

Appendix G3: Noise





forestry, fisheries & the environment

Department:
Forestry, Fisheries and the Environment
REPUBLIC OF SOUTH AFRICA

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SPECIALIST DECLARATION FORM – AUGUST 2023

Specialist Declaration form for assessments undertaken for application for authorisation in terms of the National Environmental Management Act, Act No. 107 of 1998, as amended and the Environmental Impact Assessment (EIA) Regulations, 2014, as amended (the Regulations)

REPORT TITLE

De Jager, M (2024). "Environmental Noise Impact Assessment for the Soufflet Malting Plant in the Sedibeng District, Gauteng Province", Enviro-Acoustic Research cc, Pretoria

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1. This form must always be used for assessment that are in support of applications that must be subjected to Basic Assessment or Scoping & Environmental Impact Reporting, where this Department is the Competent Authority.
2. This form is current as of August 2023. It is the responsibility of the Applicant / Environmental Assessment Practitioner (EAP) to ascertain whether subsequent versions of the form have been published or produced by the Competent Authority. The latest available Departmental templates are available at <https://www.dffe.gov.za/documents/forms>.
3. An electronic copy of the signed declaration form must be appended to all Draft and Final Reports submitted to the department for consideration.
4. The specialist must be aware of and comply with '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 act, when applying for environmental authorisation - GN 320/2020', where applicable.

1. SPECIALIST INFORMATION

Title of Specialist Assessment	Environmental Noise Impact Assessment
Specialist Company Name	Enviro-Acoustic Research CC
Specialist Name	Morné de Jager
Specialist Identity Number	[REDACTED]
Specialist Qualifications:	B. Ing (Chemical)
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SPECIALIST DECLARATION FORM – AUGUST 2023

2. DECLARATION BY THE SPECIALIST

I, Morné de Jager declare that –

- I act as the independent specialist in this application;
- I am aware of the procedures and requirements 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 (NEMA), 1998, as amended, when applying for environmental authorisation which were promulgated in Government Notice No. 320 of 20 March 2020 (i.e. “the Protocols”) and in Government Notice No. 1150 of 30 October 2020.
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations 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 undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing –
 - any decision to be taken with respect to the application by the competent authority; and;
 - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- All the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of Regulation 48 and is punishable in terms of section 24F of the NEMA Act.



Signature of the Specialist

Enviro-Acoustic Research CC

Name of Company:

16 June 2024

Date

3. UNDERTAKING UNDER OATH/ AFFIRMATION

I, **Morné de Jager** _____, swear under oath / affirm that all the information submitted or to be submitted for the purposes of this application is true and correct.



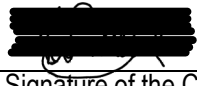
Signature of the Specialist

Enviro-Acoustic Research CC

Name of Company:

16 June 2024

Date



Signature of the Commissioner of Oaths:

16 June 2024

Date

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Soufflet Malt South Africa (Pty) Ltd

ENVIRONMENTAL NOISE IMPACT ASSESSMENT

for the

**Soufflet Malting Plant in the Sedibeng district,
Gauteng Province**



Study done for:



Prepared by:



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EXECUTIVE SUMMARY

INTRODUCTION AND PURPOSE

Enviro-Acoustic Research (“EARES”) was contracted by Royal Haskoning DHV (Pty) (the “EAP”) to determine the potential noise impact on the surrounding environment due to the development of a Malting Plant in the Sedibeng District of Gauteng Province.

This report describes ambient sound levels in the area, potential worst case noise rating levels and the potential noise impacts that the operation may have on the surrounding sound environment, highlighting the methods used, potential issues identified, findings and recommendations.

PROJECT DESCRIPTION

Soufflet Malt proposes to construct a new greenfield malt production facility located to the south of the Heineken Sedibeng Brewery (“Heineken”) in the Kliprivier Business Park in the Sedibeng District Municipality, Gauteng Province.

The malt plant (“plant”) will be constructed on Erf 244 Graceview which is owned by Heineken. The plant will provide the neighbouring Heineken Brewery with malt via a conveyor belt system. The initial delivery capacity will be 93 KT/year of malt which will increase in the future to 135 KT/year. The malt plant will be operational for up to 50 years.

The following are key components of the proposed facility:

- Working building;
- Barley Storage;
- Malt Storage;
- Steeping Building;
- Germination Vessel;
- Malt Dispatch;
- Energy System;
- Workshop and Spare Parts;
- Electrical Buildings;
- Water Storage;
- Wastewater Storage and Treatment Plant;
- Ammonia Storage; and
- Ancillary Infrastructure.

SURROUNDING LAND USE AND POTENTIAL NOISE-SENSITIVE RECEPTORS

The surrounding topography can be defined as plains, hills and lowlands, with the surrounding land use being mainly residential, some wilderness and industrial. Residential areas are located to the south and south-west of the study area with industrial activities taking place to the north and east. Wilderness is located to the west and north-west. A small group of approximately eight small holdings is situated 1km south-west of the proposed plant area, with an informal settlement located 1.1km to the south. A few potential noise-sensitive receptors ("NSR") are scattered in a heterogeneous manner in the area.

BASELINE ASSESSMENT

Ambient sound levels were measured at three locations in the vicinity of the project area in a semi-continuous manner over a period of 2-nights (more than 700 daytime and 300 night-time measurements – each with a duration of 10-minutes). A measurement was obtained at the Heineken Brewery, the SOLA solar plant and at a small holding 1km south-west of the study area. Measurements were obtained during May 2024, with the data indicating ambient sound levels typical of a rural noise district (daytime period) to urban noise district (night-time period).

Ambient sound levels were mainly dominated by noises from Heineken and SOLA PV plant at the two measurement locations closer to these activities. Noise from birds, insects, farm animals and road noise from the R59 dominated the soundscape at the measurement location at the small holding.

DESIRED NOISE LIMITS

Considering the average fast-weighted sound level data collected in the area, average:

- daytime fast-weighted sound levels ranged from 36 to 66 dBA, with average sound levels being 45.3 dBA. Only considering the fast-weighted values, sound levels are typical of a rural noise district, setting a zone sound level of 50 dBA for the daytime period; and
- night-time fast-weighted sound levels ranged from 28 to 69 dBA, with average sound levels being 40.6 dBA. Only considering the fast-weighted values, sound levels are typical of a sub-urban noise district, setting a zone sound level of 40 dBA for the night-time period.

In addition, considering international guidelines, the IFC (relevant for projects financed by the World Bank Group - see **section 5.4.4**) the following noise levels should not be exceeded:

- 55 dBA (as recommended by the IFC) for daytime residential use; and

- 45 dBA (as recommended by the IFC) for night-time residential use.

The plant should also limit the noise level to less than 60 dBA on the boundary (70 dBA during the daytime period, and 60 dBA at night for a 70 dBA day-night noise limit).

NOISE IMPACT DETERMINATION AND FINDINGS

This study considers the potential noise impact on the surrounding environment due to the construction, operational and future decommissioning activities associated with the development of the Soufflet Malting Plant. Using conceptual worst-case noise models, it was determined that the potential noise impacts at the project would be:

- of a **low significance** for daytime construction activities;
- of **low significance** for night-time construction activities (even though night-time construction are not anticipated);
- of a **low significance** for daytime operational activities; and
- of a **low significance** for night-time operational activities.

