum requirements are:

- a) the purpose of the investigation (see **section 4.1**);
- b) a brief description of the planned development or the changes that are being considered (see **section 4.2**);
- c) a brief description of the existing environment including, where relevant, the topography, surface conditions and meteorological conditions during measurements (see **section 4.4**);
- d) the identified noise sources together with their respective sound pressure levels or sound power levels (PWL) (or both) and, where applicable, the operating cycles, the nature of sound emission, the spectral composition and the directional characteristics (see **section 6**);
- e) the identified noise sources that were not taken into account and the reasons as to why they were not investigated (see **section 6, 8 and 9**);
- f) the identified noise-sensitive developments and the noise impact on them (see **section 4.7, 10 and 11**);
- g) where applicable, any assumptions, with references, made with regard to any calculations or determination of source and propagation characteristics (see **section 9**);
- h) 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 (see **section 8 and 9**);
- i) 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 (see **sections 4.4, 4.5, 8 and 10**);
 - j) the location of measuring or calculating points in a sketch or on a map (see **sections 4.4 and section 10**);
 - k) quantification of the noise impact with, where relevant, reference to the literature consulted and the assumptions made (see **section 10**);
 - l) alternatives that were considered and the results of those that were investigated (see **section 11.4**);
 - m) a list of all the interested or affected parties that offered any comments with respect to the environmental noise impact investigation (see **section 4.8**);
 - n) 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 (see **section 4.8**);
 - o) conclusions that were reached (see **section 14**);
 - p) proposed recommendations (see **section 14**);
 - q) 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 (see **section 12 and 14**); and
 - r) 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 (see **section 14**).

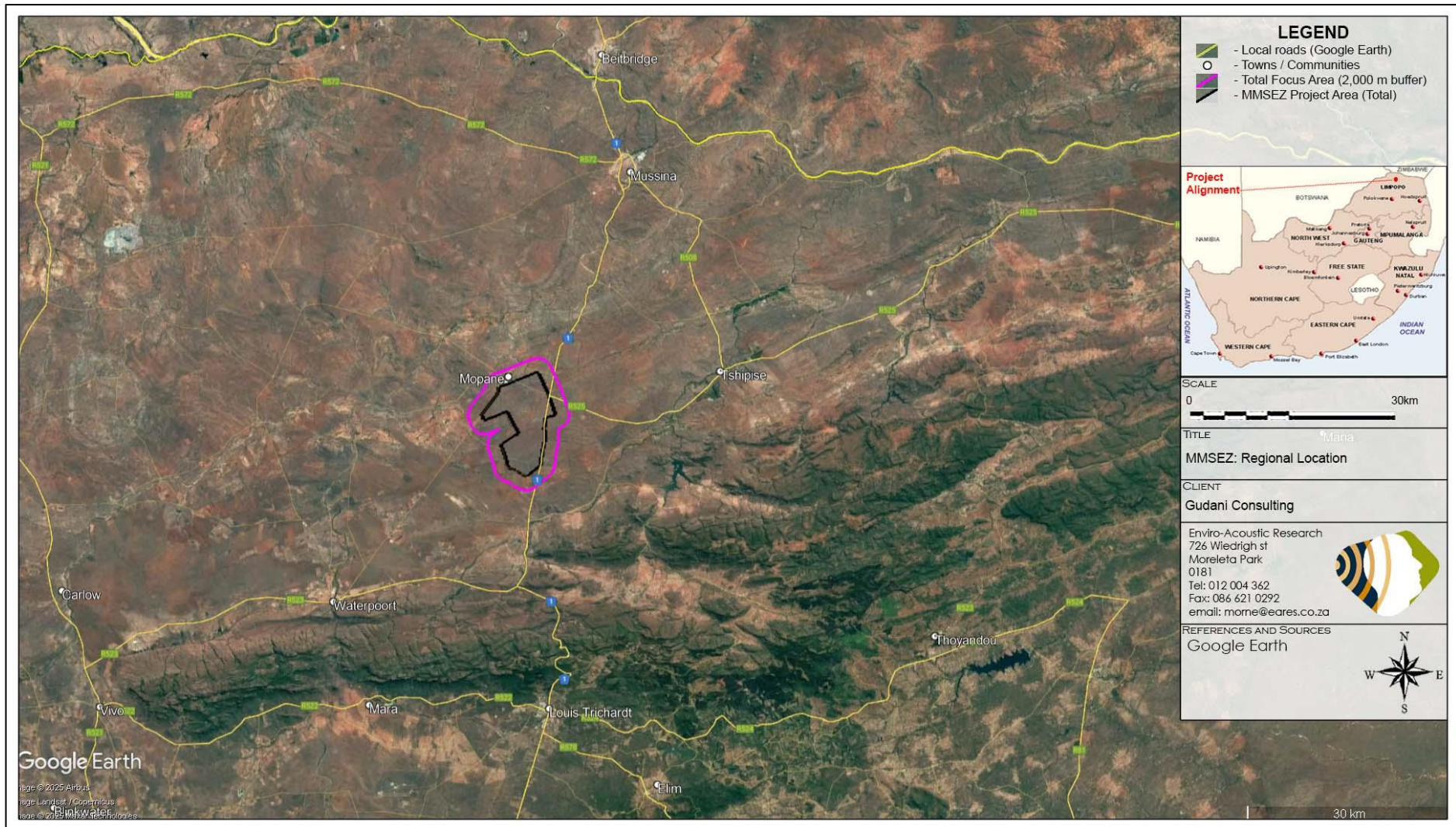
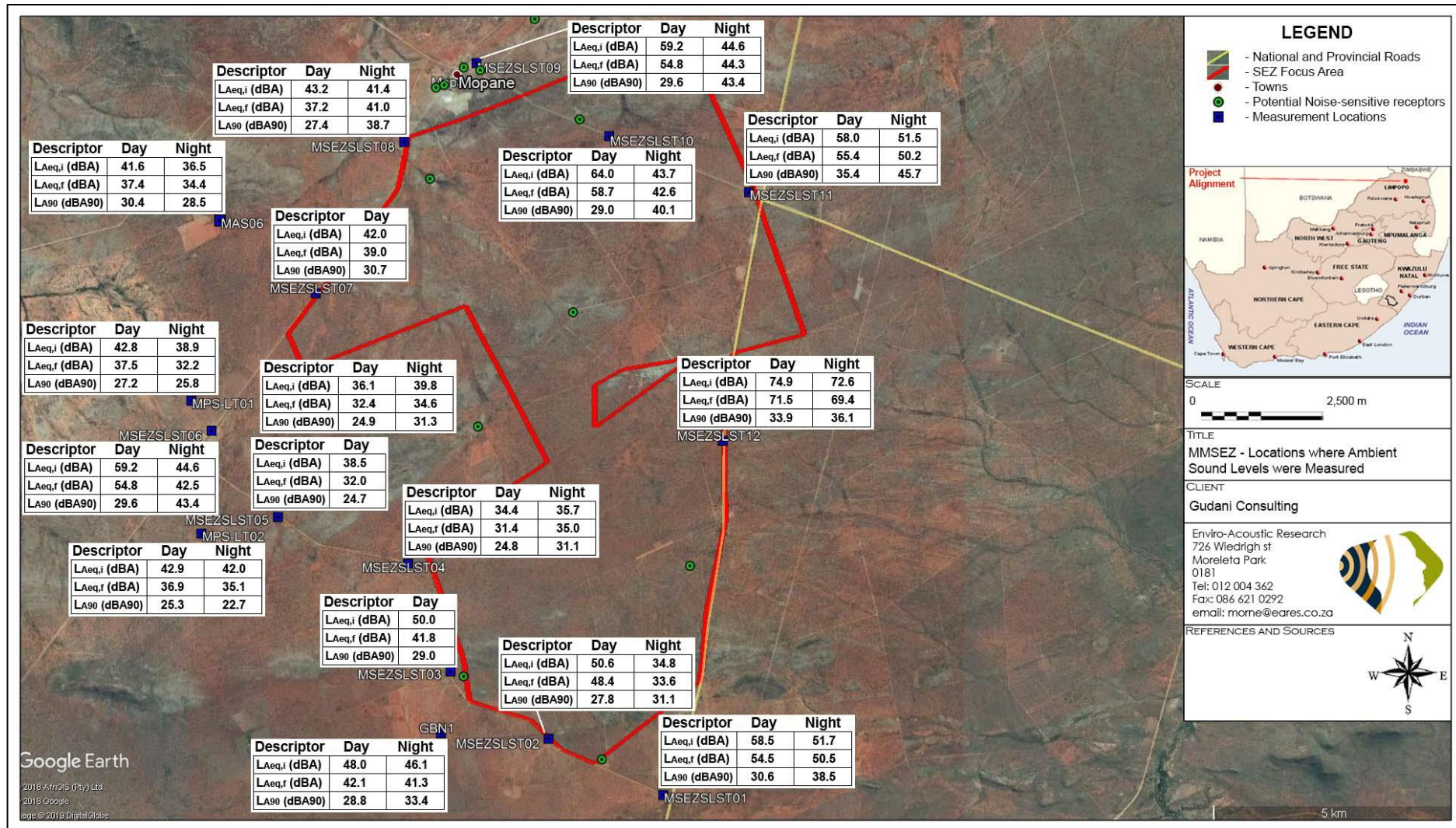


Figure 4-1: Locality map indicating the proposed project focus area



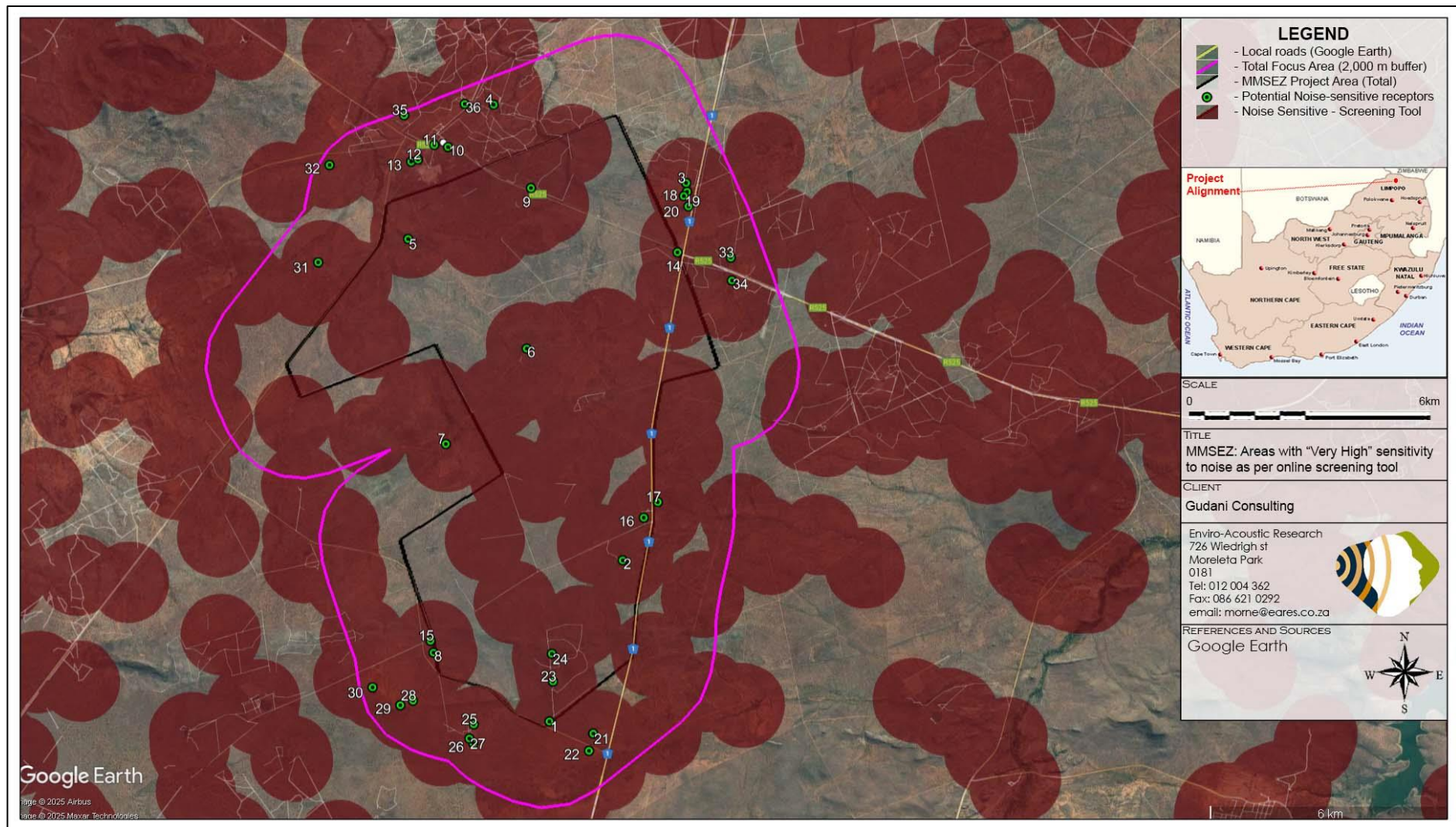


Figure 4-3: Aerial image indicating areas with a "very high" sensitivity to noise as per screening tool

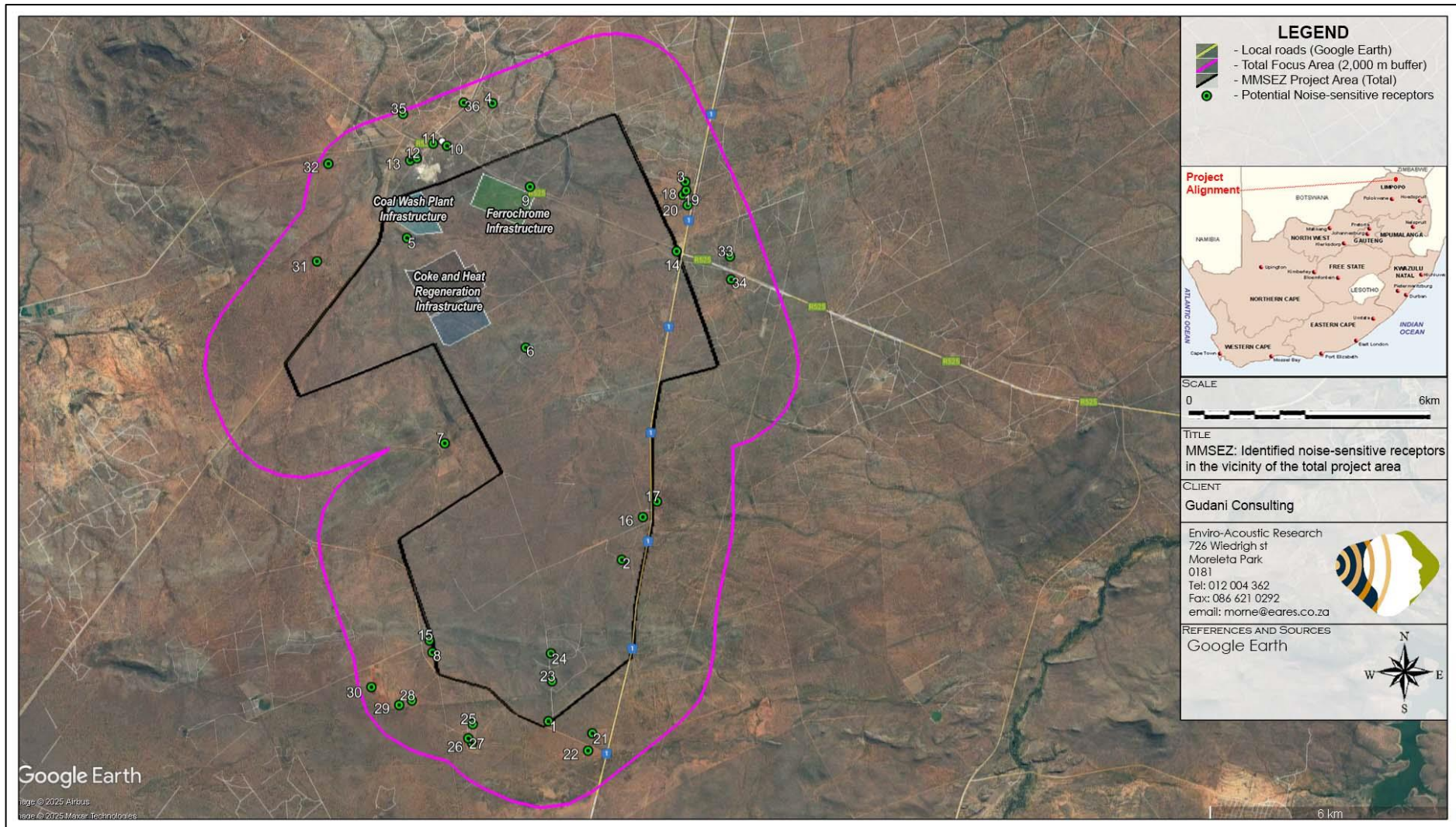


Figure 4-4: Aerial image indicating potentially noise-sensitive receptors close to the proposed project focus area