The development of the Soufflet Malting Plant could increase noise levels at NSR1 (the closest noise-sensitive receptor), although this is considering a worst-case scenario and it is not deemed as a noise impact.

At all stages, surrounding receptors should be informed about the project, providing them with factual information without setting unrealistic expectations. It is counterproductive to suggest that the activities will be inaudible due to existing high ambient sound levels, or that noise levels will be low (based on the noise assessment). The magnitude of the sound levels will depend on a multitude of variables and will vary from day to day and from place to place with environmental and operational conditions. Audibility is distinct from the sound level, because it depends on the relationship between the sound level from the activities, the spectral character and that of the surrounding soundscape (both level and spectral character).

The project applicant must implement a line of communication (i.e., a help line where complaints could be lodged). All potential sensitive receptors should be made aware of these contact numbers. The plant should maintain a commitment to the local community (people staying within 1,000 m from construction or operational activities) and respond to noise concerns in an expedient fashion. Sporadic and legitimate noise complaints could be raised. For example, sudden and sharp increases in sound levels could result from mechanical malfunctions or maintenance issues. Problems of this nature can be corrected quickly and it is in the plant's interest to do so.

MANAGEMENT AND MITIGATION

The noise study considers the potential noise impact on the surrounding environment due to construction activities as conceptualized. It was determined that the potential noise impact would be of a **low significance** and additional mitigation is not recommended or required.

General measures are however included to ensure that annoyance with the project is minimised. These measures could include:

- All employees and contractors should receive Health and Safety induction that includes an environmental awareness component (noise). This is to allow employees and contractors to the potential noise risks that activities (especially night-time activities) pose to the realise surrounding environment;
- The applicant must implement a line of communication (i.e., a helpline where complaints could be lodged). All potential sensitive receptors should be made aware of these contact numbers, or alternative means to communicate issues. The plant should maintain a commitment to the local community and respond to concerns in an expedient fashion. Sporadic and legitimate noise complaints could develop and if valid, should be investigated. Feedback must be provided to the affected stakeholder(s) with details of any steps taken to mitigate the impact (if valid complaint) or preventative steps to minimise this from happening again;
- The plant must investigate any reasonable and valid noise complaint if registered by a receptor staying within 1,000 m from the processing plant;

The study considers the potential noise impact on the surrounding environment due to operational activities at the plant. The potential noise impact would be of a **low** significance during the operational phase for both the day- and night-time activities.

Continued management measures as highlighted for the construction phase will allow the reduction in potential noise annoyance with the project. General mitigation measures recommended for the applicant to note include:

- The continued commitment to consider the potential sensitivity of the surrounding communities to increased noises. Management measures as highlighted for the construction phase should continue;
- The plant must investigate any reasonable and valid noise complaint if registered by a receptor staying within 1,000 m from the plant.

NEED AND DESIRABILITY OF PROJECT

When industrial projects are near to potential noise-sensitive receptors, consideration must be given to ensure a compatible co-existence. The potential sensitive receptors

should not be adversely affected and yet, at the same time the project needs to reach an optimal scale in terms of layout and production.

While the proposed project will provide economic and social benefits to the area, the noises could be audible at the surrounding receptors, and, even considering the slightly elevated ambient sound levels, will raise the noise levels at the closest receptors. The closest receptors could consider these noises annoying at times (although unlikely). In terms of acoustics, there is no benefit to the surrounding environment (closest receptors).

However, the project will greatly assist in the economic growth and development challenges South Africa is facing by means of assisting in providing employment and other business opportunities. Considering only noise, people in the area not directly affected by increased noise levels could have a positive perception of the project and could see the need and desirability of the project.

CONCLUSION AND RECOMMENDATION

The construction and operational scenarios all consider worst-case noise emission levels from various simultaneous activities. The scenarios consider numerous activities at various locations, which would increase cumulative effects.

It is expected that the plant could be audible at the closest NSR (NSR01) during the night-time, though it is not regarded as a noise impact. While complaints about noise might be possible (though considered unlikely), the implementation of the general mitigation measures could assist in reducing annoyance with the project.

It is therefore recommended that the Soufflet Malting Plant be authorized (from a noise impact perspective).

This noise impact assessment is considered sufficient and further acoustic studies will not be required, with bi-annual noise monitoring is recommended at NSR01 for the first year of operation (summer and during winter). Noise monitoring should consider the requirements of SANS 10103:2008.



Morné de Jager

Enviro-Acoustic Research cc

2024 – 06 – 13

CONTENTS OF THE SPECIALIST REPORT – CHECKLIST

Contents of this report in terms of Regulation GNR 982 of 2014, Appendix 6 (as amended 2017)		Relevant Section of Specialist study
(1)	A specialist report prepared in terms of these Regulations must contain-	
(a)	details of-	
	(i) the specialist who prepared the report; and	Section 1
	(ii) the expertise of that specialist to compile a specialist report including a curriculum vitae	Section 1
(b)	a declaration that the specialist is independent in a form as may be specified by the competent authority;	Section 2
(c)	an indication of the scope of, and the purpose for which, the report was prepared;	Section 4.1
(cA)	an indication of the quality and age of base data used for the specialist report;	Section 6.1
(cB)	a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Section 6.1 and 6.2
(d)	the duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment;	Section 6.1
(e)	a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	Section 4.6
(f)	details of an assessment of the specifically identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives;	Sections 6.1 and 10.5
(g)	an identification of any areas to be avoided, including buffers;	No buffers required. Noise rating levels calculated and illustrated.
(h)	a map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	Sections 6.1
(i)	a description of any assumptions made and any uncertainties or gaps in knowledge;	Section 9
(j)	a description of the findings and potential implications of such findings on the impact of the proposed activity or activities;	Sections 10 and 11
(k)	any mitigation measures for inclusion in the EMPr;	Sections 12.3
(l)	any conditions for inclusion in the environmental authorisation (EA);	Sections 12.3
(m)	any monitoring requirements for inclusion in the EMPr or environmental authorisation;	Section Error! Reference source

Contents of this report in terms of Regulation GNR 982 of 2014, Appendix 6 (as amended 2017)		Relevant Section of Specialist study
		not found.
(n)	a reasoned opinion -	Section 14
	whether the proposed activity, activities or portions thereof should be authorised;	Section 14
	regarding the acceptability of the proposed activity or activities; and	Section 14
	if the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan;	Section 14
(o)	a description of any consultation process that was undertaken during the course of preparing the specialist report;	See Section 4.5
(p)	a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	See Section 4.5
(q)	any other information requested by the competent authority.	None

This report should be cited as:

De Jager, M. (2024): “*Environmental Noise Impact Assessment for the Soufflet Malting Plant in the Sedibeng District, Gauteng Province*”. Enviro-Acoustic Research CC, Pretoria

Client:

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June 2024

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APPENDICES

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<u>ANNEXURE B</u>	Photos of measurement locations
<u>ANNEXURE C</u>	Calculated conceptual noise levels and potential significance

GLOSSARY OF ABBREVIATIONS

ADT	Articulated Dump Trucks
ASTER	Advanced Spaceborne Thermal Emission and Reflection Radiometer
DFFE	Department of Forestry, Fisheries and Environment
EARES	Enviro Acoustic Research cc
ECA	Environment Conservation Act
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
ENIA	Environmental Noise Impact Assessment
ENM	Environmental Noise Monitoring
ENPAT	Environmental Potential Atlas for South Africa
EPs	Equator Principles
EPFIs	Equator Principles Financial Institutions
FEL	Front-end Loader
GN	Government Notice
HME	Heavy Mobile Equipment
IEC	International Electrotechnical Commission
IFC	International Finance Corporation
ISO	International Organization for Standardization
METI	Ministry of Economy, Trade, and Industry
NASA	National Aeronautical and Space Administration
NCR	Noise Control Regulations
NSD	Noise-sensitive Development
NSR	Noise-sensitive Receptor
PFA	Project Focus Area
PWL	Sound Power Level
SABS	South African Bureau of Standards
SANS	South African National Standards

SPL	Sound Power Level
UTM	Universal Transverse Mercator
WHO	World Health Organization

GLOSSARY OF UNITS

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

1 THE AUTHOR

The Author started his career in the mining industry as a bursar Learner Official (JCI, Randfontein), working in the industry, doing various mining-related courses (Rock Mechanics, Surveying, Sampling, Safety and Health [Ventilation, noise, illumination etc.] and Metallurgy. He did work in both underground (Coal, Gold and Platinum) as well as opencast (Coal) for 4 years. He changed course from Mining Engineering to Chemical Engineering after 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 these projects within budget and timeframe, gradually moving towards environmental acoustics, focusing on this field exclusively since 2007.

He has been interested in acoustics as from school days, doing projects mainly related to loudspeaker design. Interest in the matter brought him into the field of Environmental Noise Measurement, Prediction and Control. He has been doing work in this field for the past 8 years, and was involved with the following projects in the last few years:

Wind Energy Facilities

Zen (Savannah Environmental – SE), Goereesoe (SE), Springfontein (SE), Garob (SE), Project Blue (SE), ESKOM Kleinzee (SE), iNca Gouda (Aurecon SA), Kangnas (Aurecon), Walker Bay (SE), Oyster Bay (SE), Hidden Valley (SE), Happy Valley (SE), Deep River (SE), Saldanha WEF (Terramanzi), Loeriesfontein (SiVEST), Noupoot (SiVEST), Prieska (SiVEST), Plateau East and West (Aurecon), Saldanha (Aurecon), Veldrift (Aurecon), Tsitsikamma (SE), AB (SE), West Coast One (SE), Namakwa Sands (SE), Dorper (SE), VentuSA Gouda (SE), AmakhalaEmoyeni (SE), Klipheuwel (SE), Cookhouse (SE), Cookhouse II (SE), Canyon Springs (Canyon Springs), Rhebokfontein (SE), Suurplaat (SE), Karoo Renewables (SE), Outeniqua (Aurecon), Koningaas (SE), Eskom Aberdene (SE), Spitskop (SE), Rhenosterberg (SiVEST), Bannf (Vidigenix), Wolf WEF (Aurecon)

Mining and Industry

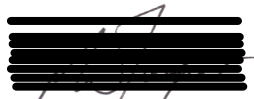
BECSA – Middelburg (Golder Associates), Kromkrans Colliery (Geovicon Environmental), SASOL Borrow Pits Project (JMA Consulting), Lesego Platinum (AGES), Tweefontein Colliery (Cleanstream), EvrazVametco Mine and Plant (JMA),

	<p>Goedehoop Colliery (Geovicon), Hakra Project (Prescali Environmental), Der Brochen Platinum Project (J9 Environment), Delft Sand (AGES), Brandbach Sand (AGES), Verkeerdepan Extension (CleanStream), Dwaalboom Limestone (AGES), Jagdlust Chrome (MENCO), WPB Coal (MENCO), Landau Expansion (CleanStream), Stuart Coal – Weltevreden (CleanStream), 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), EastPlats (CleanStream), Chapudi Coal (Jacana Environmental), Generaal Coal (JE), Mopane Coal (JE), Boshhoek Chrome (JMA), Langpan Chrome (PE), Vlakpoort Chrome (PE), Sekoko Coal (SE), Frankford Power (REMIG), Strahrae Coal (Ferret Mining), Transalloys Power Station (Savannah), Pan Palladium Smelter, Iron and PGM Complex (Prescali)</p>
Road and Railway	<p>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)</p>
Airport	<p>Oudtshoorn Noise Monitoring (AGES), Sandton Heliport (Alpine Aviation), Tete Airport Scoping</p>
Noise monitoring	<p>Peerboom Colliery (EcoPartners), Thabametsi (Digby Wells), DoxaDeo (DoxaDeo), Harties Dredging (Rand Water), Xstrata Coal – Witbank Regional, Sephaku Delmas (AGES), Amakhala Emoyeni WEF (Windlab Developments), Oyster Bay WEF (Renewable Energy Systems), Tsitsikamma WEF (Cennergj and SE), Hopefield WEF (Umoya), Wesley WEF (Innowind), Ncora WEF (Innowind), Boschmanspoort (Jones and Wagner), Nqamakwe WEF (Innowind), Dassiesfontein WEF Noise Analysis (BioTherm), Transnet Noise Analysis (Aurecon)</p>
Small Noise Impact Assessments	<p>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 (BPTrust), Ekuseni Youth Centre (MENCO), Kranskop Industrial Park (Cape South Developments), Pretoria Central Mosque (NomanShaikh), Soshanguve Development (Maluleke Investments), Seshego-D Waste Disposal (Enviroxcellence), Zambesi Safari Equipment (Owner), Noise Annoyance Assessment due to the Operation of the Gautrain (Thornhill and Lakeside Residential Estate), Upington Solar (SE), Ilangalethu Solar (SE), Pofadder Solar (SE), Flagging Trees WEF (SE), Uyekraal WEF (SE), Ruuki Power Station (SE), Richards Bay Port Expansion (AECOM), Babalegi Steel Recycling (AGES), SafikaLadium (AGES), Safika Cement Isando (AGES), Natref (NEMAI), RareCo (SE), Struisbaai WEF (SE)</p>
Project reviews and amendment reports	<p>Loperberg (Savannah), Dorper (Savannah), Penhoek Pass (Savannah), Oyster Bay (RES), Tsitsikamma (Cennergj), AmakhalaEmoyeni (Windlab), Spreeukloof (Savannah), Spinning Head (Savannah), Kangra Coal (ERM), West Coast One (Moyeng Energy), Rhebokfontein (Moyeng Energy)</p>

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
- 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 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:

2024 – 06 – 13

3 MINIMUM REQUIREMENTS – SCREENING OF SITE

The National Web based Environmental Screening Tool¹ was used to screen the proposed site (see **Figure 4-1** for the regional location) for the noise environmental sensitivity as per the requirements of GNR320 (20 March 2020), considering the site location. The site report generated by the Screening Tool highlighted that a Noise Impact Assessment must be completed and appended to the Environmental Authorization (“EA”) documentation. The screening report was developed for:

- Activity requiring permit or licence in terms of National or Provincial legislation governing the release or generation of emissions => Emissions.

The potential noise sensitive areas layer is not included in the above-mentioned categories, but was obtained from the Utilities Infrastructure => Electricity => Generation => Renewable => Wind category, with the noise sensitive areas illustrated on **Figure 4-3**.