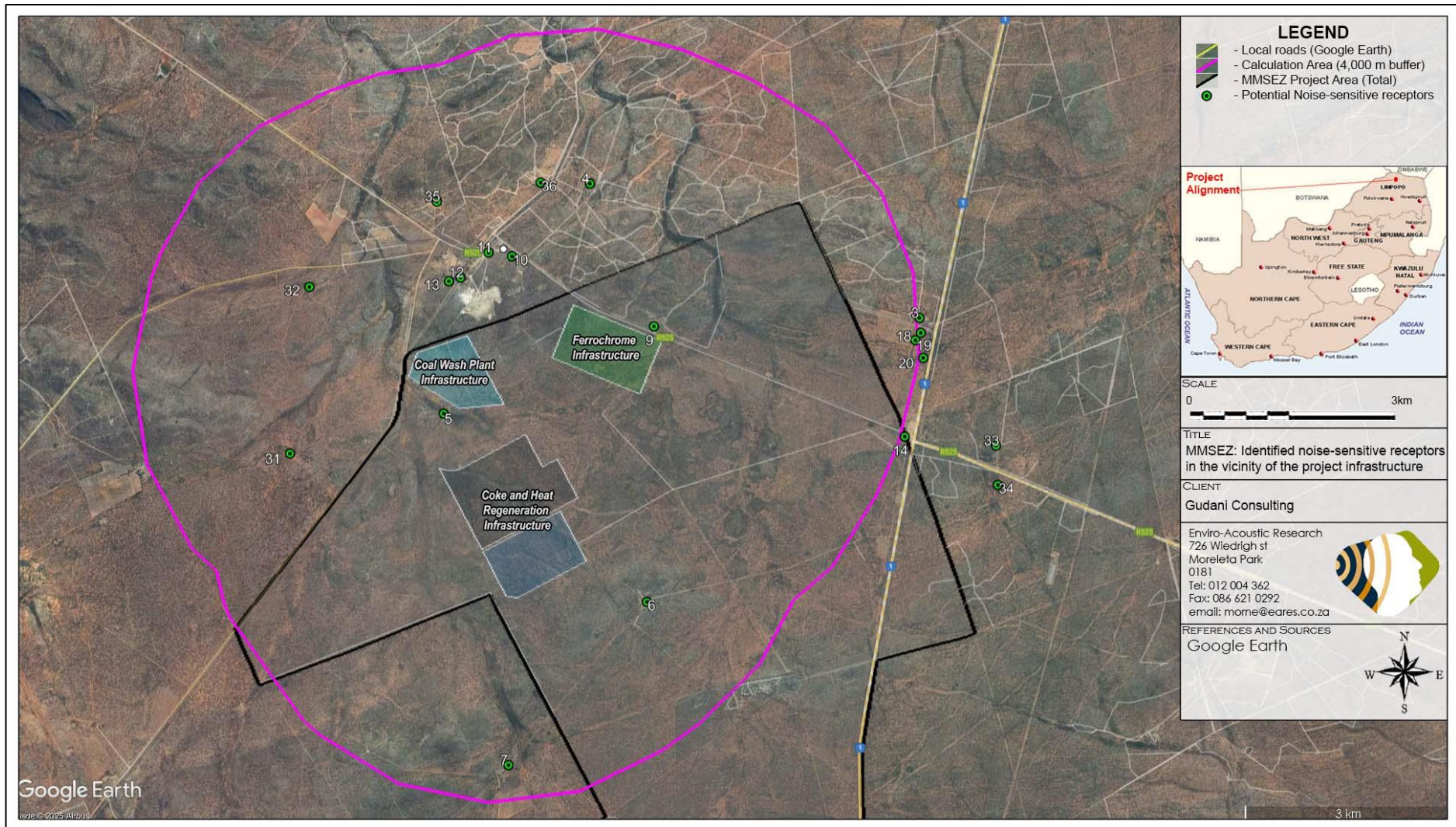


Figure 4-5: Aerial image indicating potentially NSR close to the proposed project infrastructure

5 LEGAL CONTEXT, POLICIES AND GUIDELINES

5.1 THE REPUBLIC OF SOUTH AFRICA CONSTITUTION ACT (“THE CONSTITUTION”)

The environmental rights contained in section 24 of the Constitution provide that everyone is entitled to an environment that is not harmful to his or her well-being. In the context of noise, this requires a determination of what level of noise is harmful to well-being. The general approach of the common law is to define an acceptable level of noise as that which the reasonable person can be expected to tolerate in the particular circumstances. The subjectivity of this approach can be problematic, which has led to the development of noise standards (see **Section 5.4**).

“Noise pollution” is specifically included in Part B of Schedule 5 of the Constitution, which means that noise pollution control is a local authority competence, provided that the local authority concerned has the capacity to carry out this function.

5.2 THE NATIONAL ENVIRONMENTAL MANAGEMENT ACT (ACT 107 OF 1998)

The National Environmental Management Act (“NEMA”) defines “pollution” to include any change in the environment, including noise. A duty therefore arises under section 28 of NEMA to take reasonable measures while establishing and operating any facility to prevent noise pollution occurring. NEMA sets out measures, which may be regarded as reasonable. They include the following measures:

1. to investigate, assess and evaluate the impact on the environment
2. to inform and educate employees about the environmental risks of their work and the manner in which their tasks must be performed to avoid causing significant pollution or degradation of the environment
3. to cease, modify or control any act, activity or process causing the pollution or degradation
4. to contain or prevent the movement of the pollution or degradation
5. to eliminate any source of the pollution or degradation
6. to remedy the effects of the pollution or degradation

In addition, a number of regulations have been promulgated as Regulation 982 of December 2014 (Government Notice 38282) in terms of this Act. It defines minimum information requirements for specialist reports, with Government Gazette (GG) 43110 (20 March 2020) updating the minimum requirements for reporting.

GG 43110 prescribe general requirements for undertaking site sensitivity verification and for protocols for the assessment and minimum report content requirements of environmental impacts for environmental themes for activities requiring environmental authorisation. These protocols were promulgated in terms of sections 24(5)(a), (h) and 44 of the National Environmental Management Act, 1998.

When the requirements of a protocol apply, the requirements of Appendix 6 of the Environmental Impact Assessment Regulations, as amended, (EIA Regulations), promulgated under sections 24(5) and 44 of the National Environmental Management Act, 1998 (Act No. 107 of 1998), are replaced by these requirements.

5.3 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 5.3.1**.

5.3.1 National Noise Control Regulations (GN R154 of 1992)

In terms of section 25 of the ECA, the National Noise Control Regulations (GN R 154 of 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 exist in the Free State, Gauteng and Western Cape provinces but not in KwaZulu Natal.

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—

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 meters, but not more than 1,4 meters, 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;

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 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 e, 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 –

(a) establish a new township unless the lay-out plan concerned, if required by a local authority, indicates in accordance with the specifications of the local authority, the existing and future sources of noise, with concomitant dBA values which are foreseen in the township for a period of 15 years following the date on which the erection of the buildings in and around the township commences;

(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 level 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 (f) designate a controlled area in its area of jurisdiction or amend or cancel an existing controlled area by notice in the Official Gazette concerned.

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".

General prohibition

3. No person shall -

(c) make changes to existing facilities or existing uses of land or buildings or erect new buildings, if it shall in the opinion of a local authority house or cause activities which shall, after such change or erection, cause a disturbing noise, unless precautionary measures to prevent the disturbing noise have been taken to the satisfaction of the local authority;

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."*

5.4 NOISE STANDARDS

There are a few South African scientific standards (SABS) relevant to noise from developments, 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*.

It must be noted that SANS 10103:2008 does stipulate *"for industries legitimately operating in an industrial district during the entire 24 h day/night cycle, $L_{Req,d} = L_{Req,n} = 70$ dBA can be considered as typical and normal"*.

5.5 INTERNATIONAL GUIDELINES

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

5.5.1 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. It discusses the specific effects of noise on communities including:

- Interference with communication, noise-induced hearing impairment, sleep disturbance effects, cardiovascular and psychophysiological effects, mental health effects, effects on performance, annoyance responses and effects on social behavior.

It further discusses how noise can affect (and propose guideline noise levels) specific environments such as residential dwellings, schools, preschools, hospitals, ceremonies, festivals and entertainment events, sounds through headphones, impulsive sounds from toys, fireworks and firearms, and parklands and conservation areas.

To protect the majority of people from being affected by noise during the daytime, it proposes that sound levels at outdoor living areas should not exceed 55 dB L_{Aeq} for a

steady, continuous noise. To protect the majority of people from being moderately annoyed during the day, the outdoor sound pressure level should not exceed 50 dB L_{Aeq} . At night, equivalent sound levels at the outside façades of the living spaces should not exceed 45 dBA and 60 dBA L_{Amax} so that people may sleep with bedroom windows open. It is critical to note that this guideline requires the sound level measuring instrument to be set on the “fast” detection setting.

5.5.2 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. The report notes that only below 30 dB (outside annual average) are “*no significant biological effects observed,*” and that between 30 and 40 dB, several effects are observed, with the chronically ill and children being more susceptible; however, “*even in the worst cases the effects seem modest.*” Elsewhere, the report states more definitively, “*There is no sufficient evidence that the biological effects observed at the level below 40 dB (night, outside) are harmful to health.*” At levels over 40 dB “*Adverse health effects are observed*” and “*many people have to adapt their lives to cope with the noise at night. Vulnerable groups are more severely affected.*”

The 184-page report offers a comprehensive overview of research into the various effects of noise on sleep quality and health (including the health effects of non-waking sleep arousal), and is recommended reading for anyone working with noise issues. The use of an outdoor noise standard is in part designed to acknowledge that people do prefer to leave windows open when sleeping, though the year-long average may be difficult to obtain (it would require longer-term sound monitoring than is usually budgeted for by either industry or neighbourhood groups).

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.”

5.5.3 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 participating banks chose to model the Equator Principles on the environmental standards of the World Bank (1999) 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.

5.5.4 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, including:

- Selecting equipment with lower PWL;
- Installing silencers for fans;
- Installing suitable mufflers on engine exhausts and compressor components;
- Installing acoustic enclosures for equipment casing radiating noise;
- Improving the acoustic performance of constructed buildings, apply sound insulation;
- Installing acoustic barriers without gaps and with a continuous minimum surface density of 10 kg/m² in order to minimize the transmission of sound through the barrier. Barriers should be located as close to the source or to the receptor location to be effective;
- Installing vibration isolation for mechanical equipment;
- Limiting the hours of operation for specific pieces of equipment or operations, especially mobile sources operating through community areas ;
- Re-locating noise sources to less sensitive areas to take advantage of distance and shielding;
- Placement of permanent facilities away from community areas if possible;
- Taking advantage of the natural topography as a noise buffer during facility design;

- Reducing project traffic routing through community areas wherever possible;
- Planning flight routes, timing and altitude for aircraft (airplane and helicopter) flying over community areas; and
- Developing a mechanism to record and respond to complaints.

It sets noise level guidelines (see **Table 5-1**) and highlights 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. Therefore, it is EARES's 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 5-1: 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 $L_{Aeq,1hr}$ 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 in Europe.

5.5.5 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 and applied from 3 January 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.

6 POTENTIAL NOISE SOURCES

Increased noise levels are directly linked with the various activities associated with the construction of the MMSEZ infrastructure, the operational activities and the future closure and decommissioning phases of such activities. The potential noise impacts from the activities associated with these phases are discussed in the following sections.

It should be noted that there are numerous equipment and activities taking place at such a project, of which only a few pieces of equipment were identified and listed. This however is the main generators of noise, with the other activities or equipment having a minor to insignificant impact on the noise levels.

6.1 POTENTIAL NOISE SOURCES: CONSTRUCTION PHASE

Depending on the activity, construction activities may take between 12 and 24 months, with this assessment considering a potential scenario where simultaneous construction activities may take place at the Coal Wash Plant, the Ferrochrome Plant as well as the Coke and HRSG plant. It is assumed that construction will include the following principal activities at three different areas:

- Site survey and preparation;
- Transport of components and equipment to site – all components will be brought to site in sections by means of flatbed trucks. The typical civil engineering construction equipment will need to be brought to the site for the civil works (e.g., excavators, trucks, graders, compaction equipment, cement trucks, etc.). The transportation of ready-mix concrete to site or the materials for onsite concrete batching will result in a temporary increase in heavy traffic;
- Establishment of site entrance, internal access roads, contractor's compound and security fencing;
- Site preparation activities will include clearance of vegetation at the footprint of the site infrastructure. These activities will require the stripping of topsoil which will need to be stockpiled, backfilled and/or spread on site;
- Construction of required foundations at the plant and other infrastructure;
- The establishment of various infrastructure components; and
- Testing and the commissioning of the processes.

Construction activities will take place at various locations, at different times, with equipment operating under different loads (generating different noise levels). It should be noted that

noise levels generated by such industrial projects is generally significantly less than the operational phase.

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 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. Potential maximum noise levels generated by various construction equipment as well as the potential extent of these sounds are presented in **Table 6-1**.

Average or equivalent sound levels are another factor that impacts on the ambient sound levels and is the constant sound level that the receptor can experience. Typical PWL associated with various activities that may be found at a construction site is presented in **Table 6-2**. A worst-case scenario will be evaluated, considering a number of general noise sources at each project area, emitting 108.8 dBA (re 1 pW) at a number of locations. It is assumed that general noise sources will have an acoustic usage factor of 100%.

To account for undefined construction noises sources, area noise sources (emitting 65 dBA/m² re 1 pW) are included over the full foot-print of the major project infrastructure.

This assessment in addition will consider an average of 20 each heavy road vehicles (HRV) and light-delivery vehicles (LDV) per hour, per project, along a conceptual route. This will allow for 120 vehicles travelling between the N1 road and the Ferrochrome plant, 80 vehicles between the Ferrochrome and the Coal Wash plants, and 40 vehicles travelling between the Coal Wash and Coke/HRSG plants. It is assumed that all vehicles will travel at an average speed of 60 km/hr.

Table 6-1: Potential maximum noise levels generated by various equipment

Equipment Description ⁵	Impact Device?	Maximum PWL (dBA)	Operational Noise Level at given distance considering potential maximum noise 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
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 Batch Plant	No	117.7	92.7	86.7	80.6	72.7	66.7	63.1	60.6	57.1	52.7	49.2	46.7	40.6
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 Pump Truck	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
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
Dozer	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
Drum Mixer	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
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 (<25KVA)	No	104.7	79.7	73.7	67.6	59.7	53.7	50.1	47.6	44.1	39.7	36.2	33.7	27.6
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
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
Rivit Buster/Chipping Gun	Yes	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
Sonic Pile Driver	Yes	124.2	99.2	93.2	87.2	79.2	73.2	69.6	67.2	63.6	59.2	55.7	53.2	47.2
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
Vibratory/Impact 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

⁵ Equipment list and PWL sources: http://www.fhwa.dot.gov/environment/noise/construction_noise/handbook/handbook09.cfm and British Standard BS5228:20124 - "Noise and Vibration Control on Construction and Open Sites"

Table 6-2: Potential equivalent noise levels generated by various equipment

Equipment Description	Equivalent (average) PWL, (dBA)	Operational Noise Level at given distance considering equivalent (average) PWL (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 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
Cement truck (with cement)	111.7	86.7	80.7	74.7	66.7	60.7	57.2	54.7	51.2	46.7	43.2	40.7	34.7
Compressor - Fuel Gas	96.4	71.4	65.4	59.4	51.4	45.4	41.9	39.4	35.9	31.4	27.9	25.4	19.4
Compressor - Gas, silenced	107.4	82.4	76.4	70.3	62.4	56.4	52.8	50.3	46.8	42.4	38.9	36.4	30.3
Compressor - Gas, unmitigated	113.3	88.4	82.4	76.3	68.4	62.4	58.8	56.3	52.8	48.4	44.9	42.4	36.3
Compressor building	92.8	67.9	61.8	55.8	47.9	41.8	38.3	35.8	32.3	27.9	24.3	21.8	15.8
Crane - Construction, typical	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
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 - Cat 416D	103.9	78.9	72.9	66.8	58.9	52.9	49.3	46.8	43.3	38.9	35.4	32.9	26.8
Fans - Compressor cooling	95.4	70.4	64.4	58.4	50.4	44.4	40.9	38.4	34.8	30.4	26.9	24.4	18.4
Fans - Cooling, array	111.8	86.8	80.8	74.8	66.8	60.8	57.3	54.8	51.3	46.8	43.3	40.8	34.8
Fans - Water Cooling	100.4	75.4	69.4	63.4	55.4	49.4	45.9	43.4	39.9	35.4	31.9	29.4	23.4
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
General noise	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
General noise (area)	64.4	39.5	33.4	27.4	19.5	13.4	9.9	7.4	3.9	-0.5	-4.1	-6.6	-12.6
Generator - C2250 D5 (silenced)	71.4	46.5	40.4	34.4	26.5	20.4	16.9	14.4	10.9	6.5	2.9	0.4	-5.6
Grader - Operational Hitachi	108.9	83.9	77.9	71.9	63.9	57.9	54.4	51.9	48.4	43.9	40.4	37.9	31.9
Pile Driver - Impact	129.4	104.4	98.4	92.4	84.4	78.4	74.9	72.4	68.8	64.4	60.9	58.4	52.4
Pile Driver - Sonic	124.2	99.2	93.2	87.2	79.2	73.2	69.6	67.2	63.6	59.2	55.7	53.2	47.2
Pump - Condensate	103.5	78.5	72.5	66.5	58.5	52.5	49.0	46.5	43.0	38.5	35.0	32.5	26.5
Pump - Demineralized Water	89.5	64.5	58.5	52.5	44.5	38.5	35.0	32.5	29.0	24.5	21.0	18.5	12.5
Pumps (Cavity, slurry, VSD, etc)	89.5	64.5	58.5	52.5	44.5	38.5	35.0	32.5	28.9	24.5	21.0	18.5	12.5
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
Rock Breaker, CAT	120.7	95.7	89.7	83.7	75.7	69.7	66.2	63.7	60.2	55.7	52.2	49.7	43.7
Substation (one transformer)	85.2	60.3	54.2	48.2	40.3	34.2	30.7	28.2	24.7	20.3	16.7	14.2	8.2
Trenching Machine	115.6	90.6	84.6	78.6	70.6	64.6	61.1	58.6	55.1	50.6	47.1	44.6	38.6

6.2 POTENTIAL NOISE SOURCES: OPERATIONAL PHASE

As with any large industrial project, there will thousands of activities and equipment that could generate noise, with the assessment mainly focusing on the main equipment or activities that would generate 95% of the noise. Activities and equipment generating low levels will not be considered, instead using an area noise source over the project footprint to account for such minor noise sources. As the layout as well as the various noise sources are not defined during the EIA process, this assessment will consider the information gained from similar projects where noise levels were measured.