Based on the output of the online screening tool, most of the area is considered to have a “very high” sensitivity to noise. This was also confirmed during the site visit that identified and confirmed various residential activities within the potential area of influence from the project activities (see also **Figure 4-4**).

In terms of GNR 320 (20 March 2020), the Noise Specialist Assessment must contain, as a minimum, the following information:

Clause	Reporting Requirements as per the Protocol for Noise Specialist Assessments	Compliance of current report / Reference
2.3.1	Current ambient sound levels recorded at relevant locations over a minimum of two nights and that provide a representative measurement of the ambient noise climate, with each sample being a minimum of ten minutes and taken at two different times of the night on each night, in order to record typical ambient sound levels at these different times of night	Section 6
2.3.2	Records of the approximate wind speed at the time of the measurement	Section 6
2.3.3	Mapped distance of the receiver from the proposed development that is the noise source	

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

Clause	Reporting Requirements as per the Protocol for Noise Specialist Assessments	Compliance of current report / Reference
2.3.4	Discussion on temporal aspects of baseline ambient conditions	Section 6
2.4.1	Characterization and determination of noise emissions from the noise source, where characterization could include types of noise, frequency, content, vibration and temporal aspects	Section 7
2.4.2	Projected total noise levels and changes in noise levels as a result of the construction, commissioning and operation of the proposed development for the nearest receptors using industry accepted models and forecasts	Sections 10
2.4.3	Desired noise levels for the area	Section 6.2
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 6
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	Sections 4.6, 6, 9 and 10
2.5.5	a map showing the proposed development footprint (including supporting infrastructure) overlaid on the noise sensitivity map generated by the screening tool	Section 9
2.5.6	confirmation that all reasonable measures have been taken through micro- siting to minimise disturbance to receptors	Various layouts previously investigated
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 12.3 and 14
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	Project location limited by the presence of the resource
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	Project location limited by the presence of the resource

Clause	Reporting Requirements as per the Protocol for Noise Specialist Assessments	Compliance of current report / Reference
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 Error! Reference source not found.
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 (“EARES”) was contracted by Royal Haskoning DHV (Pty) (the “EAP”) to determine the potential noise impact on the surrounding environment due to the development of a Malting Plant in the Sedibeng District of Gauteng Province.

This report describes ambient sound levels in the area, potential worst case noise rating levels and the potential noise impacts that the operation may have on the surrounding sound environment, highlighting the methods used, potential issues identified, findings and recommendations.

This study considered local regulations and both local and international guidelines, using the terms of reference as proposed by SANS 10328:2008 as well as the International Finance Corporation Performance Standards to allow for a comprehensive Environmental Noise Impact Assessment.

4.2 PROJECT DESCRIPTION

Soufflet Malt proposes to construct a new greenfield malt production facility located to the south of the Heineken Sedibeng Brewery (“Heineken”) in the Kliprivier Business Park in the Sedibeng District Municipality, Gauteng Province.

The malt plant (“plant”) will be constructed on Erf 244 Graceview which is owned by Heineken. The plant will provide the neighbouring Heineken Brewery with malt via a conveyor belt system. The initial delivery capacity will be 93 KT/year of malt which will increase in the future to 135 KT/year. The malt plant will be operational for up to 50 years.

Table 4-1: Key Components of Malting Plant

General Arrangement of Proposed Buildings	Description
Working building	<ul style="list-style-type: none">• The process of barley intake, cleaning and grading and malt blending, cleaning and bulk shipping will take place at this building.• Pit for grain will be arranged in front of the processing tower for receiving and shipping by truck.• Several bins with steel support structure will be situated on beams system of the building.

General Arrangement of Proposed Buildings	Description
	<ul style="list-style-type: none"> Conveyor systems also run inside the building.
Barley storage	<ul style="list-style-type: none"> Storage of barley before the malting process starts.
Malt storage	<ul style="list-style-type: none"> Storage and distribution of malt.
Steeping building	<ul style="list-style-type: none"> The barley steeping process will occur in this building. Steeping tanks with steel support structures will be arranged inside the building. There will be conveyor system for transferring malt from here to the germination vessels.
Germination vessels	<ul style="list-style-type: none"> The germination process will occur in these vessels.
Kilning vessel	<ul style="list-style-type: none"> This building is where the kilning process takes place. The kilning process occurs at various degrees Celsius ranging from 40°C to 90°C.
Malt dispatch	<ul style="list-style-type: none"> Malt dispatch will be via a conveyor system between the malt plant and the Heineken Brewery.
Energy system	<ul style="list-style-type: none"> Capacity of the combined heat and power genset (CHP) (including back up system) - 8MW of heating energy, 4MW of cooling energy and 3MW of electrical power through the CHP Plant, heat pumps and heat exchangers. 70GWh gas for CHP will be used. Capacity of the boilers (back-up) – 2 x 8MW using liquified natural gas (LNG) as a fuel source Approximately 70GWh of gas will be used per year. The Solar PV Project will not form part of the project scope but will be considered in future.
Administration building	<ul style="list-style-type: none"> The administration building contains the following functions: office space, meeting room, laboratory, security/weighbridge office, canteen, toilet, lockers, and dressing rooms. This building is a single storey structure is a local designed building with traditional features optimised to facilitate the corporate identity. The canteen and lockers are to serve an assumed 50 personnel with an estimated max. 40 persons in the day shift.
Workshop and spare parts	<ul style="list-style-type: none"> The building will comprise of welding workshop, forklift maintenance, storage area, office, and ablutions
Electrical buildings	<ul style="list-style-type: none"> Switch gear and transformers.
Water storage	<ul style="list-style-type: none"> The malting process consumes large amounts of water on a daily basis. The expected water usage for the current mandate based on the process mass energy balance

General Arrangement of Proposed Buildings	Description
	<p>spreadsheet is projected at 1000 m³/day peak load.</p> <ul style="list-style-type: none"> • The arrangement of the water storage tanks is described below: <ul style="list-style-type: none"> ○ One (1) freshwater tank of 1000 m³ available water storage volume. This volume includes 10% spare capacity for malt production usage demand for 24 hours. ○ One (1) process water tank of 1000 m³ available water storage volume. This volume including the option to be 50% recycled water.
Wastewater storage and treatment plant	<p>Effluent will either be discharged directly into ERWAT and on-site treatment of wastewater may only be considered as an alternative option.</p> <p>Process wastewater:</p> <ul style="list-style-type: none"> • Volume of wastewater stored in Reservoir below Steeping Building – 1000m³. <p>Treatment of the following wastewater streams:</p> <ul style="list-style-type: none"> • Domestic sewage/wastewater from the Administration building. • Industrial effluent/wastewater emanating from the washing and germination process of a maximum of 900 m³/d. • Volume of wastewater treated per day – 575m³ (Phase 1). • Concrete tank at the bottom of the steeping building which will serve as (bulk) process effluent storage with a capacity of 1000m³.
Ammonia storage	<ul style="list-style-type: none"> • Approximately 1.5 tonnes (2000m³).
Ancillary infrastructure	<p>Construction lay-down area, Internal conveyor system to transport grain between the Steeping building, Germination vessels, Kilning area, Bagging and chemical storage buildings, Fire pump room, gatehouse, weighbridge, truck staging area, waste pick-up area, internal access roads, staff parking.</p>

4.3 STUDY AREA

The project focus area ("PFA") is an area selected to enclose the proposed Malt Production Plant up to 2,000 m from such infrastructure. The PFA is located within the Midvaal Local Municipality (Sedibeng District Municipality) within the Gauteng Province. The PFA is further described in terms of environmental components that may contribute to or change the sound character in the area in the following sub-sections.

4.3.1 Topography

The Environmental Potential Atlas of South Africa ("ENPAT") (Van Riet *et al*, 1998) describes the topography as "Plains" (eastern part) and "Hills and Lowlands" (western part). Topographical features are unlikely to limit the propagation of noise from the project activities.

4.3.2 Surrounding Land Use

Considering aerial images (GoogleEarth ©) and observations made during the site visit, the surrounding land use can be classed as residential, wilderness and industrial.

4.3.3 Roads and Railways

The most significant road in terms of acoustics is the R59 which runs in a north-south direction approximately 300m east of the proposed Malting Plant location. Traffic on the R59 regularly exceeds 100km/h. This road significantly contributes to elevated ambient sound levels in the area, especially during the night-time.

4.3.4 Ground conditions and vegetation

The area falls within the grassland biome, with the natural vegetation type being "Sandy Veld"². Most of the natural veldt has been disturbed by anthropogenic activities, though some natural veldt remains to the east of the SOLA Solar Plant (east of the Soufflet Malt Plant location).

Taking into consideration available information it is the opinion of the author that the ground conditions (when considering acoustic propagation on a ground surface) can be classified as medium, which implies that the ground surface will absorb some of the acoustic energy hitting the ground surface. It should be noted that this factor is only relevant for air-borne waves being reflected from the ground surface, with certain frequencies slightly absorbed by the vegetation.

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

4.3.5 Existing Ambient Sound Levels

Ambient sound levels were measured at three locations in the vicinity of the project area in a semi-continuous manner over a period of 2-nights (more than 700 daytime and 300 night-time measurements – each with a duration of 10-minutes). A measurement was obtained at the Heineken Brewery, the SOLA solar plant and at a small holding 1km south-west of the study area. Measurements were obtained during May 2024, with the data indicating ambient sound levels typical of a rural noise district (daytime period) to urban noise district (night-time period).

Ambient sound levels were mainly dominated by noises from Heineken and SOLA PV plant at the two measurement locations closer to these activities. Noise from birds, insects, farm animals and road noise from the R59 dominated the soundscape at the measurement location at the small holding. The results and findings of the ambient sound level measurements are summarised in **Section 6.2**.

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

Potentially sensitive receptors, also known as noise-sensitive developments (“NSR”), located within the PFA were identified using Google Earth[®]. The PFA is sparsely populated, with a few NSR scattered in a heterogeneous manner in the area. Most of the NSR are located on smallholdings to the south-west (represented by NSR 1 – 9), with an informal settlement to the south (represented by NSR 10 and 11). Potential noise-sensitive receptors are depicted in **Figure 4-4**. The online screening tool identified that the PFA has a “very high” sensitivity to noise (see **Figure 4-3**).

Also indicated on **Figure 4-4** are generalized 200, 500 m and 1,000 m buffer zones. Generally, noises from industrial activities:

- can be significant at receptors staying within 500 m from active industrial activities. Noises could be at a sufficient level to be considered disturbing at night especially in an unmitigated scenario;
- are normally limited to a distance of approximately 1,000 m from the active industrial activities. Ambient sound levels are increased due to noises from the activities, with the potential noise impact measurable. Noise levels from such activities are generally less than 45 dBA further than 1,000 m from such activities;
- could be audible up to a distance of 2,000 m at night. These noises are normally of a low concern at distances greater than 2,000 m from activities at night.

These buffer distances may not be valid with very large industrial operations, or in areas with very low ambient sound levels.

4.5 COMMENTS REGARDING NOISE RECEIVED DURING THIS PROJECT

The author is not aware of any comments raised by the interested and affected parties at the date this report was compiled.

4.6 LEGISLATIVE REQUIREMENTS AND 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;
- A change in land use as highlighted in SANS 10328:2008, section 5.3;
- If an industry 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 vice 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 ("GN") 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) of GN R154 of 1992 (and GN 5479 of August 1999).

4.6.1 Requirements as per Government Gazette 43110 of March 2020

The Department of Forestry, Fisheries and Environment also promulgated Regulation 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 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.

The minimum requirements for a Noise Specialist Study (i.t.o GNR 320 of 2020) are also covered in **Section 3** of this report in the form of a checklist.

This assessment is comprehensive and a Noise Specialist Assessment is required because there are a number of potential noise-sensitive receptors living within 2,000 m from the proposed project activities.

4.6.2 Requirements as per South African National Standards

In addition, Appendix 6 of GN 326 of December 2014 (Government Gazette ("GG") 38282), as amended 7 April 2017 (GG. 40772), issued in terms of the National Environmental Management Act, No. 107 of 1998, also defines minimum information requirements for specialist reports.

In South Africa, the document that addresses the issues specifically concerning environmental noise is SANS 10103:2008. It has recently been thoroughly revised 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.

This standard 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 environmental impact assessment (“EIA”) purposes. These minimum requirements are:

1. The purpose of the investigation – **section 4.1**;
2. A brief description of the planned development or the changes that are being considered – **section 4.2**;
3. A brief description of the existing environment – **section 6**;
4. The identification of the noise sources that may affect the particular development, together with their respective estimated sound pressure levels or sound power levels (or both) – **section 7**;
5. The identified noise sources that were not taken into account and the reasons why they were not investigated – **section 7**;
6. The identified noise-sensitive developments and the estimated impact on them – **sections 4.4 and 11**;
7. Any assumptions made with regard to the estimated values used – **section 9**;
8. An explanation, either by a brief description or by reference, of the methods that were used to estimate the existing and predicted rating levels – **section 8**;
9. The location of the measurement or calculation points, i.e., a description, sketch or map – **section 10**;
10. Estimation of the environmental noise impact – **sections 10 and 11**;
11. Alternatives that were considered and the results of those that were investigated – **section 10.5**;
12. A list of all the interested or affected parties that offered any comments with respect to the environmental noise impact investigation – **section 4.5**;
13. A detailed summary of all the comments received from interested or affected parties as well as the procedures and discussions followed to deal with them – **section 4.5**;
14. Conclusions that were reached – **section 14**;
15. Recommendations, i.e., if there could be a significant impact, or if more information is needed, a recommendation that an environmental noise impact assessment be conducted – **section 14**; and
16. If remedial measures will provide an acceptable solution, which would prevent a significant impact, these remedial measures should be outlined in detail and included in the final record of decision if the approval is obtained from the relevant

authority. If the remedial measures deteriorate after a certain 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 – **section 12**.