As noise noises were not defined, this assessment will not consider acoustic usage factors (AUF), assuming that all equipment generate noise 100% of the time, assuming worst-case PWLs for the various equipment and activities. In addition, the potential effects of buildings were not considered (which will absorb, reflect, etc. acoustic energy). This approach would result in the over-modelling of potential noise levels, in line with the precautionary principle, used in instances where project information is not well defined. Main noise sources considered are discussed in the following subsections.

6.2.1 Coal Wash Plant

The coal wash plant serves to clean and process raw coal to improve its quality and market value. This process involves removing unwanted materials like rocks, dirt, ash, and sulphur from the coal, which enhances its heating value and reduces the cost of transportation, with the “cleaned” coal ready for further processing into products like coke for metallurgical industries.

The main source of noise typically would be crushing and screening activities, with lesser noises generated by material handling, cyclones and conveying contributing to the total noise levels.

For the purpose of this assessment, the following main noise sources will be considered:

- An area noise source of 55,000 m² to account for undefined noise sources;
- Various conveyors;
- Primary and secondary crushing;
- Screening activities;
- Coal beneficiation process;
- Material handling and conveyor transfer activities.

6.2.2 Coke and HRSG Plants

Coal is the main ingredient used to make coke, as coal cannot be used directly into a furnace due to all the harmful by-products associated with coal. As such the coal is converted into coke by heating the coal in an oxygen-free environment.

After heating up the coal into coke, the coke is unloaded from the oven before being quenched in the **quenching** tower using water. The finished coke product is about two-thirds the weight of the original raw coal material, with most of the impurities removed.

Main sources of noise include the coal preparation workshop, coking workshop, coke quenching workshop, coke screening workshop, waste heat power generation plant and flue gas desulfurization and dust removal workshop. For the purpose of this assessment, the following noise sources were included in the noise model:

- An area noise source of 400,000 m² to account for undefined noise sources;
- Various conveyors;
- Stacker reclaimers and feed screens (for material handling);
- Crusher rooms;
- Coking ovens (this noise source could not be defined, and it is represented by four quenching towers and four quenching cars, which should emit similar, or higher noises than the coking ovens);
- Quenching workshop, represented by four quenching towers and four quenching cars;
- Cooling towers, chimneys and baghouses; and
- A boiler room, power generation and a HRSG unit.

6.2.3 Ferrochrome Plant

A ferrochrome smelter is a metallurgical facility that produces ferrochrome, an alloy of chromium and iron, primarily used in stainless steel production. The smelting process typically involves carbothermic reduction of chromite ore (FeCr_2O_4) in a Furnace. The main equipment associated with a ferrochrome smelter include:

- Raw Material Handling and Preparation, which includes crushing and screening units, dryers and the blending of reactants (chromite ore and coke);
- Furnaces, which includes the furnace shell, cooling, charging and tapping systems;
- Slag and Metal Handling, including the ladle cars and transfer ladles, slag granulation and crushing units and casting units;
- Off-gas and Emission Control, including ducting, baghouse and scrubbers as well as induced-draft fans; and

- Auxiliary Equipment, such as power supply and distribution, process control and automation systems, cooling towers / heat exchangers, compressed air systems and fire protection systems.

For modelling, the following noise sources were included:

- An area noise source of 750,000 m² to account for undefined noise sources;
- Various conveyors and conveyor transfer points;
- Raw material handling and blending (material receiving, crushing, blending, etc.)
- Numerous furnaces and chimneys;
- Smelter buildings;
- Air handling units (cooling and air handling); and
- Bag houses.

A list of the activities and equipment, as well as the associated PWLs are included in [Appendix B](#).

6.2.4 Operational Traffic

This assessment in addition will consider an average of 20 each heavy road vehicles (HRV) and light-delivery vehicles (LDV) per hour, per project, along a conceptual route. This will allow for 120 vehicles travelling between the N1 road and the Ferrochrome plant, 80 vehicles between the Ferrochrome and the Coal Wash plants, and 40 vehicles travelling between the Coal Wash and Coke/HRSG plants. It is assumed that all vehicles will travel at an average speed of 60 km/hr.

6.3 POTENTIAL NOISE SOURCES: FUTURE NOISE SCENARIO – DECOMMISSIONING

While there are numerous activities that can take place during the decommissioning stage, the potential noise impact will only be discussed in general. This is because the noise impacts associated with the decommissioning phase is normally less than both the construction and operational phases for the following reasons:

- Final decommissioning normally takes place only during the day, a time period when existing ambient sound levels are higher, generally masking most external noises for surrounding receptors; and
- There is a lower urgency of completing this phase and less equipment remains onsite (and are used simultaneously) to affect the final decommissioning.

7 METHODS: NOISE IMPACT ASSESSMENT

7.1 WHY NOISE CONCERNS COMMUNITIES⁶

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, and 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 prefer 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);
- 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 World Health Organization, 1999; Noise quest, 2010; Journal of Acoustical Society of America, 2009

7.1.1 Annoyance associated with Industrial Processes

Annoyance is the most widely acknowledged effect of environmental noise exposure, and is considered to be the most widespread. It is estimated that less than a third of the individual noise annoyance is accounted for by acoustic parameters, and that the non-acoustic factors plays a major role. Non-acoustic factors that have been identified include age, economic dependence on the noise source, attitude towards the noise source and self-reported noise sensitivity.

On the basis of a number of studies into noise annoyance, exposure-response relationships were derived for high annoyance from different noise sources. These relationships, illustrated in **Figure 7-1**, are recommended in a European Union position paper published in 2002,⁷ stipulating policy regarding the quantification of annoyance. This can be used in environmental health impact assessment and cost-benefit analysis to translate noise maps into overviews of the numbers of persons that may be annoyed, thereby giving insight into the situation expected in the long-term. It is not applicable to local complaint-type situations or to an assessment of the short-term effects of a change in noise levels.

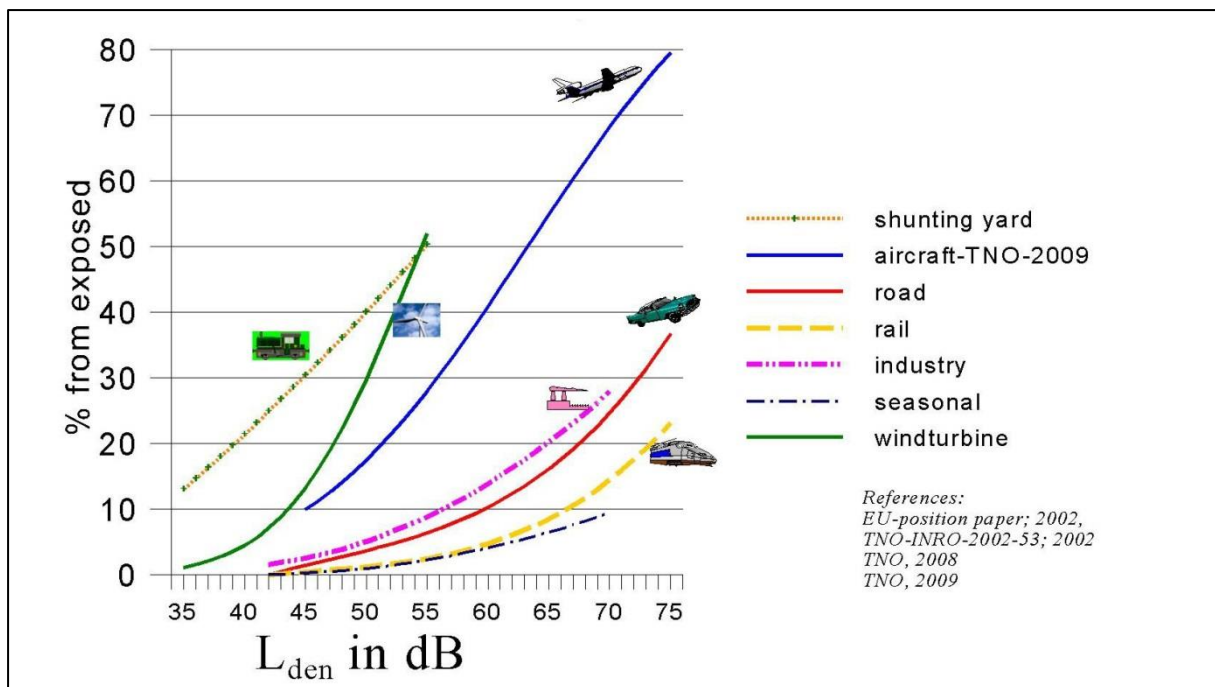


Figure 7-1: Percentage of annoyed persons as a function of the day-evening-night noise exposure at the façade of a dwelling

⁽⁷⁾ Image from presentation, Almgren (2011). Sources Miliue, 2010, European Comm., 2010, Jansen, 2009.

As shown in **Figure 7-1**, there is significant potential of annoyance associated with noise from shunting operations, mainly due to the highly impulsive character of the noises created.

7.2 IMPACT ASSESSMENT CRITERIA

7.2.1 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 that 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.

7.2.2 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 of 2014 in terms of the NEMA, SANS 10103:2008, and guidelines from the WHO.

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, caused by a new source of noise. With regards to the Noise Control Regulations, an increase of more than 7 dBA is considered a disturbing noise. See also **Figure 7-2**.
- *Zone Sound Levels:* Previously referred to as the acceptable rating levels, it sets acceptable noise levels for various areas. See also **Table 7-1**.

- **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.

In South Africa, the document that addresses the issues concerning environmental noise is SANS 10103:2008 (See also **Table 7-1**). 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.

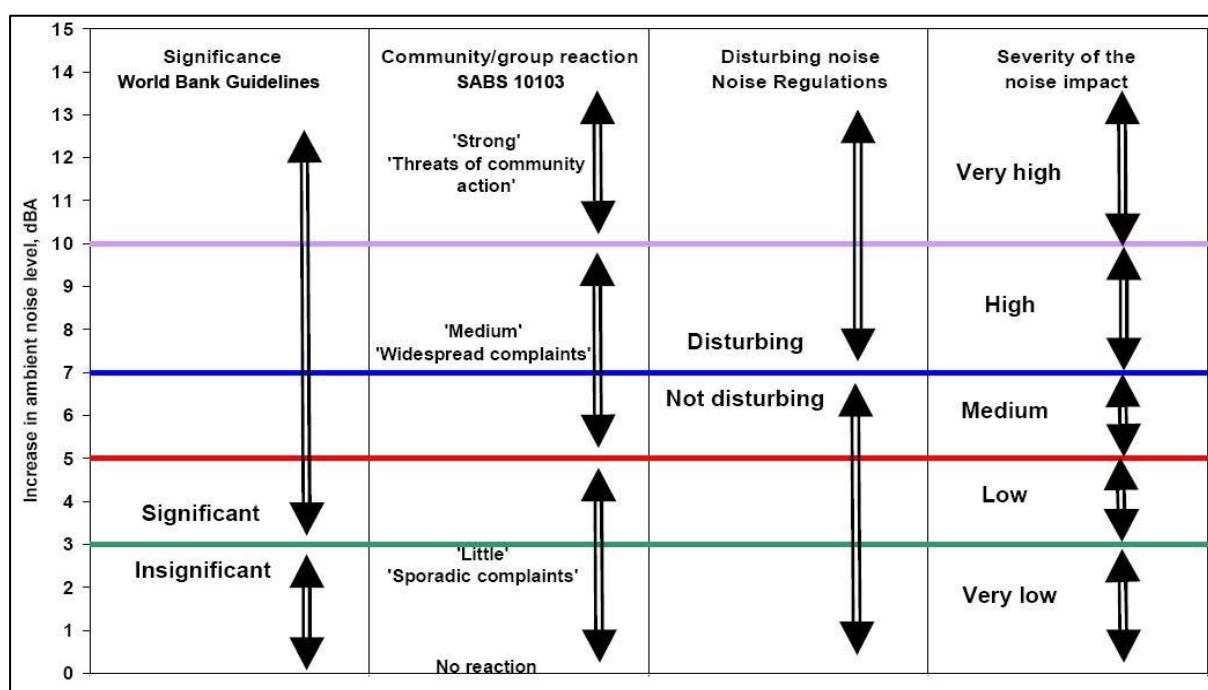


Figure 7-2: Criteria to assess the significance of impacts stemming from noise

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:

- **$\Delta \leq 3$ 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.
- **$3 < \Delta \leq 5$ 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.
- **$5 < \Delta \leq 15$ 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 by national and provincial noise control regulations.

Table 7-1: 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 $L_{R,dn}$	Daytime $L_{Req,d}$	Night-time $L_{Req,n}$	Day/night $L_{R,dn}$	Daytime $L_{Req,d}$	Night-time $L_{Req,n}$
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

7.3 SETTING APPROPRIATE NOISE LIMITS

Onsite ambient sound measurements (**Section 4.4**) indicated a site with a character typical of a rural noise district. Considering the developmental character, the acceptable zone sound level (noise rating level) during low and no-wind conditions could be typical of a rural noise district for the day- and night-time periods, e.g.:

- 45 dBA for the daytime period; and,
- 35 dBA for the night-time period.

When evaluating the results of the ambient sound levels as measured, ambient sound levels were typical of a rural environment. To assess the noise impact occurring during the construction and operational phase, this assessment will use the following noise limits:

- **50 dBA** for the daytime period (based on the 42.7 dBA average daytime sound level, approximately 7 dBA higher than the average ambient sound levels measured). Once noise level exceeds these levels, NSR may start to complain about noise levels, and, the complaint could be considered valid and reasonable; and,

- **41 dBA** for the night-time period (based on the 34.0 dBA average night-time sound level, approximately 7 dBA higher than the average ambient sound levels measured).

7.4 DETERMINING THE SIGNIFICANCE OF THE NOISE IMPACT

The level of detail as depicted in the 2014 EIA regulations, as amended on 07 April 2017, was fine-tuned by assigning specific values to each impact. In order to establish a coherent framework within which all impacts could be objectively assessed, it was necessary to establish a rating system, which was applied consistently to all the criteria. For such purposes each aspect was assigned a value as defined in the third column in the tables below.

The impact consequence is determined by summing the scores of Magnitude (**Table 7-2**), Duration (**Table 7-3**) and Spatial Extent (**Table 7-4**). The impact significance (see **Table 7-7**) is determined by multiplying the Consequence result with the Probability score (**Table 7-5**). An explanation of the impact assessment criteria is defined in the following tables.

Table 7-2: Impact Assessment Criteria – Magnitude

This defines the impact as experienced by any receptor. In this report the receptor is defined as any resident in the area, but excludes faunal species.		
Rating	Description	Score
Minor	Increase in average sound pressure levels between 0 and 3 dB from the expected ambient sound levels. Ambient sound levels are defined by the lower of the measured $L_{Aeq,8hr}$ or $L_{Aeq,16hr}$ during measurement dates. Total projected noise level is less than the Zone Sound Level and/or Equator Principle in wind-still conditions.	2
Low	Increase in average sound pressure levels between 3 and 5 dB from the expected ambient sound levels. Total projected noise levels between 3 and 5 above the Zone Sound Level and/or Equator Principle (wind-less conditions).	4
Moderate	Increase in average sound pressure levels between 5 and 7 dB from the ambient sound levels. Increase in sound pressure levels between 5 and 7 above the Zone Sound Level and/or Equator Principle (wind less conditions). Sporadic complaints expected.	6
High	Increase in average sound pressure levels between 7 and 10 from the ambient sound level. Total projected noise levels between 7 and 10 dBA above the Zone Sound Level and/or Equator Principle (wind-less condition). Medium to widespread complaints expected.	8
Very High	Increase in average ambient sound pressure levels higher than 10 dBA. Total projected noise levels higher than 10 dB above the Zone Sound Level and/or Equator Principle (wind less-conditions). Change of 10 dBA is perceived as 'twice as loud', leading to widespread complaints and even threats of community or group action. Any point where instantaneous noise levels exceed 65 dBA at any receptor.	10

Table 7-3: Impact Assessment Criteria - Duration

The lifetime of the impact that is measured in relation to the lifetime of the proposed development (construction, operation and closure phases). Will the receptors be subjected to increased noise levels for the lifetime duration of the project, or only infrequently.		
Rating	Description	Score
<i>Temporary</i>	Impacts are predicted to be of very short duration (portion of construction period) and intermittent/occasional (0 – 1 year).	1
<i>Short term</i>	Impacts that are short, predicted to last only for the duration of the construction period (2 - 5 years).	2
<i>Medium term</i>	Impacts that will continue for the life of the Project, but ceases when the Project stops operating (5 - 15 years).	3
<i>Long term</i>	Impacts that will continue for the life of the Project, but ceases when the Project stops operating (>15 years).	4
<i>Permanent</i>	Impacts that cause a permanent change in the affected receptor or resource (e.g. removal or destruction of ecological habitat) that endures substantially beyond the Project lifetime.	5

Table 7-4: Impact Assessment Criteria – Spatial extent

Classification of the physical and spatial scale of the impact		
Rating	Description	Score
<i>Site</i>	The impacted area extends only as far as the activity, such as the footprint occurring within the total site area.	1
<i>Local</i>	The impact could affect the local area (within 1,000 m from site).	2
<i>Regional</i>	The impact could affect the area including the neighbouring farms, the transport routes and the adjoining towns (further than 1,000 m from site).	3
<i>National</i>	The impact could have an effect that expands throughout the country (South Africa).	4
<i>International</i>	Where the impact has international ramifications that extend beyond the boundaries of South Africa.	5

Table 7-5: Impact Assessment Criteria - Probability

This describes the likelihood of the impacts actually occurring, and whether it will impact on an identified receptor. The impact may occur for any length of time during the life cycle of the activity, and not at any given time. The classes are rated as follows:		
Rating	Description	Score
<i>Improbable</i>	The possibility of the impact occurring is none, due either to the circumstances, design or experience. The chance of this impact occurring is zero (0 %).	1
<i>Possible</i>	The possibility of the impact occurring is very low, due either to the circumstances, design or experience. The chances of this impact occurring is defined to be up to 25 %.	2
<i>Likely</i>	There is a possibility that the impact will occur to the extent that provisions must therefore be made. The chances of this impact occurring is defined to be between 25% and 50 %.	3
<i>Highly Likely</i>	It is most likely that the impacts will occur at some stage of the development. Plans must be drawn up before carrying out the activity. The chances of this impact occurring is defined between 50 % to 75 %.	4
<i>Definite</i>	The impact will take place regardless of any prevention plans, and only mitigation actions or contingency plans to contain the effect can be relied on. The chance of this impact occurring is defined to be between 75% and 100 %.	5

In order to assess each of these factors for each impact, the following ranking scales as contained in **Table 7-6** will be used.

Table 7-6: Assessment Criteria: Ranking Scales

PROBABILITY		MAGNITUDE	
Description / Meaning	Score	Description / Meaning	Score
Definite/don't know	5	Very high/don't know	10
Highly likely	4	High	8
Likely	3	Moderate	6
Possible	2	Low	4
Improbable	1	Minor	2
DURATION		SPATIAL SCALE	
Description / Meaning	Score	Description / Meaning	Score
Permanent	5	International	5
Long Term	4	National	4
Medium Term	3	Regional	3
Short term	2	Local	2
Temporary	1	Footprint	1

Following the assignment of the necessary weights to the respective aspects, criteria are summed and multiplied by their assigned probabilities, resulting in a Significance Rating (SR) value for each impact (prior to the implementation of mitigation measures) as defined in **Table 7-7**.

Table 7-7: Calculating the Significance Rating for the Noise Impact

SR<30	Low (L)	Impacts with little real effect and which should not have an influence on or require modification of the project design or alternative mitigation. No mitigation is required.
30<SR <60	Medium (M)	Where it could have an influence on the decision unless it is mitigated. An impact or benefit which is sufficiently important to require management. Of moderate significance - could influence the decisions about the project if left unmanaged.
SR>60	High (H)	Impact is significant, mitigation is critical to reduce impact or risk. Resulting impact could influence the decision depending on the possible mitigation. An impact which could influence the decision about whether or not to proceed with the project.

7.5 REPRESENTATION OF NOISE LEVELS

Noise rating levels will be calculated in detail in this report using the appropriate sound propagation models as defined. It is therefore important to understand the difference

between sound or noise level as well as the noise rating level (also see Glossary of Terms, **Appendix A**).

Sound or noise levels generally refers to a level as measured using an instrument, whereas the noise rating level refers to a calculated sound exposure level to which various corrections and adjustments was added. These noise rating levels are further processed into a 3D map illustrating noise contours of constant rating levels or noise isopleths. In this noise scoping report, it will be used to illustrate the potential extent of the calculated noises of the project and not a noise level at a specific moment in time.

8 METHODS: CALCULATION OF NOISE LEVELS

8.1 NOISE FROM POINT, LINEAR AND AREA SOURCES

The noise emissions from various sources were calculated in detail for the conceptual existing and operational activities by using the sound propagation algorithms described by the ISO 9613-2 model. The following were considered:

- The octave band sound pressure emission levels of processes and equipment;
- The distance of the receivers from the noise sources;
- The impact of atmospheric absorption;
- The operational details of the proposed project, such as projected areas where activities will be taking place;
- Screening corrections where applicable;
- Topographical layout; and
- Acoustical characteristics of the ground.

8.2 NOISE FROM ROAD TRAFFIC

The noise emission into the environment due to project road traffic will be calculated using the sound propagation model described in RLS-90. 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; and
- Ground acoustical conditions.

While the output of the RLS-90 model provides a L_{A10} level, this report will use this level as the calculated L_{Aeq} level, together with the output of the ISO 9613-2 model and represent this as the noise level. The L_{A10} level is normally higher than the L_{Aeq} and this level will represent the worst-case scenario.

9 ASSUMPTIONS AND LIMITATIONS

9.1 LIMITATIONS - ACOUSTICAL MEASUREMENTS

Ambient sound levels are the cumulative effects of innumerable sounds generated at various instances both far and near. A high measurement may not necessarily mean that the area is always noisy. 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 day, dependant on faunal characteristics (mating season, dawn chorus⁽⁸⁾ early hours of the morning, temperature etc.), vegetation in the area and meteorological conditions (especially wind).

Selecting an ideal measurement location could be difficult, with various criteria assessed to identify the viability of a certain location as a point to define ambient sound levels. When selecting a measurement location, the most important criteria would be:

1. Security of the instrument (minimise risk to the technician; prevent theft; sabotage of the equipment);
2. Safety of the equipment (ensure that it does not prevent, interfere or limit typical agricultural or household activities; ensure that the instrument are not in a location where an animal could damage the instrument); and lastly,
3. The suitability of the measurement location to define ambient sound levels (the presence of certain trees or equipment, wetland or other water resources will influence ambient sound level significantly).

As such, after ensuring that the instrument is safe and secure, there are various environmental factors that could influence ambient sound levels measured. These constraints and limitations are discussed below and could include:

- Seasonal changes in the surrounding environment can influence typical ambient sound levels, as many faunal species are more active during warmer periods than the colder periods. As an example, cicada is usually only active during warmer periods. Certain cicada species can generate noise levels up to 120 dB for mating or distress purposes, sometimes singing in synchronisation magnifying noise levels they produce from their tymbals⁽⁹⁾;
- Defining ambient sound levels using the result of one 10-minute measurement may be very inaccurate (very low confidence level in the results) relating to the reasons mentioned above, and measurements over a longer-term period is critical;

⁽⁸⁾ Environ. We Int. Sci. Tech. *Ambient noise levels due to dawn chorus at different habitats in Delhi*. 2001. Pg. 134.

⁽⁹⁾ Clyne, D. "Cicadas: Sound of the Australian Summer, *Australian Geographic*" Oct/Dec Vol 56. 1999.

- Some equipment that could influence measurements may be missed when deploying instruments, or, the equipment may not be audible. This could include equipment such as hidden water pumps and associated pipelines and outflows, ESKOM stepdown transformers, hidden compressors, inverters, condensers or other electrical equipment, etc. While not audible during deployment, such equipment may significantly influence ambient sound levels during quiet periods;
- Type, the number and sizes of trees in the vicinity of the instrument, as well as the distances between the microphone and these trees. Certain trees, especially fruiting trees could attract birds and other animals that will significantly impact on ambient sound levels;
- Type and number of animals in the vicinity of the microphone. Dogs, chickens, geese, etc. generate different noises randomly both night and day, and other livestock (sheep, goats, cattle, horses, etc.) kept in enclosures will also raise noise levels, especially if these animals are penned in large numbers;
- Measurements over wind speeds of 3 m/s could provide data influenced by wind-induced noises. However, when determining the ambient sound levels associated with increased wind speeds, it is desired to measure ambient sound levels at higher wind speeds;
- Ambient sound levels recorded near rivers, streams, wetlands, trees and bushy areas can be high due to faunal activity which can dominate the sound levels around the measurement point (specifically during summertime, rainfall event or during dawn chorus of bird songs). This generally is still considered naturally quiet and accepted as features of the natural environment, and in various cases sought after and pleasing. Ambient sound level data measured in such area however should not be used to develop an opinion in the potential prevailing ambient sound levels in the larger area;
- Exact location of a sound level meter in an area in relation to structures, infrastructure, vegetation, wetlands and external noise sources will influence measurements. It may determine whether you are measuring anthropogenic sounds from a receptors dwelling, or environmental ambient baseline contributors of significance (faunal, roads traffic, railway traffic movement etc.); and
- As a residential area develops the presence of people will result in increased dwelling related sounds. These are generally a combination of traffic noise, voices, animals and equipment (incl. TV's and Radios). The result is that ambient sound levels will increase as an area matures.

Ambient sound levels were measured considering these limitations, and, it is the opinion of the Author that sufficient data was collected to ensure a high confidence in the resulting information.

9.2 CALCULATING NOISE EMISSIONS – ADEQUACY OF PREDICTIVE METHODS

Limitations due to the calculations of the noise emissions into the environment include the following:

- Many sound propagation models do not consider sound characteristics as calculations are based on an equivalent level (with the appropriate correction implemented e.g. tone or impulse). These other characteristics include intrusive sounds or amplitude modulation;
- Sound propagation models do not consider refraction through the various temperature layers (specifically relevant during the night-times);
- Most sound propagation models do not consider the low frequency range (third octave 16 Hz – 31.5 Hz). This would be relevant to facilities with a potentially low frequency issues;
- Many environmental models consider sound to propagate in hemi-spherical way. Certain noise sources (e.g. a speakers, exhausts, fans) emit sounds in a directional manner;
- The impact of atmospheric absorption is simplified and very uniform meteorological conditions are considered. This is an over-simplification and the effect of this in terms of sound propagation modelling is difficult to quantify;
- Many environmental models are not highly suited for close proximity calculations; and
- Acoustical characteristics of the ground are over-simplified, with ground conditions accepted as uniform.

Due to these assumptions, modelling generally could be out with as much as +10 dBA, although realistic values ranging from 3 dBA to less than 5 dBA are more common in practice. Unfortunately, as previously discussed, exact details of the noise generating sources (PWL) are normally not known during the EIA stage, and this assessment therefore considers a potential worst-case noise level, using relatively high PWL without mitigation. It is highly likely that noise levels will be over-modelled.

9.3 ADEQUACY OF UNDERLYING ASSUMPTIONS

Noise experienced at a certain location is the cumulative result of innumerable sounds emitted and generated both far and close, each in a different time domain, each having a different spectral character at a different sound level. Each of these sounds is also impacted differently by surrounding vegetation, structures and meteorological conditions that result in a total cumulative noise level represented by a few numbers on a sound level meter.

As previously mentioned, it is not the purpose of noise modelling to accurately determine a likely noise level at a certain receptor but to calculate a noise rating level that is used to identify potential issues of concern.

9.4 UNCERTAINTIES ASSOCIATED WITH MITIGATION MEASURES

Any noise impact can be mitigated to have a low significance; however, the cost of mitigating this impact may be prohibitive, or the measure may not be socially acceptable (such as the relocation of an NSR). These mitigation measures may be engineered, technological or due to management commitment.

For the purpose of the determination of the significance of the noise impact mitigation measures were selected that is feasible, mainly focussing on management of noise impacts using rules, policy and require a management commitment. This, however, does not mean that noise levels cannot be reduced further, only that to reduce the noise levels further may require significant additional costs (whether engineered, technological or management).

It was assumed the mitigation measures proposed for the construction phase will be implemented and continued during the operational phase.

9.5 UNCERTAINTIES OF INFORMATION PROVIDED

While it is difficult to define the character of a measured noise in terms of numbers (third octave PWL), it is difficult to accurately model noise levels at a receptor from any operation. The projected noise levels are the output of a numerical model with the accuracy depending on the assumptions made during the setup of the model. The assumptions include the following:

- That octave PWL selected for processes and equipment accurately represent the sound character and power levels of these processes and equipment. The determination of octave PWL in itself is subject to errors, limitations and assumptions with any potential errors carried over to any model making use of these results;
- PWL from processes and equipment changes depending on the load the process and equipment are subject to. While the octave PWL is the average (equivalent) result of a number of measurements, this measurement relates to a period that the process or equipment was subject to a certain load (work required from the engine or motor to perform action). Normally these measurements are collected when the process or equipment is under high load. The result is that measurements generally represent a worst-case scenario;

- As it is unknown which processes and equipment will be operational (when and for how long), modelling considers a scenario where processes and equipment are under full load for a set time period. Modelling assumptions comply with the precautionary principle and operational time periods are frequently overestimated. The result is that projected noise levels would likely be over-estimated;
- Modelling cannot capture the potential impulsive character of a noise that can increase the potential nuisance factor;
- The XYZ topographical information is derived from the Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER) Global DEM data, a product of Japan's Ministry of Economy, Trade, and Industry (METI) and the National Aeronautical and Space Administration (NASA). There are known inaccuracies and artefacts in the data set, yet this is still one of the most accurate data sets to obtain 3D-topographical information;
- The impact of atmospheric absorption is simplified and very uniform meteorological conditions are considered. This is an over-simplification and the effect of this in terms of sound propagation modelling is difficult to quantify; and
- Acoustical characteristics of the ground are over-simplified with ground conditions accepted as uniform. Fifty per cent (50%) soft ground conditions will be modelled as the area where the construction activities are proposed is well vegetated and sufficiently uneven to allow the consideration of soft ground conditions.

9.6 CONDITIONS TO WHICH THIS STUDY IS SUBJECT

This study is not subject to any conditions.

10 PROJECTED NOISE RATING LEVELS

10.1 CONCEPTUAL SCENARIO – POTENTIAL FUTURE CONSTRUCTION ACTIVITIES

A conceptual construction scenario will be investigated, considering the noise-generating activities as discussed in **section 6.1** and depicted in **Figure 10-1**. Only the daytime scenario will be investigated, as night-time construction activities are unlikely to take place. The potential noise contours for the conceptual operational scenario are illustrated in:

- **Figure 10-2**, with the noise levels (as well as the potential significance of the noise impact) at the identified NSR defined in **Appendix C, Table 1**; and
- **Figure 10-3**, with the noise levels (as well as the potential significance of the noise impact) at the identified NSR defined in **Appendix C, Table 2**. It is assumed that night-time activities will be similar and at the same intensity as daytime activities, though, it is likely that, if night-time activities take place, it will be less than typical daytime activities.

10.2 CONCEPTUAL SCENARIO – POTENTIAL FUTURE OPERATIONAL ACTIVITIES

The scenario considered the conceptual noise-generating activities discussed in **section 6.2** and depicted in **Figure 10-4**. The potential noise contours for the conceptual operational scenario are illustrated in:

- **Figure 10-5** from 45 dBA upwards for the conceptual daytime operational activities. The noise levels (as well as the potential significance of the noise impact) at the identified NSR are defined in **Appendix C, Table 3**; and,
- **Figure 10-6** from 35 dBA upwards for the conceptual night-time operational activities. The noise levels (as well as the potential significance of the noise impact) at the identified NSR are defined in **Appendix C, Table 4** for a worst-case scenario (assuming all noise sources are active). It is possible to reduce noise levels further with the recommended mitigation measures.

10.3 POTENTIAL DECOMMISSIONING, CLOSURE AND POST-CLOSURE NOISE LEVELS

The potential for a noise impact to occur during the decommissioning and closure phase will be much lower than that of the operational phases and noise from these phases will not be investigated further.