Figure 4-1: Aerial image indicating the regional location of the Soufflet Malting Plant

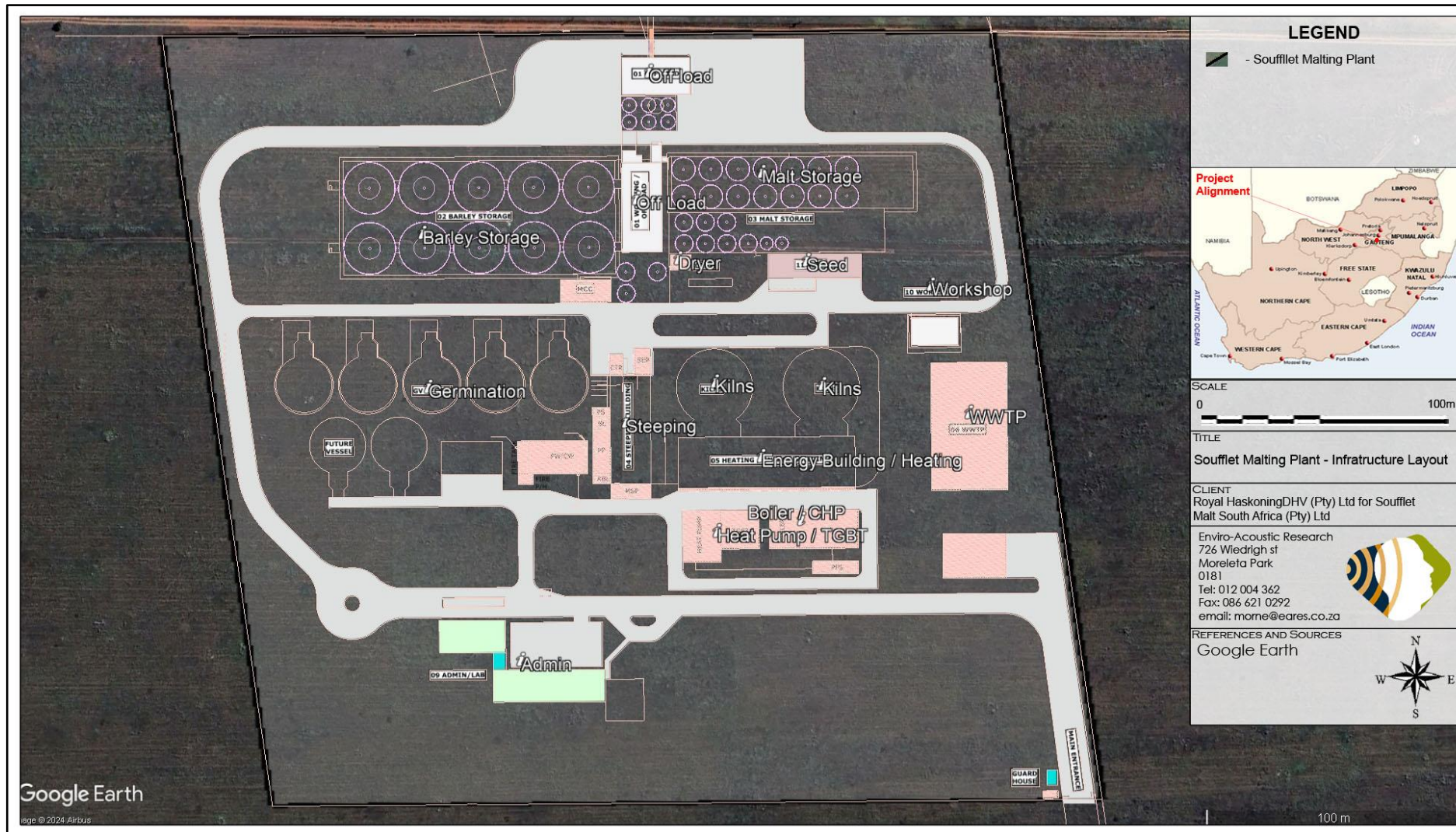


Figure 4-2: Proposed infrastructure layout



Figure 4-3: Areas identified by the online screening tool to have a “very high” sensitivity to noise

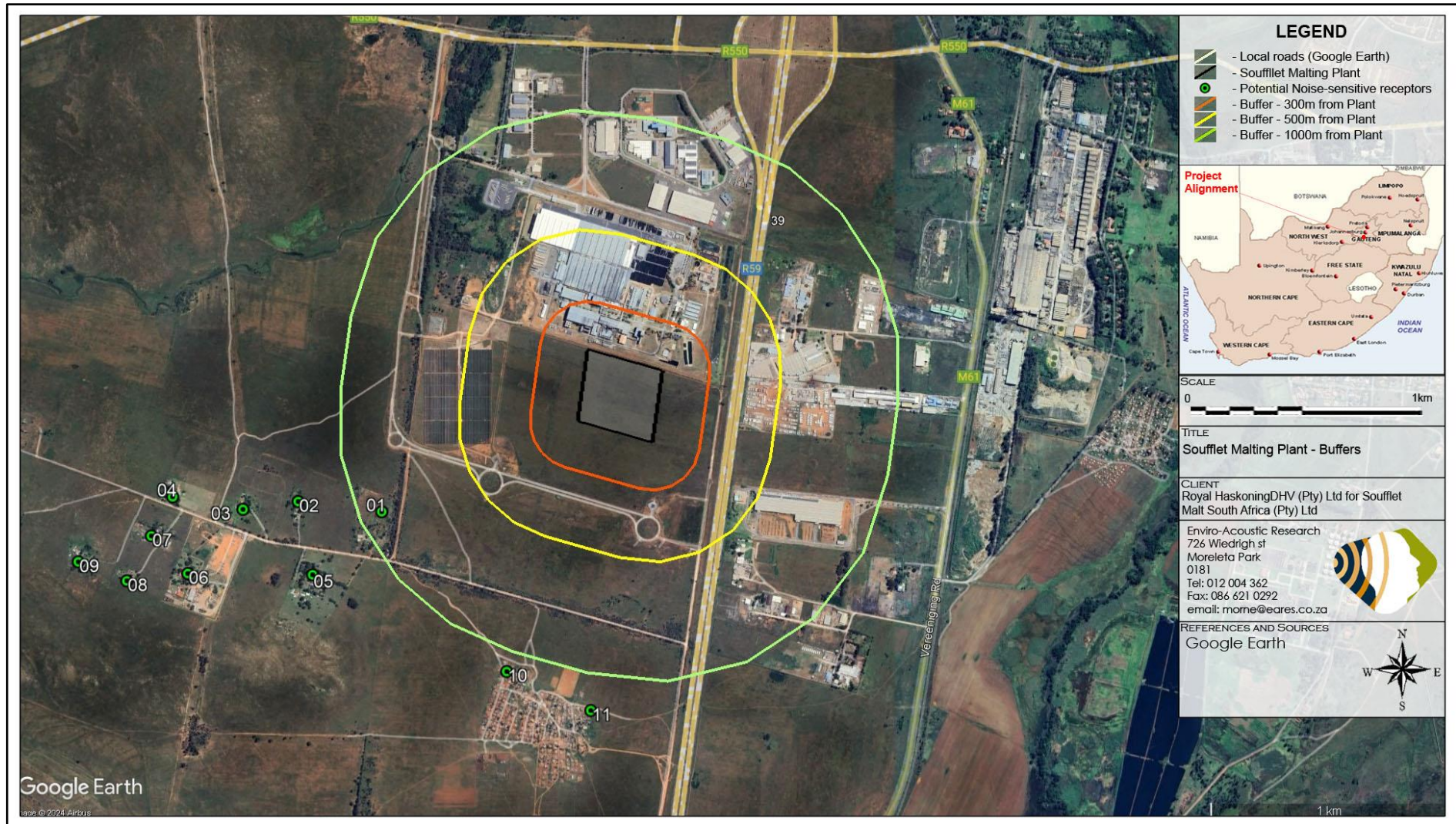


Figure 4-4: Aerial image indicating noise-sensitive receptors and areas close to proposed plant

5 LEGAL CONTEXT, POLICIES AND GUIDELINES

5.1 THE ENVIRONMENT CONSERVATION ACT (ACT 73 OF 1989)

The Environment Conservation Act (“ECA”) allows the Minister of Environmental Affairs and Tourism (“now the Ministry of Environmental Affairs”) to make regulations regarding noise, among other concerns. See also **Section 5.1.1**.