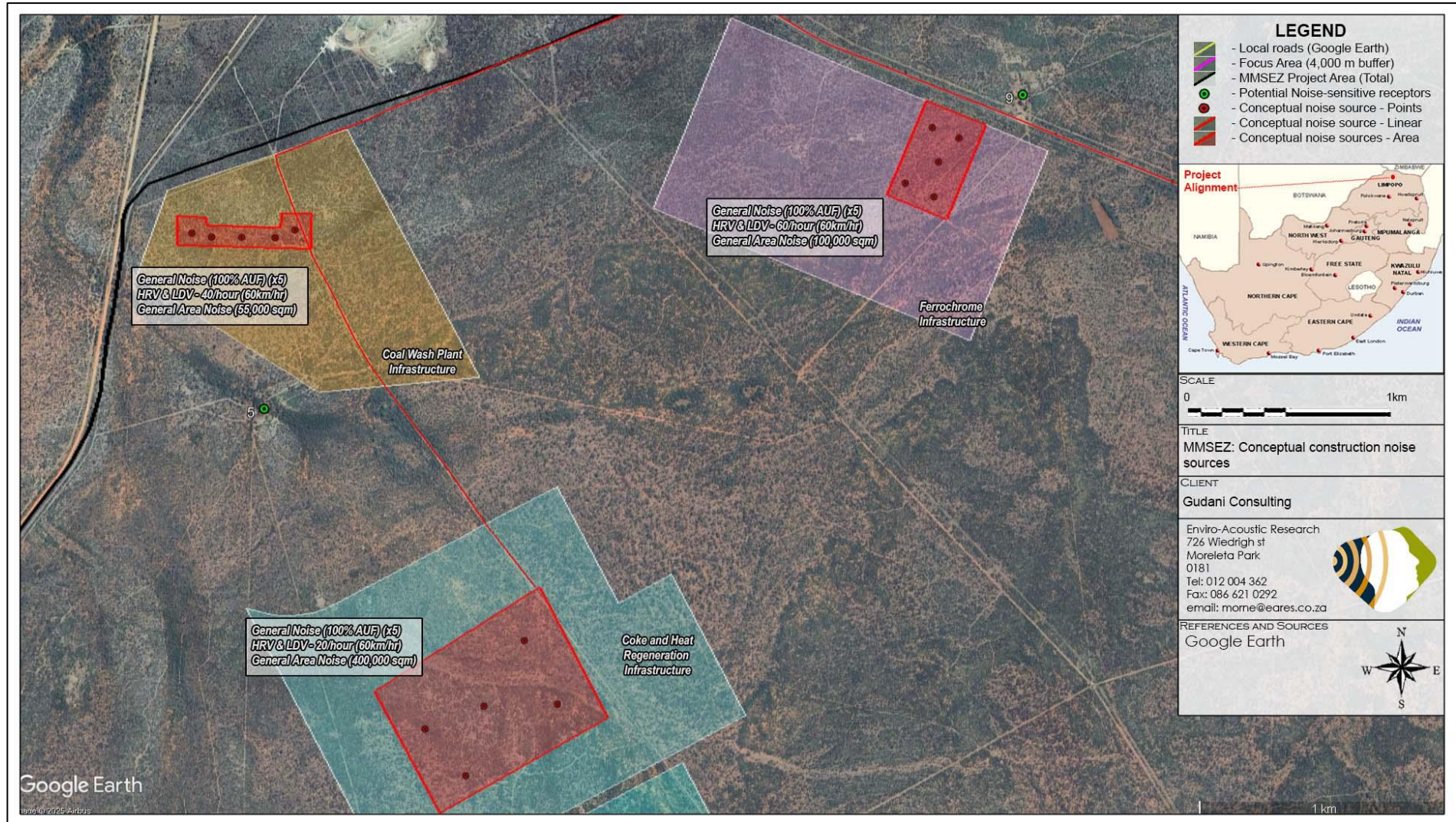


Figure 10-1: Conceptual construction noise sources

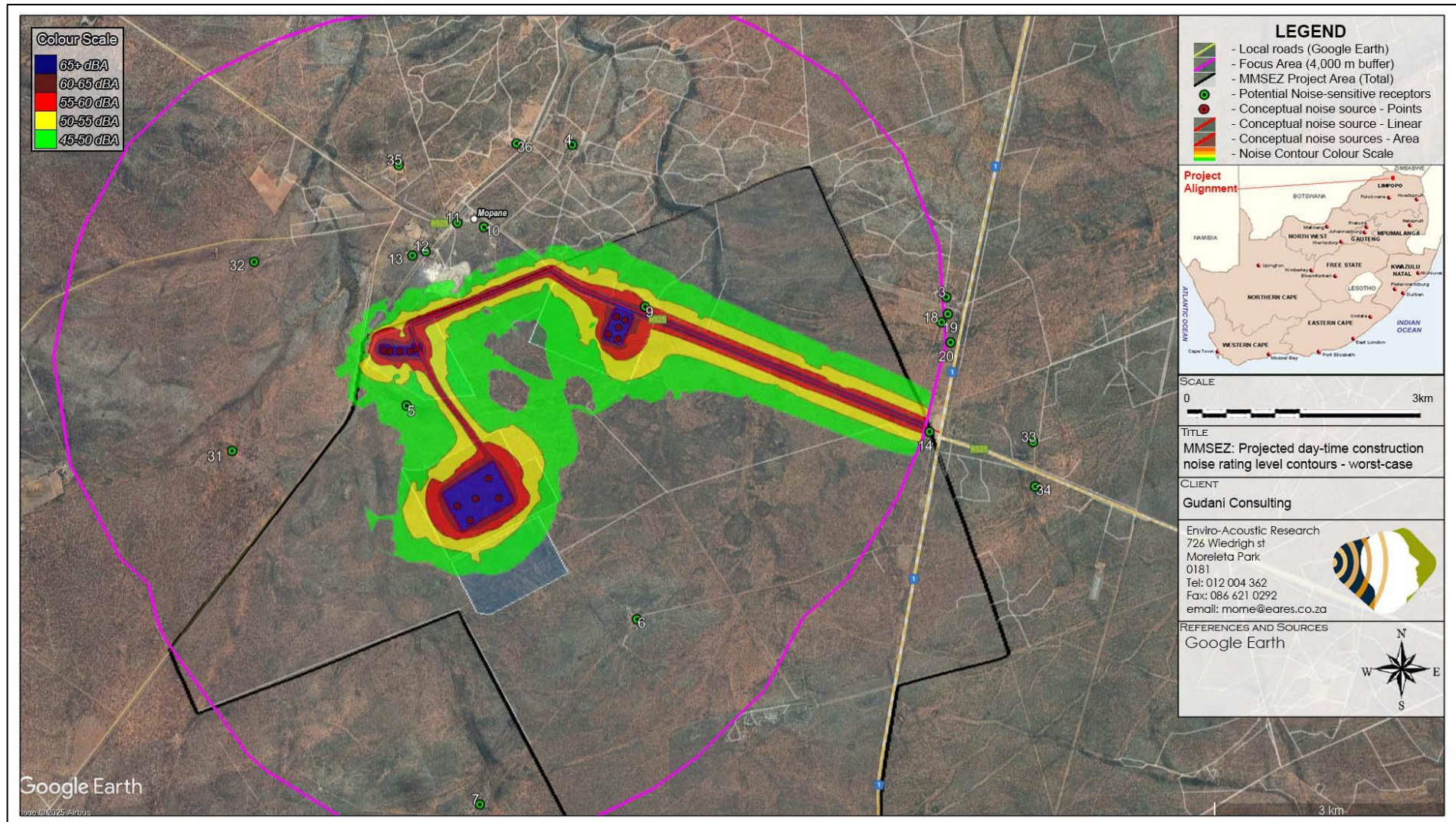


Figure 10-2: Projected conceptual daytime construction noise level contours

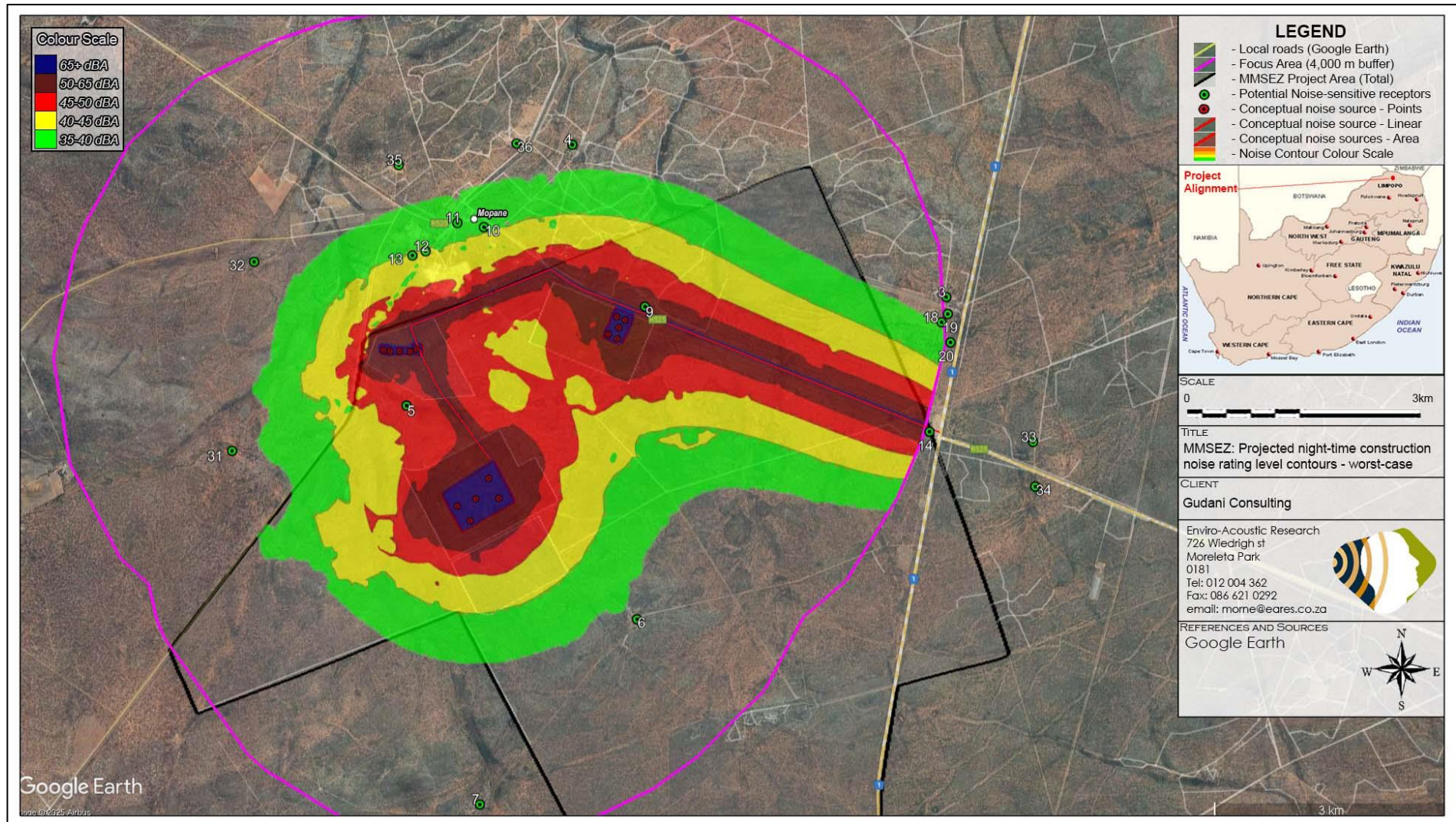


Figure 10-3: Projected conceptual night-time construction noise level contours

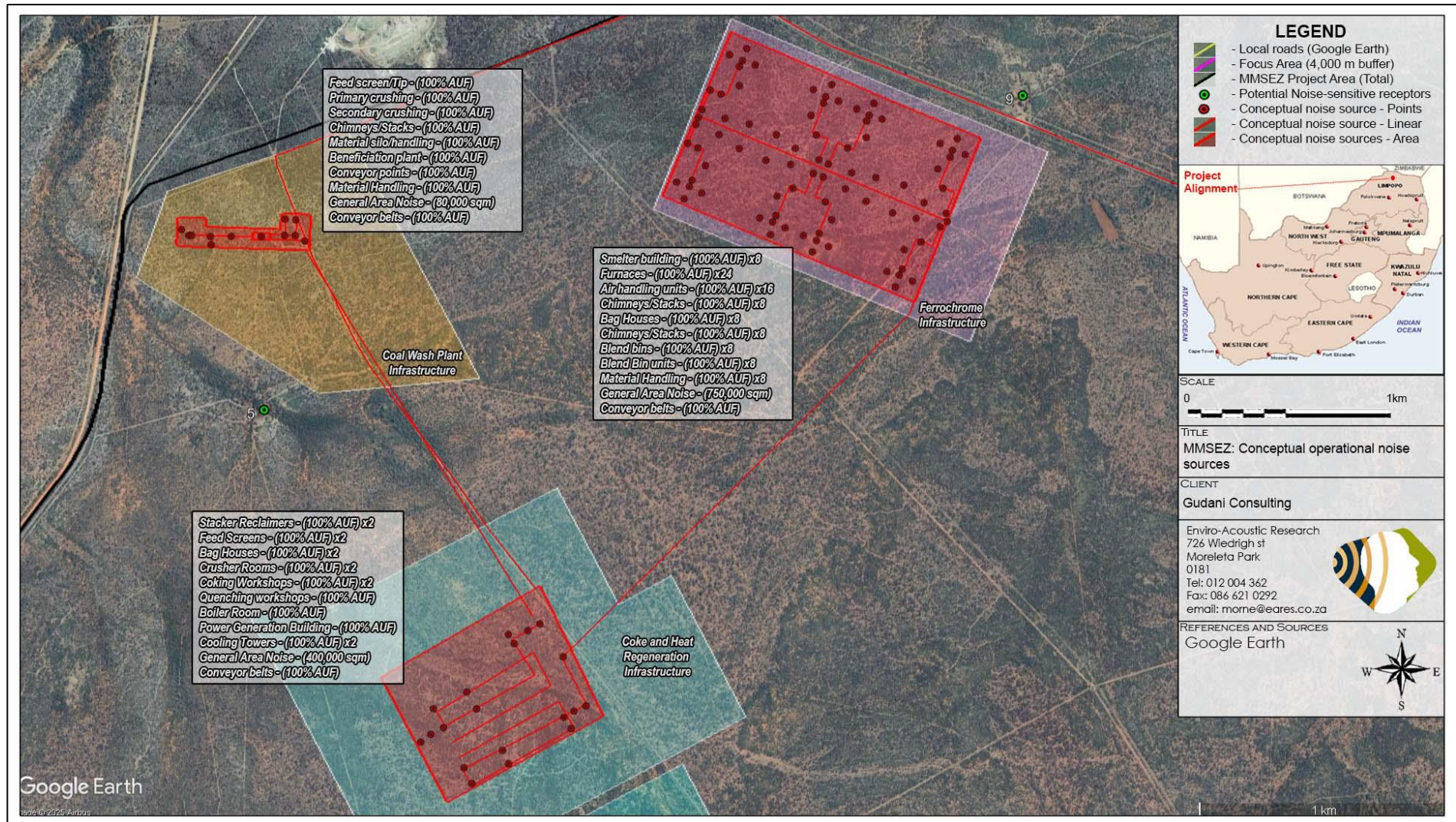


Figure 10-4: Conceptual operational noise sources

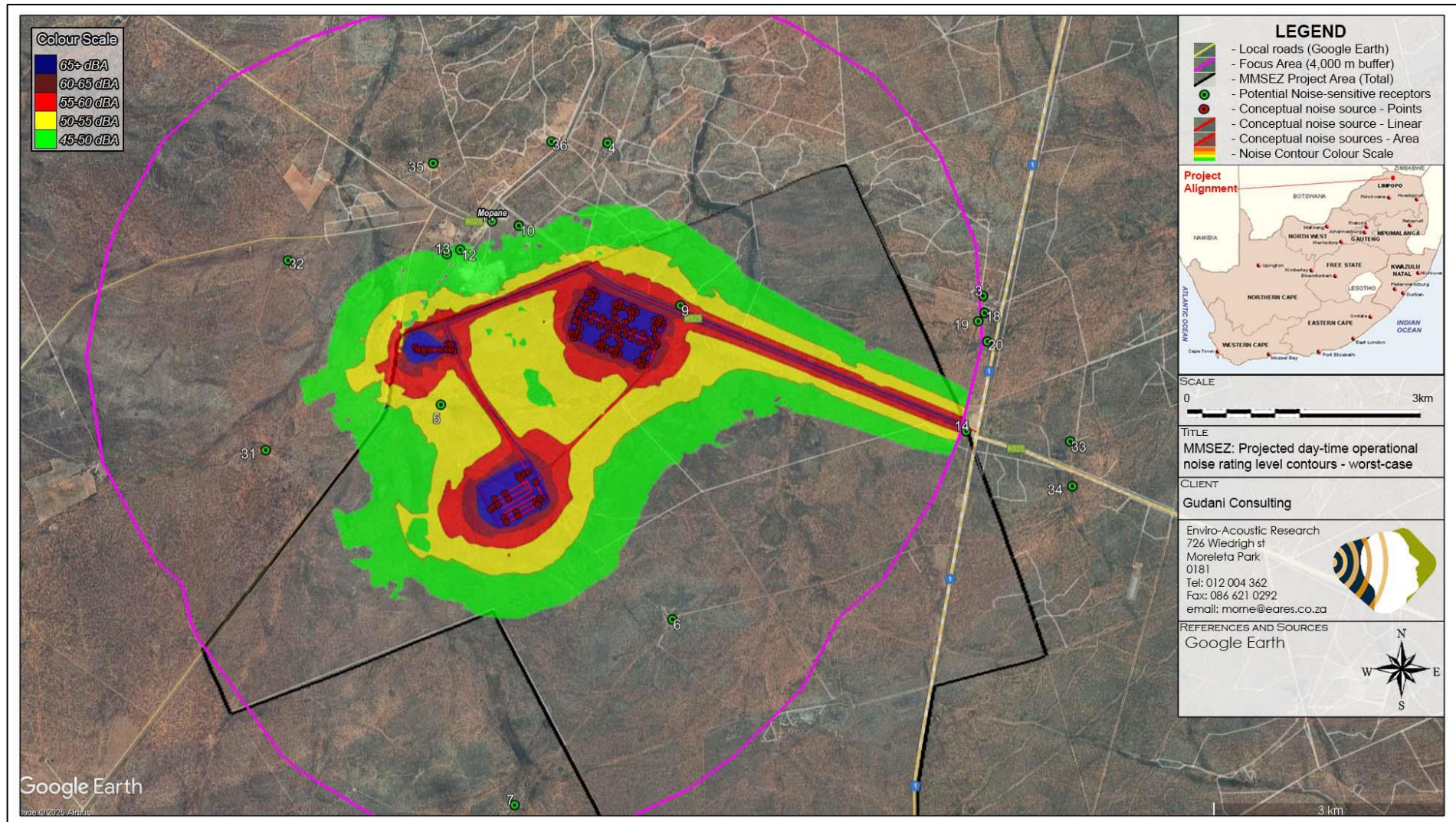


Figure 10-5: Projected conceptual daytime operational noise level contours

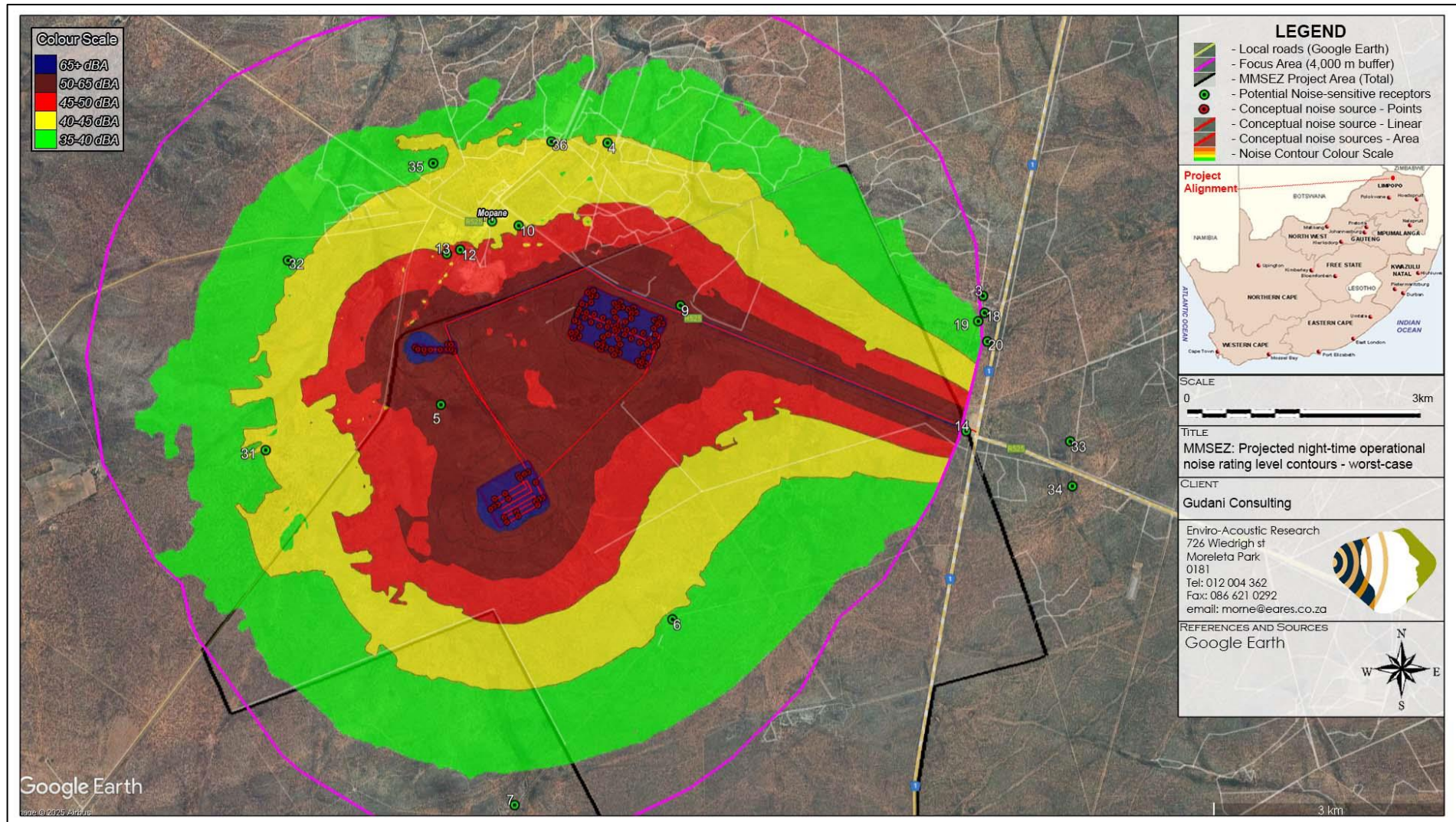


Figure 10-6: Projected conceptual night-time operational noise rating level contours

11 SIGNIFICANCE OF THE NOISE IMPACT

11.1 POTENTIAL CONSTRUCTION NOISE LEVELS - NOISE IMPACT

The noise levels for the various conceptualized construction activities were calculated in **section 10.1**. The potential significance of the noise impacts is summarized in:

- **Table 11-1** for noise impacts relating to potential daytime construction activities; and
- **Table 11-2** for noise impacts relating to potential nighttime construction activities.

Table 11-1: Noise Impact Assessment: Potential daytime construction activities

Nature:	Construction activities associated with the MMSEZ infrastructure	
Acceptable Rating Level	Precautious approach, with daytime ambient sound level measurements (see section 4.4) indicating noise levels typical of a rural noise district (refer to Table 7-1). This assessment recommends a long-term noise limit of 50 dBA for the daytime period, due to the low ambient sound levels measured. The projected noise levels, the potential change in ambient sound level as well as the potential significance are defined in Appendix C, Table 1 for the daytime period for the NSR identified.	
	Without Mitigation	With Mitigation
Magnitude (Table 7-2)	Very High (10)	Low (4) or less
Duration (Table 7-3)	Short-term (2)	Short-term (2)
Extent ($\Delta L_{Aeq,D} > 7\text{dBA}$) (Table 7-4)	Local (2)	Local (2)
Probability (Table 7-5)	Highly Likely (4)	Possible (2)
Significance of Impact (Table 7-6)	Without mitigation	With mitigation
	Medium (52)	Low (14)
Status	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	Medium loss of resource (naturally quiet environment).	
Comments	The noise levels associated with the construction of the MMSEZ infrastructure.	
Degree of Confidence	High	
Mitigation and mitigation efficiency:	The potential significance of noises from the MMSEZ infrastructure construction activities could be of a medium significance, mainly relating to NSR09. This medium significance may relate to the strict EIA criteria used together with the worst-case scenario evaluated, though it is recommended that the applicant/developer should discuss the potential noise levels with people staying at NSR location 09. While mitigation is available, it is recommended that the structures located at NSR 09 not be used for residential purposes, especially considering the future operational noise levels.	

Table 11-2: Noise Impact Assessment: Potential night-time construction activities

Nature:	Construction activities associated with the MMSEZ infrastructure	
Acceptable Rating Level	Precautious approach, with night-time ambient sound level measurements (see section 4.4) indicating noise levels typical of a rural noise district (refer to Table 7-1). This assessment recommends an upper long-term noise limit of 45 dBA for the night-time period, due to the low ambient sound levels measured. The projected noise levels, the potential change in ambient sound level as well as the potential significance are defined in Appendix C, Table 2 for the night-time period for the NSR identified.	
	Without Mitigation	With Mitigation
Magnitude (Table 7-2)	Very High (10)	Low (4) or less
Duration (Table 7-3)	Short-term (2)	Short-term (2)
Extent ($\Delta L_{Aeq,D} > 7\text{dBA}$) (Table 7-4)	Regional (3)	Regional (3)
Probability (Table 7-5)	Definite (5)	Possible (2)
Significance of Impact (Table 7-6)	Without mitigation	With mitigation
	High (75)	Low (18)
Status	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	Medium loss of resource (naturally quiet environment).	
Comments	The noise levels associated with the construction of the MMSEZ infrastructure.	
Degree of Confidence	High	
Mitigation and mitigation efficiency:	The potential significance of noises from the MMSEZ infrastructure construction activities could be of a high significance, mainly relating to the proximity of NSR05 and NSR09 to the project infrastructure. The noise impact at NSR05 also relates to the cumulative noise impacts from potential construction activities at both the coal wash and the coke and heat recovery plants. While the high significance may relate to the strict EIA criteria used together with the worst-case scenario evaluated, though it is recommended that the applicant/developer should discuss the potential noise levels with people staying at NSR locations 05 and 09. While mitigation is available, it is recommended that the structures located at NSR 05 and 09 not be used for residential purposes, especially considering the future operational noise levels.	

11.2 POTENTIAL OPERATIONAL NOISE LEVELS - NOISE IMPACT

The impact assessment for the various proposed operational activities (as conceptualised in **section 6.2**) was calculated in **section 10.2**. The potential significance of the noise impacts is summarized in:

- **Table 11-3** for noise impacts relating to daytime operational activities; and,
- **Table 11-4** for noise impacts relating to night-time operational activities.

Table 11-3: Noise Impact Assessment: Potential daytime operational activities

Nature:	Daytime operational activities associated with the MMSEZ project	
Acceptable Rating Level	Precautious approach, with daytime ambient sound level measurements (see section 4.4) indicating noise levels typical of a rural noise district refer to Table 7-1). This assessment recommends a long-term noise limit of 50 dBA for the daytime period, due to the low ambient sound levels measured. The projected noise levels, the potential change in ambient sound level as well as the potential significance are defined in Appendix C, Table 3 for the daytime period for the NSR identified.	
	Without Mitigation	With Mitigation
Magnitude (Table 7-2)	Very high (10)	Low (4)
Duration (Table 7-3)	Long-term (4)	Long-term (4)
Extent ($\Delta L_{Aeq,D} > 7\text{dBA}$) (Table 7-4)	Local (2)	Local (2)
Probability (Table 7-5)	Highly Likely (4)	Possible (2)
Significance of Impact (Table 7-6)	Without mitigation	Without mitigation
	High (64)	Low (20)
Status	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	Medium loss of resource (naturally quiet environment).	
Comments	The noise levels associated with the construction of the MMSEZ infrastructure.	
Degree of Confidence	High	
Mitigation and mitigation efficiency:	The potential significance of noises from the MMSEZ activities could be of a high significance, mainly relating to the proximity of NSR05 and NSR09 to the project infrastructure. The noise impact at NSR05 also relates to the cumulative noise impacts from potential operational activities at both the coal wash and the coke and heat recovery plants. While the high significance may relate to the strict EIA criteria used together with the worst-case scenario evaluated, though it is recommended that the applicant/developer should discuss the potential noise levels with people staying at NSR locations 05 and 09. While mitigation is available, it is recommended that the structures located at NSR 05 and 09 not be used for residential purposes.	

Table 11-4: Noise Impact Assessment: Potential night-time operational activities

Nature:	Night-time operational activities associated with the MMSEZ project	
Acceptable Rating Level	Precautious approach, with night-time ambient sound level measurements (see section 4.4) indicating noise levels typical of a rural noise district refer to Table 7-1). This assessment recommends an upper long-term night-time noise limit of 45 dBA for the night-time period, due to the low ambient sound levels measured. The projected noise levels, the potential change in ambient sound level as well as the potential significance are defined in Appendix C, Table 4 for the night-time period for the NSR identified.	
	Without Mitigation	With Mitigation
Magnitude (Table 7-2)	Very high (10)	Low (4)
Duration (Table 7-3)	Long-term (4)	Long-term (4)
Extent ($\Delta L_{Aeq,D} > 7\text{dBA}$) (Table 7-4)	Regional (3)	Regional (3)
Probability (Table 7-5)	Definite (5)	Possible (2)
Significance of Impact (Table 7-6)	Without mitigation	Without mitigation
	High (85)	Low (18)
Status	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	Medium to high loss of resource (naturally quiet environment).	
Comments	The noise levels associated with the construction of the H2PEF infrastructure.	
Degree of Confidence	Medium-high	
Mitigation and mitigation efficiency:	The potential significance of noises from the MMSEZ activities could be of a high significance, mainly relating to the proximity of NSR05 and NSR09 to the project infrastructure. The noise impact at NSR05 also relates to the cumulative noise impacts from potential operational activities at both the coal wash and the coke and heat recovery plants. As such it is recommended that the structures at NSR location 05 and 09 not be used for residential activities should the MMSEZ project proceed. Noise levels may also be elevated at NSR associated with the Mopane town, resulting in a potential medium significance for a noise impact at these NSR location (represented by NSR 10, 11, 12 & 13). Noises from the Syferfontein dolomite project may also slightly add to the noise from the MMSEZ project cumulatively. Potential mitigation measures could include: - Locating the Coal Wash Plant as far as possible from the town of Mopane; - The developer should consider the PWL of the various equipment to be used at the coal wash plant, and locate equipment or activities in a building where possible. This is especially important for all crushing activities; and - The design and implementation of a noise monitoring programme, using the monitoring results to refine and update mitigation measures (if required).	

11.3 CUMULATIVE NOISE IMPACT

There is an insignificant risk of a cumulative noise during the construction phase, as noise from other construction activities are unlikely to take place simultaneously, even though this assessment did consider the potential cumulative impact for the construction phase.

Potential worst-case construction noise levels (including cumulative noise levels) are defined in **Appendix C, Table 1** (daytime scenario) and **Appendix C, Table 2** (night-time scenario).

As it is definite that the various MMSEZ infrastructure will operate simultaneously, this assessment also did consider the cumulative noise impact from the Coal Wash, Coke and Heat Recovery and Ferrochrome plants. Potential worst-case construction noise levels (including cumulative noise levels) are defined in **Appendix C, Table 3** and in **Appendix C, Table 4**.

There is a slight potential that noises from the Syferfontein dolomite project may also slightly add to the noise from the MMSEZ project cumulatively, though the cumulative effect will be minor.

11.4 EVALUATION OF ALTERNATIVES

11.4.1 Alternative 1: No-go option

The ambient sound levels will remain as is. The noise levels experienced by the surrounding receptors (from the activity) will remain as it is currently. Ambient sound levels are already elevated due to noises from industrial activities and road traffic in the area.

11.4.2 Alternative 2: Proposed development of MMSEZ Infrastructure

The proposed development of the MMSEZ infrastructure (worst-case evaluated) may raise the noise levels at the closest potential noise-sensitive developments as identified. Ambient sound levels are low, and the development of the MMSEZ project will raise the ambient sound levels at the closest NSR (mainly residents of the Mopane settlement). While the conceptual scenarios did project worst-case noise levels, this might be due to the selection of the unmitigated equipment. Mitigation is available and relatively easy to implement during the planning stages of the project.

If considering the mitigation measures recommended in this assessment, the project will greatly assist in the economic growth and development challenges South Africa is facing. This will assist in providing employment and other business opportunities, in the local area and even the larger district. Considering only noise¹⁰, people may have a neutral to positive perception of the project and could see the need and desirability of the project.

¹⁰ Considering only noise as other environmental factors may affect other people.

12 MITIGATION OPTIONS

This assessment considers the potential noise impact on the surrounding environment due to the future MMSEZ project. It considers potential worst-case noise emission levels from typical activities associated with the proposed infrastructure. It was determined that the potential noise impacts would be:

- of a **medium significance** for the daytime construction activities. This noise impact relates to high noise levels at NSR09, mostly due to construction activities associated with the Ferrochrome project. Mitigation is available, but mainly limited to the relocation of NSR09 due to the high noise levels associated with future operational activities at the Ferrochrome project;
- of a **high significance** for the night-time construction activities, even though there might be fewer night-time activities than daytime construction activities. This noise impact relates to high noise levels at NSRs 05 (potential worst-case construction activities associated with the Coal Wash and Coke & HRSG plants) and 09 (construction activities associated with the Ferrochrome project). Mitigation is available, but mainly limited to the relocation of NSRs 05 and 09 due to the potential high noise levels associated with future operational activities;
- of a **high significance** for the daytime operational activities. This noise impact relates to high noise levels at NSR 05 and 09. Mitigation is available that will reduce the significance of the noise impact to low; and
- of a **high significance** for the night-time operational activities. This noise impact relates to high noise levels at NSR 05 and 09, though noise levels may be elevated at the Mopane project. Mitigation is available that will reduce the significance of the noise impact to low.

12.1 MITIGATION OPTIONS RECOMMENDED FOR THE PLANNING PHASE

Due to the cost of mitigating high noise levels during the operational phase, potential measures that could reduce noise levels during the future operational phase should be identified and planned. These measures should be:

- Discussing the potential future noise levels with NSR05 and NSR09, as recommended mitigation measures involve the relocation of these receptors. The structures located at NSR05 and 09 should not be used for residential purposes;
- If possible, the Coal Wash plant should be located as far as possible from the Mopane settlement; and
- The applicant/developer should consider the PWLs of major equipment to be used at the MMSEZ project, and, equipment with a PWL higher than 110 dBA (re 1 pW),

located within 2,000m from the Mopane settlement, should be located within a building, or acoustic treatment should be added to reduce the PWL (and the noise emission levels);

- The crushers at the Coal Wash plant should be located within buildings, or, acoustic barriers should be placed between the crushers and the Mopane settlement.

12.2 MITIGATION OPTIONS RECOMMENDED FOR THE CONSTRUCTION PHASE

The potential significance of noises from the MMSEZ infrastructure construction activities could be of a **medium** (daytime) to **high** (night-time) significance. While this significance may relate to the strict EIA criteria used together with the worst-case scenario evaluated (cumulative scenario evaluated), the implementation of the measures recommended for the planning phase will reduce noise levels as well as the probability of noise impacts occurring.

12.3 MITIGATION OPTIONS RECOMMENDED FOR THE OPERATIONAL PHASE

The potential significance of operational noises from the MMSEZ project could be of a **high** significance both day and night. While this significance may relate to the strict EIA criteria used together with the worst-case scenario evaluated (cumulative scenario evaluated), the implementation of the measures recommended for the planning phase will reduce noise levels as well as the probability of noise impacts occurring.

The applicant/developer however must design and implement a noise monitoring programme before, and during the operational phase. Results of the noise monitoring should be evaluated and, if required, mitigation measures should be implemented to reduce noise levels. This could include additional noise monitoring to identify the sources of high noise levels, with the design and implementation of additional acoustic treatment to equipment or activities generating high noise levels.

13 ENVIRONMENTAL MONITORING PLAN

Environmental Noise Monitoring can be divided into two distinct categories, namely:

- Passive monitoring – the registering of any complaints (reasonable and valid from NSR living within 2 000m from activities or equipment associated with the MMSEZ project; and
- Active monitoring – the measurement of noise levels at identified locations.

Worst-case noise levels modelled on the current layout are projected to be higher than 42 dBA (more than 7 dBA of the night-time rating level of a rural noise district) and therefore active noise monitoring is recommended and required. In addition, passive monitoring also applies in the instance where a reasonable and valid noise complaint be registered, and the applicant should investigate the noise complaint as per the guidelines in **sub-section 13.1** and **13.2**. These guidelines should be used as a rough guideline as site-specific conditions may require that the monitoring locations, frequency or procedure be adapted.

13.1 MEASUREMENT LOCALITIES AND FREQUENCY

For active monitoring, it is recommended that noise monitoring be done at representative NSR where the worst-case noise levels could exceed 42 dBA (NSR locations used for residential purposes). Six-monthly noise monitoring should commence once construction activities start and continue for the first two years of operational activities. The procedures are described in the sub-section below. Six-monthly measurements should continue if noise monitoring indicate noise levels higher than 42 dBA at any NSR.

In addition, should there be a valid and reasonable noise complaint, once-off noise measurements must be conducted at the location of the person that registered a valid and reasonable noise complaint. The measurement location should consider the direct surroundings to ensure that other sound sources cannot influence the reading.

13.2 MEASUREMENT PROCEDURES

Noise level measurements should be collected considering the requirements of SANS 10103:2008 (or an internationally recognised method such as ISO 1996). When a noise complaint is being investigated, measurements should be collected during a period or in conditions similar to when the receptor experienced the disturbing noise event.

14 CONCLUSIONS AND RECOMMENDATIONS

This ENIA covers the proposed construction and operation of various operations associated with the MMSEZ project south of Mussina, Limpopo province.