5.1.1 Noise Control Regulations: Gauteng Province (GN5479 of 20 August 1999)

The Gauteng Noise Control Regulations is based on the National Noise Control Regulations and most of the regulations are the same. It prohibits the generation of a disturbing noise in any manner (Regulation 8) and defines and prohibits activities that can result in a noise nuisance (Regulation 9). Regulation 11(1) allows a local authority to designate a controlled area as well as zone sound levels for specific areas and during specific times.

The difference between the National Noise Control Regulations and the Gauteng Province is the criteria set out for a controlled area, namely:

“**controlled area**” means a piece of land designed by a local authority where, in the case of-

- (c) industrial noise in the vicinity of an industry -
 - i. the reading on an integrating impulse sound level meter, taken outdoors at the end of a period of 24 hours while such meter was in operation, exceeds 60 dBA; or
 - ii. the calculated outdoor equivalent continuous "A"-weighted sound pressure level at a height of at least 1,2 metres, but not more than 1,4 metres, above the ground for a period of 24 hours, exceeds 60 dBA

“**disturbing noise**” as the noise level that causes the ambient noise level to rise above the designated zone level, or if no zone level has been designated, the typical rating levels for ambient noise in districts, indicated in table 2 of SABS 10103.

“**measuring point**” relating to -

- (a) a piece of land from which an alleged disturbing noise emanates, means a point outside the property projection plane where an alleged disturbing noise shall be measured in accordance with the provisions of regulation 16;

“**noise level**” means the reading on an integrating impulse sound level meter taken at a measuring point in the presence of any alleged disturbing noise at the end of a total

period of at least 10 minutes after such meter was put into operation, and, if the alleged disturbing noise has a discernible pitch, for example, a whistle, buzz, drone or music, to which 5 dBA has been added;

Section 8 of the Gauteng Noise Control Regulations prohibits the making, producing or causing of a disturbing noise.

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 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 (calculated from the sound pressure levels over the reference time, see [Appendix A](#)) 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*".

5.4 INTERNATIONAL GUIDELINES

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

5.4.1 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.

5.4.2 European Parliament Directive 200/14/EC (2000)

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.

5.4.3 Equator Principles (2003)

The **Equator Principles** ("EP") are a voluntary set of standards for determining, assessing and managing social and environmental risk in project financing. Equator Principles Financial Institutions ("EPFI") 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 EPs were developed by private sector banks and were launched in June 2003. The banks chose to model the EPs on the environmental standards of the World Bank and the social policies of the International Finance Corporation (“IFC”). As of March 2021, one hundred and sixteen (116) financial institutions (in 37 different countries) have adopted the EPs, which have become the de facto standard for banks and investors on how to assess major development projects around the world. The environmental standards of the World Bank have been integrated into the social policies of the IFC since April 2007 as the IFC Environmental, Health and Safety (“EHS”) Guidelines.

5.4.4 IFC: General EHS Guidelines – Environmental Noise Management (2007)

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 propose methods for the prevention and control of noise emissions, including:

- Selecting equipment with lower sound power levels;
- 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 minimise 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 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.

5.4.5 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.”

5.4.6 Environmental Noise Guidelines for the European Region (WHO, 2018)

This document identifies levels at which noise has significant health impacts and recommends actions to reduce exposure. Compared to previous WHO guidelines on noise, this version contains five significant developments:

- Stronger evidence of the cardiovascular and metabolic effects of environmental noise;
- Inclusion of new noise sources, namely wind turbine noise and leisure noise, in addition to noise from transportation (aircraft, rail, and road traffic);
- Use of a standardized approach to assess the evidence;
- A systematic review of evidence, defining the relationship between noise exposure and risk of adverse health outcomes;
- Use of long-term average noise exposure indicators to better predict adverse health outcomes.

6 CURRENT ENVIRONMENTAL SOUND CHARACTER

6.1 EFFECT OF SEASON ON SOUND LEVELS

Natural sounds are a part of the environmental noise surrounding humans. In rural areas the sounds from insects and birds would dominate the ambient sound character, with noises such as wind flowing through vegetation increasing as wind speed increase. Work by Fégeant (2002) stressed the importance of wind speed and turbulence causing variations in the level of vegetation-generated noise. In addition, factors such as the season (e.g., dry or no leaves versus green leaves), the type of vegetation (e.g., grass, conifers, deciduous), the vegetation density and the total vegetation surface all determine both the sound level as well as spectral characteristics.

Ambient sound levels are significantly affected by the area where the sound measurement location (or a listener) is situated. When the sound measurement location is situated within an urban area, close to industrial plants or areas with a constant sound source (ocean, rivers, etc.), seasons and higher wind speeds may have an insignificant impact on ambient sound levels.

Sound levels in undeveloped rural areas (away from occupied dwellings), however, are impacted by changes in season for a number of complex reasons. The two main reasons are:

- Faunal communication is more significant during the warmer spring and summer months as various species communicate in an effort to find mates. Faunal communication is normally less during the colder months, with ambient sound levels measured during the winter period frequently being very low.
- The occurrence of temperature inversions, see **Sub Section 6.1.1**, and
- Seasonal changes in weather patterns, mainly due to increased wind speeds (also see **Sub Section 6.1.2** below) and potential gustiness of the wind.

For environmental noise, weather plays an important role. The greater the separation distance, the greater the influence of the weather conditions, so, from day to day, a road 1,000 m away can sound very loud or can be completely inaudible. Other, environmental factors that impact on sound propagation includes wind, temperature and humidity, as discussed in the sub-sections below.

Ambient sound levels are generally less during the colder months (due to less faunal communication) and higher during the warmer months.

6.1.1 Effect of Temperature inversions

On a typical sunny afternoon, the air is the hottest near the ground surface and temperature decreases at higher altitudes. This temperature gradient causes sound waves to refract upward, away from the ground and results in lower noise levels being heard at a measurement location. In the evening, this temperature gradient will reverse, but, during certain meteorological conditions, the normal vertical temperature gradient could be inverted so that the air is colder near the surface, with a warmer layer blanketing the lower layer. This is illustrated in **Figure 6-1** below.