Potential scenarios were conceptualized for the future proposed construction and operational phases, with the output of the modelling exercise indicating a potential noise impact of a:

- of a **medium significance** for the daytime construction activities. This noise impact relates to high noise levels at NSR09, mostly due to construction activities associated with the Ferrochrome project. Mitigation is available, but mainly limited to the relocation of NSR09 due to the high noise levels associated with future operational activities at the Ferrochrome project;
- of a **high significance** for the night-time construction activities, even though there might be fewer night-time activities than daytime construction activities. This noise impact relates to high noise levels at NSRs 05 (potential worst-case construction activities associated with the Coal Wash and Coke & HRSG plants) and 09 (construction activities associated with the Ferrochrome project). Mitigation is available, but mainly limited to the relocation of NSRs 05 and 09 due to the potential high noise levels associated with future operational activities;
- of a **high significance** for the daytime operational activities. This noise impact relates to high noise levels at NSR 05 and 09. Mitigation is available that will reduce the significance of the noise impact to low; and
- of a **high significance** for the night-time operational activities. This noise impact relates to high noise levels at NSR 05 and 09, though noise levels may be elevated at the Mopane project. Mitigation is available that will reduce the significance of the noise impact to low.

Though there is a potential for a noise impact during the construction and operational phases, the noise impact can be mitigated to a **low** significance. This finding is only relevant to the Coal Wash, the Coke and HRSG as well as the Ferrochrome projects, and noise studies should consider other activities associated with the MMSEZ project. Six-monthly noise monitoring is also recommended.

While the development of the MMSEZ project will elevate noise levels in the area, the noise impact can be mitigated and it is recommended that the Coal Wash, the Coke and HRSG as well as the Ferrochrome projects be authorized.

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APPENDIX A

Glossary of Acoustic Terms, Definitions and General Information

<i>1/3-Octave Band</i>	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.
<i>A – Weighting</i>	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.
<i>Air Absorption</i>	The phenomena of attenuation of sound waves with distance propagated in air, due to dissipative interaction within the gas molecules.
<i>Alternatives</i>	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.
<i>Ambient</i>	The conditions surrounding an organism or area.
<i>Ambient Noise</i>	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.
<i>Ambient Sound</i>	The all-encompassing sound at a point being composite of sounds from near and far.
<i>Ambient Sound Level</i>	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.
<i>Amplitude Modulated Sound</i>	A sound that noticeably fluctuates in loudness over time.
<i>Anthropogenic</i>	Human impact on the environment or anthropogenic impact on the environment includes impacts on biophysical environments, biodiversity and other resources
<i>Applicant</i>	Any person who applies for an authorisation to undertake a listed activity or to cause such activity in terms of the relevant environmental legislation.
<i>Assessment</i>	The process of collecting, organising, analysing, interpreting and communicating data that is relevant to some decision.
<i>Attenuation</i>	Term used to indicate reduction of noise or vibration, by whatever method necessary, usually expressed in decibels.
<i>Audible frequency Range</i>	Generally assumed to be the range from about 20 Hz to 20,000 Hz, the range of frequencies that our ears perceive as sound.
<i>Ambient Sound Level</i>	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.
<i>Axle</i>	Shaft connecting two wheels on either side of the vehicle. The wheels are forced to rotate at the same speed. Vehicles with independent wheels have ‘stub axles’ that do not connect the two wheels on either side of the vehicle.
<i>Ballast</i>	A layer of coarse stones supporting the sleepers.
<i>Baseplate</i>	A track component designed to hold the rail in place, usually with resilience to provide improved vibration isolation.
<i>Broadband Noise</i>	Spectrum consisting of a large number of frequency components, none of which is individually dominant.
<i>C-Weighting</i>	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.
<i>dB(A)</i>	Sound Pressure Level in decibel that has been A-weighted, or filtered, to match the response of the human ear.
<i>Decibel (db)</i>	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.
<i>Diffraction</i>	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.
<i>Direction of Propagation</i>	The direction of flow of energy associated with a wave.
<i>Disturbing noise</i>	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.
<i>Echolocation</i>	Echo locating animals emit calls out to the environment and listen to the echoes of those calls that return from various objects near them. They use these echoes to locate and

	identify the objects. Echolocation is used for navigation and for foraging (or hunting) in various environments.
<i>Environment</i>	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.
<i>Environmental Control Officer</i>	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.
<i>Environmental impact</i>	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.
<i>Environmental Impact Assessment</i>	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.
<i>Environmental issue</i>	A concern felt by one or more parties about some existing, potential or perceived environmental impact.
<i>Equivalent continuous A-weighted sound exposure level ($L_{Aeq,T}$)</i>	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.
<i>Equivalent continuous A-weighted rating level ($L_{Req,T}$)</i>	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.
<i>F (fast) time weighting</i>	(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.
<i>Footprint area</i>	Area to be used for the construction of the proposed development, which does not include the total study area.
<i>Free Field Condition</i>	An environment where there is no reflective surfaces.
<i>Frequency</i>	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.
<i>Green field</i>	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 exist.
<i>Grinding</i>	A process for removing a thin layer of metal from the top of the rail head in order to remove roughness and/or to restore the correct profile. Special grinding trains are used for this.
<i>G-Weighting</i>	An International Standard filter used to represent the infrasonic components of a sound spectrum.
<i>Harmonics</i>	Any of a series of musical tones for which the frequencies are integral multiples of the frequency of a fundamental tone.
<i>I (impulse) time weighting</i>	(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.
<i>Impulsive sound</i>	A sound characterized by brief excursions of sound pressure (transient signal) that significantly exceed the ambient sound level.
<i>Infrasound</i>	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.

<i>Integrated Development Plan</i>	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).
<i>Integrated Environmental Management</i>	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.
<i>Interested and affected parties</i>	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.
<i>Interburden</i>	Material of any nature that lies between two or more bedded ore zones or mineral resource seams. Term is primarily used in surface mining
<i>Joint rail</i>	A connection between two lengths of rail, often held together by an arrangement of bolts and fishplates.
<i>Key issue</i>	An issue raised during the Scoping process that has not received an adequate response and that requires further investigation before it can be resolved.
<i>Listed activities</i>	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.
<i>Locomotive</i>	A powered vehicle used to draw or propel a train of carriages or wagons (as opposed to a multiple unit).
<i>L_{AMin} and L_{AMax}</i>	Is the RMS (root mean squared) minimum or maximum level of a noise source.
<i>Loudness</i>	The attribute of an auditory sensation that describes the listener's ranking of sound in terms of its audibility.
<i>Magnitude of impact</i>	Magnitude of impact means the combination of the intensity, duration and extent of an impact occurring.
<i>Masking</i>	The raising of a listener's threshold of hearing for a given sound due to the presence of another sound.
<i>Mitigation</i>	To cause to become less harsh or hostile.
<i>Natural Sounds</i>	Are sounds produced by natural sources in their normal soundscape.
<i>Negative impact</i>	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).
<i>Noise</i>	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.
<i>Noise Level</i>	The term used in lieu of sound level when the sound concerned is being measured or ranked for its undesirability in the contextual circumstances.
<i>Noise-sensitive development</i>	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
<i>Octave Band</i>	A filter with a bandwidth of one octave, or twelve semi-tones on the musical scale representing a doubling of frequency.
<i>Overburden</i>	In mining and in archaeology, overburden (also called waste or spoil) is the material that lies above an area of economic or scientific interest. In mining, it is most commonly the rock, soil, and ecosystem that lies above a mineral resource seam or ore body
<i>Pavement</i>	Road surface or pavement is the durable surface material laid down on an area intended to sustain vehicular or foot traffic, such as a road or walkway.
<i>Positive impact</i>	A change that improves the quality of life of affected people or the quality of the environment.

<i>Property</i>	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
<i>Public Participation Process</i>	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
<i>Reflection</i>	Redirection of sound waves.
<i>Refraction</i>	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.
<i>Reverberant Sound</i>	The sound in an enclosure which results from repeated reflections from the boundaries.
<i>Reverberation</i>	The persistence, after emission of a sound has stopped, of a sound field within an enclosure.
<i>Rail head</i>	The bulbous part at the top of the rail.
<i>Rolling Stock</i>	Rolling stock comprises all the vehicles that move on a railway. It usually includes both powered and unpowered vehicles, for example locomotives, railroad cars, coaches, and wagons.
<i>ROM</i>	The mineral resource delivered from the mine that reports to the processing or preparation plant is called run-of-mine, or ROM. This is the raw material for the plant and consists of mineral resource of interest, rocks, middlings, minerals and contamination
<i>Shunting</i>	Shunting, in railway operations, is the process of sorting items of rolling stock into complete train sets.
<i>Railway Sidings</i>	A siding, in rail terminology, is a low-speed track section distinct from a running line or through route such as a main line or branch line or spur. It may connect to through track or to other sidings at either end.
<i>Significant Impact</i>	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.
<i>S (slow) time weighting</i>	(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.
<i>Sound Level</i>	The level of the frequency and time weighted sound pressure as determined by a sound level meter, i.e. A-weighted sound level.
<i>Sound Power</i>	Of a source, the total sound energy radiated per unit time.
<i>Sound Pressure Level (SPL)</i>	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.
<i>Soundscape</i>	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.
<i>Study area</i>	Refers to the entire study area encompassing all the alternative routes as indicated on the study area map.
<i>Sustainable Development</i>	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).
<i>Timbre</i>	Timbre (also known as tone colour or tone quality) is the quality of the sound made by a particular voice or musical instrument.
<i>Tread braked</i>	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.
<i>Tone</i>	Noise can be described as tonal if it contains a noticeable or discrete, continuous note. This includes noises such as hums, hisses, screeches, drones, etc. and any such subjective description is open to discussion and contradiction when reported.
<i>Wagon</i>	A freight-carrying vehicle.

<i>Zone of Potential Influence</i>	The area defined as the radius about an object, or objects beyond which the noise impact will be insignificant.
<i>Zone Sound Level</i>	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.

APPENDIX B

List of Activities and Equipment as well as
associated Sound Power Levels

Appendix B, Table 1: Activity and Equipment List with Sound Power Levels

Emission spectrum	Source type	I or A m,m ²	Time histogram	63Hz dB(A)	125Hz dB(A)	250Hz dB(A)	500Hz dB(A)	1kHz dB(A)	2kHz dB(A)	4kHz dB(A)	L'w dB(A)	Lw dB(A)
Conveyor transfer points	Point		100%/24h	72.1	81.2	88.9	93.5	95.1	92.1	88.6	99.4	99.4
Conveyor transfer points	Point		100%/24h	72.1	81.2	88.9	93.5	95.1	92.1	88.6	99.4	99.4
Conveyor transfer points	Point		100%/24h	72.1	81.2	88.9	93.5	95.1	92.1	88.6	99.4	99.4
Conveyor transfer points	Point		100%/24h	72.1	81.2	88.9	93.5	95.1	92.1	88.6	99.4	99.4
Conveyor transfer points	Point		100%/24h	72.1	81.2	88.9	93.5	95.1	92.1	88.6	99.4	99.4
Bin - blending (Hard Rock)	Point		100%/24h	87.8	95.1	95.1	96	97	101	99	106	106
Bin - blending (Hard Rock)	Point		100%/24h	87.8	95.1	95.1	96	97	101	99	106	106
Bin - blending (Hard Rock)	Point		100%/24h	87.8	95.1	95.1	96	97	101	99	106	106
Conveyor transfer points	Point		100%/24h	72.1	81.2	88.9	93.5	95.1	92.1	88.6	99.4	99.4
Conveyor transfer points	Point		100%/24h	72.1	81.2	88.9	93.5	95.1	92.1	88.6	99.4	99.4
Baghouse	Point		100%/24h	90.4	94.9	100.2	103.2	103.7	102.8	98.7	109.3	109.3
Baghouse	Point		100%/24h	90.4	94.9	100.2	103.2	103.7	102.8	98.7	109.3	109.3
Baghouse	Point		100%/24h	90.4	94.9	100.2	103.2	103.7	102.8	98.7	109.3	109.3
Conveyor transfer points	Point		100%/24h	72.1	81.2	88.9	93.5	95.1	92.1	88.6	99.4	99.4
Conveyor transfer points	Point		100%/24h	72.1	81.2	88.9	93.5	95.1	92.1	88.6	99.4	99.4
Conveyor transfer points	Point		100%/24h	72.1	81.2	88.9	93.5	95.1	92.1	88.6	99.4	99.4
Conveyor transfer points	Point		100%/24h	72.1	81.2	88.9	93.5	95.1	92.1	88.6	99.4	99.4
Conveyor transfer points	Point		100%/24h	72.1	81.2	88.9	93.5	95.1	92.1	88.6	99.4	99.4
Bin - blending (Hard Rock)	Point		100%/24h	87.8	95.1	95.1	96	97	101	99	106	106
Smelter building - chrome	Point		100%/24h	78.7	90.2	102.3	98	96.4	93.6	88.6	105	105
Smelter building - chrome	Point		100%/24h	78.7	90.2	102.3	98	96.4	93.6	88.6	105	105
Smelter building - chrome	Point		100%/24h	78.7	90.2	102.3	98	96.4	93.6	88.6	105	105
Furnace	Point		100%/24h	73.4	82.5	101.1	103.8	102.9	97.5	88.4	108	108
Smelter building - chrome	Point		100%/24h	78.7	90.2	102.3	98	96.4	93.6	88.6	105	105
Exhaust stack	Point		100%/24h	94.5	100.1	99	99.1	92.8	90	83	105.1	105.1
Exhaust stack	Point		100%/24h	94.5	100.1	99	99.1	92.8	90	83	105.1	105.1
Smelter building - chrome	Point		100%/24h	78.7	90.2	102.3	98	96.4	93.6	88.6	105	105
Smelter building - chrome	Point		100%/24h	78.7	90.2	102.3	98	96.4	93.6	88.6	105	105
Furnace	Point		100%/24h	73.4	82.5	101.1	103.8	102.9	97.5	88.4	108	108
Bin - blending (Hard Rock)	Point		100%/24h	87.8	95.1	95.1	96	97	101	99	106	106
Bin - blending (Hard Rock)	Point		100%/24h	87.8	95.1	95.1	96	97	101	99	106	106
Bin - blending (Hard Rock)	Point		100%/24h	87.8	95.1	95.1	96	97	101	99	106	106
Bin - blending (Hard Rock)	Point		100%/24h	87.8	95.1	95.1	96	97	101	99	106	106
Furnace	Point		100%/24h	73.4	82.5	101.1	103.8	102.9	97.5	88.4	108	108
Furnace	Point		100%/24h	73.4	82.5	101.1	103.8	102.9	97.5	88.4	108	108
Furnace	Point		100%/24h	73.4	82.5	101.1	103.8	102.9	97.5	88.4	108	108
Furnace	Point		100%/24h	73.4	82.5	101.1	103.8	102.9	97.5	88.4	108	108
Material handling (various)	Point		100%/24h	82.4	85	93.6	96	94.1	89.5	85.9	100.3	100.3
Material handling (various)	Point		100%/24h	82.4	85	93.6	96	94.1	89.5	85.9	100.3	100.3
Material handling (various)	Point		100%/24h	82.4	85	93.6	96	94.1	89.5	85.9	100.3	100.3
Material handling (various)	Point		100%/24h	82.4	85	93.6	96	94.1	89.5	85.9	100.3	100.3
Air Handling unit - General	Point		100%/24h	83	87.1	100.1	90	86	77	73	100.9	100.9
Air Handling unit - General	Point		100%/24h	83	87.1	100.1	90	86	77	73	100.9	100.9
Material handling (various)	Point		100%/24h	85.4	88	96.6	99	97.1	92.5	88.9	103.2	103.2
Material handling (various)	Point		100%/24h	82.4	85	93.6	96	94.1	89.5	85.9	100.3	100.3
Furnace	Point		100%/24h	72.6	81.7	100.3	103	102.1	96.7	87.6	107.2	107.2
Furnace	Point		100%/24h	72.6	81.7	100.3	103	102.1	96.7	87.6	107.2	107.2
Furnace	Point		100%/24h	72.6	81.7	100.3	103	102.1	96.7	87.6	107.2	107.2
Furnace	Point		100%/24h	72.6	81.7	100.3	103	102.1	96.7	87.6	107.2	107.2
Furnace	Point		100%/24h	72.6	81.7	100.3	103	102.1	96.7	87.6	107.2	107.2
Material handling (various)	Point		100%/24h	82.4	85	93.6	96	94.1	89.5	85.9	100.3	100.3
Furnace	Point		100%/24h	72.6	81.7	100.3	103	102.1	96.7	87.6	107.2	107.2
Furnace	Point		100%/24h	72.6	81.7	100.3	103	102.1	96.7	87.6	107.2	107.2
Furnace	Point		100%/24h	72.6	81.7	100.3	103	102.1	96.7	87.6	107.2	107.2
Air Handling unit - General	Point		100%/24h	83	87.1	100.1	90	86	77	73	100.9	100.9
Air Handling unit - General	Point		100%/24h	83	87.1	100.1	90	86	77	73	100.9	100.9
Air Handling unit - General	Point		100%/24h	83	87.1	100.1	90	86	77	73	100.9	100.9
Air Handling unit - General	Point		100%/24h	83	87.1	100.1	90	86	77	73	100.9	100.9
Baghouse	Point		100%/24h	90.4	94.9	100.2	103.2	103.7	102.8	98.7	109.3	109.3
Baghouse	Point		100%/24h	90.4	94.9	100.2	103.2	103.7	102.8	98.7	109.3	109.3
Baghouse	Point		100%/24h	90.4	94.9	100.2	103.2	103.7	102.8	98.7	109.3	109.3
Baghouse	Point		100%/24h	90.4	94.9	100.2	103.2	103.7	102.8	98.7	109.3	109.3
Baghouse	Point		100%/24h	90.4	94.9	100.2	103.2	103.7	102.8	98.7	109.3	109.3

Air Handling unit - General	Point		100%/24h	83	87.1	100.1	90	86	77	73	100.9	100.9
Air Handling unit - General	Point		100%/24h	83	87.1	100.1	90	86	77	73	100.9	100.9
Air Handling unit - General	Point		100%/24h	83	87.1	100.1	90	86	77	73	100.9	100.9
Air Handling unit - General	Point		100%/24h	83	87.1	100.1	90	86	77	73	100.9	100.9
Air Handling unit - General	Point		100%/24h	83	87.1	100.1	90	86	77	73	100.9	100.9
Air Handling unit - General	Point		100%/24h	83	87.1	100.1	90	86	77	73	100.9	100.9
Air Handling unit - General	Point		100%/24h	83	87.1	100.1	90	86	77	73	100.9	100.9
Air Handling unit - General	Point		100%/24h	83	87.1	100.1	90	86	77	73	100.9	100.9
Crusher room (Coal)	Point		100%/24h	77.9	91.5	101.9	106.1	105.1	101.3	93.3	110.2	110.2
Crusher room (Coal)	Point		100%/24h	77.9	91.5	101.9	106.1	105.1	101.3	93.3	110.2	110.2
Bin - blending (Hard Roack)	Point		100%/24h	93.8	101.1	101.1	102	103	107	105	112	112
Baghouse	Point		100%/24h	93.4	97.9	103.3	106.3	106.7	105.8	101.8	112.3	112.3
Feed screen - chrome	Point		100%/24h	59.8	78.9	86.4	97.8	101	104.2	103	108.4	108.4
Conveyor transfer points	Line	3432.95	100%/24h	78.1	87.2	94.8	99.4	101.1	98.1	94.5	70	105.4
Stacker Reclaimer	Point		100%/24h	77.8	84.9	85.4	87.8	91	92.2	91	97.8	97.8
Stacker Reclaimer	Point		100%/24h	77.8	84.9	85.4	87.8	91	92.2	91	97.8	97.8
Feed screen - chrome	Point		100%/24h	59.8	78.9	86.4	97.8	101	104.2	103	108.4	108.4
Cooling tower - Coke plant	Point		100%/24h	89	93.1	111.1	106	107	103	101	114.1	114.1
Cooling tower - Coke plant	Point		100%/24h	89	93.1	111.1	106	107	103	101	114.1	114.1
Boiler House	Point		100%/24h	96.5	103.4	108.1	112.6	112.8	111.4	106.6	118.1	118.1
Generator building	Point		100%/24h	53.7	68.2	74.2	85.8	95.4	80.3	67.9	96	96
Exhaust stack	Point		100%/24h	99.5	105.1	104.1	104.2	97.8	95	88.1	110.1	110.1
Baghouse	Point		100%/24h	93.4	97.9	103.3	106.3	106.7	105.8	101.8	112.3	112.3
Coke - Quenching Tower	Point		100%/24h	81.8	88.9	92.4	96.8	100	98.2	88	103.9	103.9
Coke - Quenching Tower	Point		100%/24h	81.8	88.9	92.4	96.8	100	98.2	88	103.9	103.9
Exhaust stack	Point		100%/24h	99.5	105.1	104.1	104.2	97.8	95	88.1	110.1	110.1
Conveyor transfer points	Line	296.82	100%/24h	67.4	76.5	84.2	88.8	90.4	87.4	83.9	70	94.7
Conveyor transfer points	Line	1892.81	100%/24h	75.5	84.6	92.3	96.8	98.5	95.5	92	70	102.8
Conveyor transfer points	Line	230.63	100%/24h	66.3	75.4	83.1	87.7	89.3	86.3	82.8	70	93.6
Conveyor transfer points	Line	138.61	100%/24h	64.1	73.2	80.9	85.5	87.1	84.1	80.6	70	91.4
Conveyor transfer points	Line	163.64	100%/24h	64.9	73.9	81.6	86.2	87.8	84.8	81.3	70	92.2
Conveyor transfer points	Line	1716.09	100%/24h	75.1	84.2	91.8	96.4	98.1	95.1	91.5	70	102.4
General Noise - Area	Area	455402	100%/24h	81.6	96.7	107.2	114.6	117.8	114	113.8	65	121.6
General Noise - Area	Area	56892	100%/24h	72.6	87.7	98.2	105.5	108.8	105	104.8	65	112.6
General Noise - Area	Area	726385	100%/24h	83.6	98.7	109.2	116.6	119.8	116	115.8	65	123.6
Conveyor transfer points	Line	1836.74	100%/24h	75.4	84.5	92.1	96.7	98.4	95.4	91.8	70	102.7
Conveyor transfer points	Line	295.66	100%/24h	67.4	76.5	84.2	88.8	90.4	87.4	83.9	70	94.7
Conveyor transfer points	Line	294.07	100%/24h	67.4	76.5	84.2	88.8	90.4	87.4	83.9	70	94.7
Conveyor transfer points	Line	296.88	100%/24h	67.4	76.5	84.2	88.8	90.4	87.4	83.9	70	94.7
Conveyor transfer points	Line	294.56	100%/24h	67.4	76.5	84.2	88.8	90.4	87.4	83.9	70	94.7
Conveyor transfer points	Line	297.46	100%/24h	67.4	76.5	84.2	88.8	90.4	87.4	83.9	70	94.7
Conveyor transfer points	Line	65.28	100%/24h	60.9	70	77.6	82.2	83.9	80.9	77.3	70	88.2
Conveyor transfer points	Line	34.99	100%/24h	58.2	67.3	74.9	79.5	81.2	78.2	74.6	70	85.5
Conveyor transfer points	Line	293.48	100%/24h	67.4	76.5	84.2	88.8	90.4	87.4	83.9	70	94.7
Conveyor transfer points	Line	299.41	100%/24h	67.5	76.6	84.2	88.8	90.5	87.5	83.9	70	94.8
Material handling (various)	Point		100%/24h	85.4	88	96.6	99	97.1	92.5	88.9	103.2	103.2
Conveyor transfer points	Point		100%/24h	72.1	81.2	88.9	93.5	95.1	92.1	88.6	99.4	99.4
Conveyor transfer points	Point		100%/24h	72.1	81.2	88.9	93.5	95.1	92.1	88.6	99.4	99.4
Smelter building - chrome	Point		100%/24h	78.7	90.2	102.3	98	96.4	93.6	88.6	105	105
Material handling (various)	Point		100%/24h	85.4	88	96.6	99	97.1	92.5	88.9	103.2	103.2
Coal silo	Point		100%/24h	85.4	88	96.6	99	97.1	92.5	88.9	103.2	103.2
Material handling (various)	Point		100%/24h	85.4	88	96.6	99	97.1	92.5	88.9	103.2	103.2
Coal - Beneficiation Plant	Point		100%/24h	84.7	91.1	100.3	102	103.2	97.4	92.1	107.5	107.5
Material handling (various)	Point		100%/24h	85.4	88	96.6	99	97.1	92.5	88.9	103.2	103.2
Exhaust stack	Point		100%/24h	94.5	100.1	99	99.1	92.8	90	83	105.1	105.1
Exhaust stack	Point		100%/24h	94.5	100.1	99	99.1	92.8	90	83	105.1	105.1
Exhaust stack	Point		100%/24h	94.5	100.1	99	99.1	92.8	90	83	105.1	105.1
Exhaust stack	Point		100%/24h	94.5	100.1	99	99.1	92.8	90	83	105.1	105.1
Exhaust stack	Point		100%/24h	94.5	100.1	99	99.1	92.8	90	83	105.1	105.1
Furnace	Point		100%/24h	73.4	82.5	101.1	103.8	102.9	97.5	88.4	108	108
Exhaust stack	Point		100%/24h	94.5	100.1	99	99.1	92.8	90	83	105.1	105.1
Furnace	Point		100%/24h	73.4	82.5	101.1	103.8	102.9	97.5	88.4	108	108
Smelter building - chrome	Point		100%/24h	78.7	90.2	102.3	98	96.4	93.6	88.6	105	105
Crushing - Secondary	Point		100%/24h	90.3	99.8	108.5	111.5	107.9	104	103.9	115.2	115.2
Coke - Quech Car	Point		100%/24h	66.8	71.9	86.4	76.8	74	66.2	64	87.3	87.3
Coke - Quech Car	Point		100%/24h	66.8	71.9	86.4	76.8	74	66.2	64	87.3	87.3
Coke - Quech Car	Point		100%/24h	66.8	71.9	86.4	76.8	74	66.2	64	87.3	87.3
Coke - Quech Car	Point		100%/24h	66.8	71.9	86.4	76.8	74	66.2	64	87.3	87.3
Coke - Quech Car	Point		100%/24h	66.8	71.9	86.4	76.8	74	66.2	64	87.3	87.3
Coke - Quenching Tower	Point		100%/24h	81.8	88.9	92.4	96.8	100	98.2	88	103.9	103.9
Coke - Quenching Tower	Point		100%/24h	81.8	88.9	92.4	96.8	100	98.2	88	103.9	103.9

Appendix B: Equipment and Activity list with Sound Power Levels

Coke - Quech Car	Point		100%/24h	66.8	71.9	86.4	76.8	74	66.2	64	87.3	87.3
Coke - Quech Car	Point		100%/24h	66.8	71.9	86.4	76.8	74	66.2	64	87.3	87.3
HRSB	Point		100%/24h	109.8	108.9	110.4	110.8	108	106.2	103	117.3	117.3
Material handling (various)	Point		100%/24h	85.4	88	96.6	99	97.1	92.5	88.9	103.2	103.2
Crusher - Primary	Point		100%/24h	94.9	106.2	111.5	116.8	117.3	113.7	107.3	121.7	121.7
Plant - Feed screens	Point		100%/24h	73.8	86.8	93.1	99.8	103.2	104.2	102.1	108.8	108.8
Coke - Quenching Tower	Point		100%/24h	81.8	88.9	92.4	96.8	100	98.2	88	103.9	103.9
Coke - Quench Car	Point		100%/24h	66.8	71.9	86.4	76.8	74	66.2	64	87.3	87.3
Coke - Quenching Tower	Point		100%/24h	81.8	88.9	92.4	96.8	100	98.2	88	103.9	103.9
Coke - Quenching Tower	Point		100%/24h	81.8	88.9	92.4	96.8	100	98.2	88	103.9	103.9
Coke - Quenching Tower	Point		100%/24h	81.8	88.9	92.4	96.8	100	98.2	88	103.9	103.9

APPENDIX C

Calculated conceptual noise levels

Appendix C, Table 1: Projected daytime noise levels due to future construction activities

Potential Noise-sensitive development / Receptor(s)	Recommended Rating Levels	Potential Existing Residual Noise Levels (long-term average - impulse-weighted, low wind) [as measured, estimated or calculated]	Recommended Noise Limit	Projected Noise Rating Level, construction phase - Day	Change in rating level	Magnitude / Intensity	Duration	Extent	Probability of Impact Occurring	Significance
4	45	43.8	50.0	32.7	0.3	Minor	Short-term	Local	Improbable	Low
5	45	43.8	50.0	46.6	4.6	Low	Short-term	Local	Possible	Low
6	45	43.8	50.0	32.7	0.3	Minor	Short-term	Local	Improbable	Low
7	45	43.8	50.0	25.2	0.1	Minor	Short-term	Local	Improbable	Low
9	45	43.8	50.0	56.9	13.3	Very High	Short-term	Local	Highly Likely	Medium
10	45	43.8	50.0	39.2	1.3	Minor	Short-term	Local	Improbable	Low
11	45	43.8	50.0	37.9	1.0	Minor	Short-term	Local	Improbable	Low
12	45	43.8	50.0	40.3	1.6	Minor	Short-term	Local	Improbable	Low
13	45	43.8	50.0	41.1	1.9	Minor	Short-term	Local	Improbable	Low
19	45	43.8	50.0	34.3	0.5	Minor	Short-term	Local	Improbable	Low
31	45	43.8	50.0	33.1	0.4	Minor	Short-term	Local	Improbable	Low
32	45	43.8	50.0	30.9	0.2	Minor	Short-term	Local	Improbable	Low
35	45	43.8	50.0	31.6	0.3	Minor	Short-term	Local	Improbable	Low
36	45	43.8	50.0	32.1	0.3	Minor	Short-term	Local	Improbable	Low

Appendix C, Table 2: Projected night-time noise levels due to future construction activities

Potential Noise-sensitive development / Receptor(s)	Recommended Rating Levels	Potential Existing Residual Noise Levels (long-term average - impulse-weighted, low wind) [as measured, estimated or calculated]	Recommended Noise Limit	Projected Noise Rating Level, construction phase - Night	Change in rating level	Magnitude / Intensity	Duration	Extent	Probability of Impact Occurring	Significance
4	35	40.9	45.0	32.7	0.6	Minor	Short-term	Regional	Improbable	Low
5	35	40.9	45.0	46.6	6.8	Moderate	Short-term	Regional	Highly Likely	Medium
6	35	40.9	45.0	32.7	0.6	Minor	Short-term	Regional	Improbable	Low
7	35	40.9	45.0	25.2	0.1	Minor	Short-term	Regional	Improbable	Low
9	35	40.9	45.0	56.9	16.1	Very High	Short-term	Regional	Definite	High
10	35	40.9	45.0	39.2	2.3	Minor	Short-term	Regional	Possible	Low
11	35	40.9	45.0	37.9	1.8	Minor	Short-term	Regional	Improbable	Low
12	35	40.9	45.0	40.3	2.7	Minor	Short-term	Regional	Possible	Low
13	35	40.9	45.0	41.1	3.1	Low	Short-term	Regional	Possible	Low
19	35	40.9	45.0	34.3	0.9	Minor	Short-term	Regional	Improbable	Low
31	35	40.9	45.0	33.1	0.7	Minor	Short-term	Regional	Improbable	Low

32	35	40.9	45.0	30.9	0.4	Minor	Short-term	Regional	Improbable	Low
35	35	40.9	45.0	31.6	0.5	Minor	Short-term	Regional	Improbable	Low
36	35	40.9	45.0	32.1	0.5	Minor	Short-term	Regional	Improbable	Low

Appendix C, Table 3: Projected daytime noise levels due to future operation activities

Potential Noise-sensitive development / Receptor(s)	Recommended Rating Levels	Potential Existing Residual Noise Levels (long-term average - impulse-weighted, low wind) [as measured, estimated or calculated]	Recommended Noise Limit	Projected Noise Rating Level, operational phase - Day	Change in rating level	Magnitude / Intensity	Duration	Extent	Probability of Impact Occurring	Significance
4	45	43.8	50.0	40.3	1.6	Minor	Long-term	Local	Improbable	Low
5	45	43.8	50.0	53.5	10.1	Very High	Long-term	Local	Likely	Medium
6	45	43.8	50.0	39.4	1.3	Minor	Long-term	Local	Improbable	Low
7	45	43.8	50.0	33.4	0.4	Minor	Long-term	Local	Improbable	Low
9	45	43.8	50.0	57.7	14.0	Very High	Long-term	Local	Highly Likely	High
10	45	43.8	50.0	44.7	3.5	Low	Long-term	Local	Possible	Low
11	45	43.8	50.0	43.8	3.0	Minor	Long-term	Local	Improbable	Low
12	45	43.8	50.0	45.6	4.0	Low	Long-term	Local	Possible	Low
13	45	43.8	50.0	46.6	4.6	Low	Long-term	Local	Possible	Low
19	45	43.8	50.0	35.7	0.6	Minor	Long-term	Local	Improbable	Low
31	45	43.8	50.0	40.2	1.6	Minor	Long-term	Local	Improbable	Low
32	45	43.8	50.0	39.2	1.3	Minor	Long-term	Local	Improbable	Low
35	45	43.8	50.0	39.4	1.3	Minor	Long-term	Local	Improbable	Low
36	45	43.8	50.0	40.1	1.5	Minor	Long-term	Local	Improbable	Low

Appendix C, Table 4: Projected night-time noise levels due to future operation activities

Potential Noise-sensitive development / Receptor(s)	Recommended Rating Levels	Potential Existing Residual Noise Levels (long-term average - impulse-weighted, low wind) [as measured, estimated or calculated]	Recommended Noise Limit	Projected Noise Rating Level, operational phase - Night	Change in rating level	Magnitude / Intensity	Duration	Extent	Probability of Impact Occurring	Significance
4	35	40.9	45.0	40.3	2.7	Minor	Long-term	Regional	Possible	Low
5	35	40.9	45.0	53.5	12.9	Very High	Long-term	Regional	Highly Likely	High
6	35	40.9	45.0	39.4	2.3	Minor	Long-term	Regional	Possible	Low
7	35	40.9	45.0	33.4	0.7	Minor	Long-term	Regional	Improbable	Low
9	35	40.9	45.0	57.7	16.9	Very High	Long-term	Regional	Definite	High
10	35	40.9	45.0	44.7	5.3	Moderate	Long-term	Regional	Possible	Low
11	35	40.9	45.0	43.8	4.7	Low	Long-term	Regional	Possible	Low
12	35	40.9	45.0	45.6	6.0	Moderate	Long-term	Regional	Likely	Medium
13	35	40.9	45.0	46.6	6.8	Moderate	Long-term	Regional	Likely	Medium

Appendix C: Calculated conceptual noise levels

19	35	40.9	45.0	35.7	1.2	Minor	Long-term	Regional	Improbable	Low
31	35	40.9	45.0	40.2	2.7	Minor	Long-term	Regional	Possible	Low
32	35	40.9	45.0	39.2	2.3	Minor	Long-term	Regional	Possible	Low
35	35	40.9	45.0	39.4	2.3	Minor	Long-term	Regional	Possible	Low
36	35	40.9	45.0	40.1	2.6	Minor	Long-term	Regional	Possible	Low

End of Report