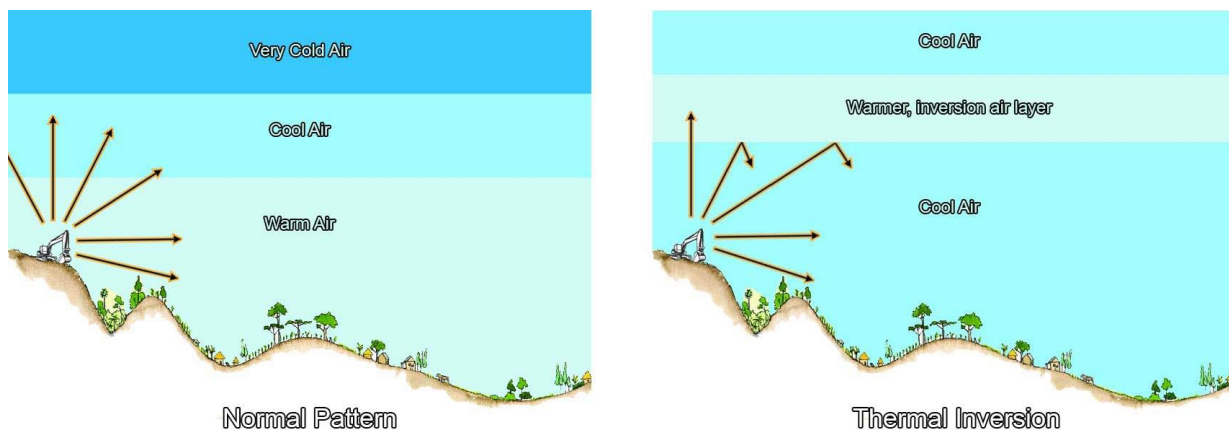


Figure 6-1: Influence of temperature inversions on the propagation of sound

When such an inversion layer is present, some of the sound waves will be refracted³ by the temperature gradient, with the refracted sound waves returned to the ground. This effect has been noticed near airports and roads, where noises can be heard over greater distances at night than other times of day (Parnell, 2015; Saurenman, 2005; Van der Berg, 2003) for various industries.

Like wind gradients, temperature gradients can influence sound propagation over long distances, complicate sound level measurements as well as propagation modelling.

6.1.2 Effect of Wind

Wind alters sound propagation by the mechanism of refraction, that is, wind bends sound waves. Wind nearer to the ground moves more slowly than wind at higher altitudes, due to surface characteristics such as hills, trees, and man-made structures that interfere with the wind. This wind gradient, with faster wind at higher elevation and slower wind at lower elevation, causes sound waves to bend downward when they are traveling to a location downwind of the source and to bend upward when traveling toward a location

³ Redirecting the wave propagation direction due to a change in the density of the air which influence the speed of sound.

upwind of the source. Waves bending downward means that a listener standing downwind of the source will hear louder noise levels than the listener standing upwind of the source. This phenomenon can significantly impact sound propagation over long distances and when wind speeds are high. Over short distances wind direction has a small impact on sound propagation as long as wind velocities are reasonably slow, i.e., less than 5 m/s.

Wind speed frequently plays a role in increasing sound levels in natural locations. With no wind, there is little vegetation movement that could generate noises and faunal noises (normally birds and insects) dominate, however, as wind speeds increase, the rustling of leaves increases which subsequently can increase sound levels. This directly depends on the type of vegetation in a certain area. The impact of increased wind speed on sound levels depends on the vegetation type (deciduous versus conifers), the density of vegetation in an area, seasonal changes (in winter deciduous trees are bare) as well as the height of this vegetation. This excludes unanticipated consequences, as suitable vegetation may create suitable habitats and food sources attracting birds and insects (and the subsequent increase in faunal communication).

6.1.3 Effect of Humidity and Temperature

Generally, sound propagate better at lower temperatures (down to 10°C), and with everything being equal, a decrease in temperature from 32°C to 10°C could increase the sound level at a listener 600 m away by ± 2.5 dB (at 1,000 Hz).

The effect of humidity on sound propagation is quite complex, but effectively relates to how increased humidity changes the density of air. Lower density translates into faster sound wave travel, so sound waves travel faster at high humidity⁴. With everything being equal, an increase in humidity from 20% to 80% would increase the sound level at a listener 600 m away by ± 4 dB (at 1,000 Hz at 20°C).

Together, the impact of temperature and humidity (together with air pressure - to a minor extent) are complex and highly dependent on the frequency composition of the noise. This is illustrated in **Figure 6-2**.

⁴ The addition of water vapor to air (making the air more humid) **reduces the density of the air**. This occurs because the molar mass of water vapor (18 g/mol) is less than the molar mass of dry air (around 29 g/mol).

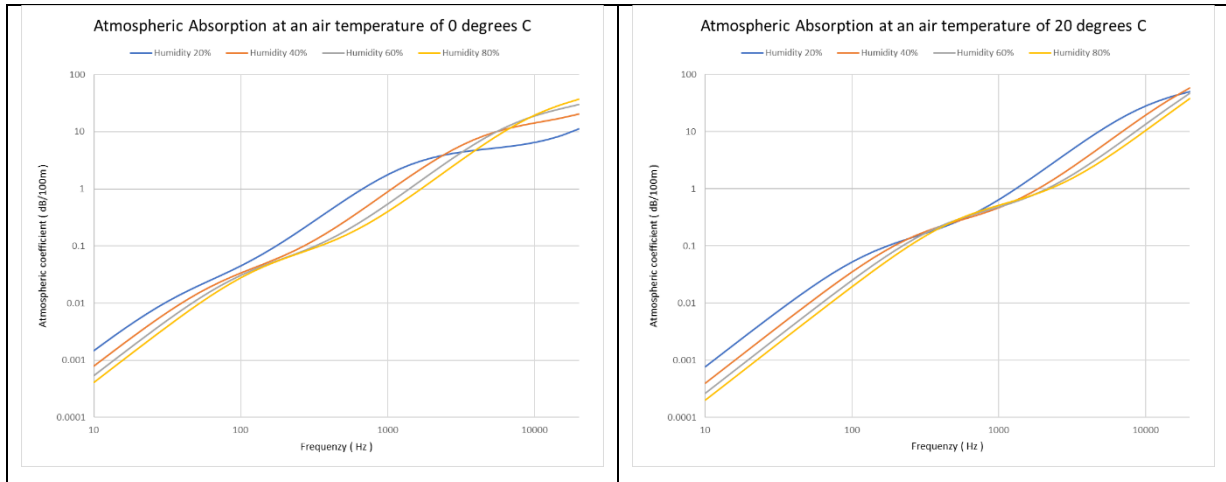


Figure 6-2: Effect of Temperature and Humidity on propagation of Sound

6.2 AMBIENT SOUND LEVEL MEASUREMENTS

Long-term Ambient (background) sound levels were measured over a period of two nights at three locations during May 2024 considering the prescribed procedures of GNR320 of 2020 and SANS 10103:2008 "***The measurement and rating of environmental noise with respect to land use, health, annoyance and to speech communication***".

The SANS 10103 guideline specifies the acceptable techniques for sound measurements including:

- type of equipment;
- minimum duration of measurement;
- microphone positions;
- calibration procedures and instrument checks; and
- weather conditions.

The sound measurement locations are illustrated in **Figure 6-3** as blue squares. Measurements were unattended semi-continuous long-term measurements over a two-night period, where the instrument will measure the sound level for a period of 10 minutes, save the data and immediately start with a new measurement. The measurement locations were named RHSMLTSL01 - 03. Measurements obtained in 2016 as part of the ENIA for the Heineken Brewery is also included in this report.

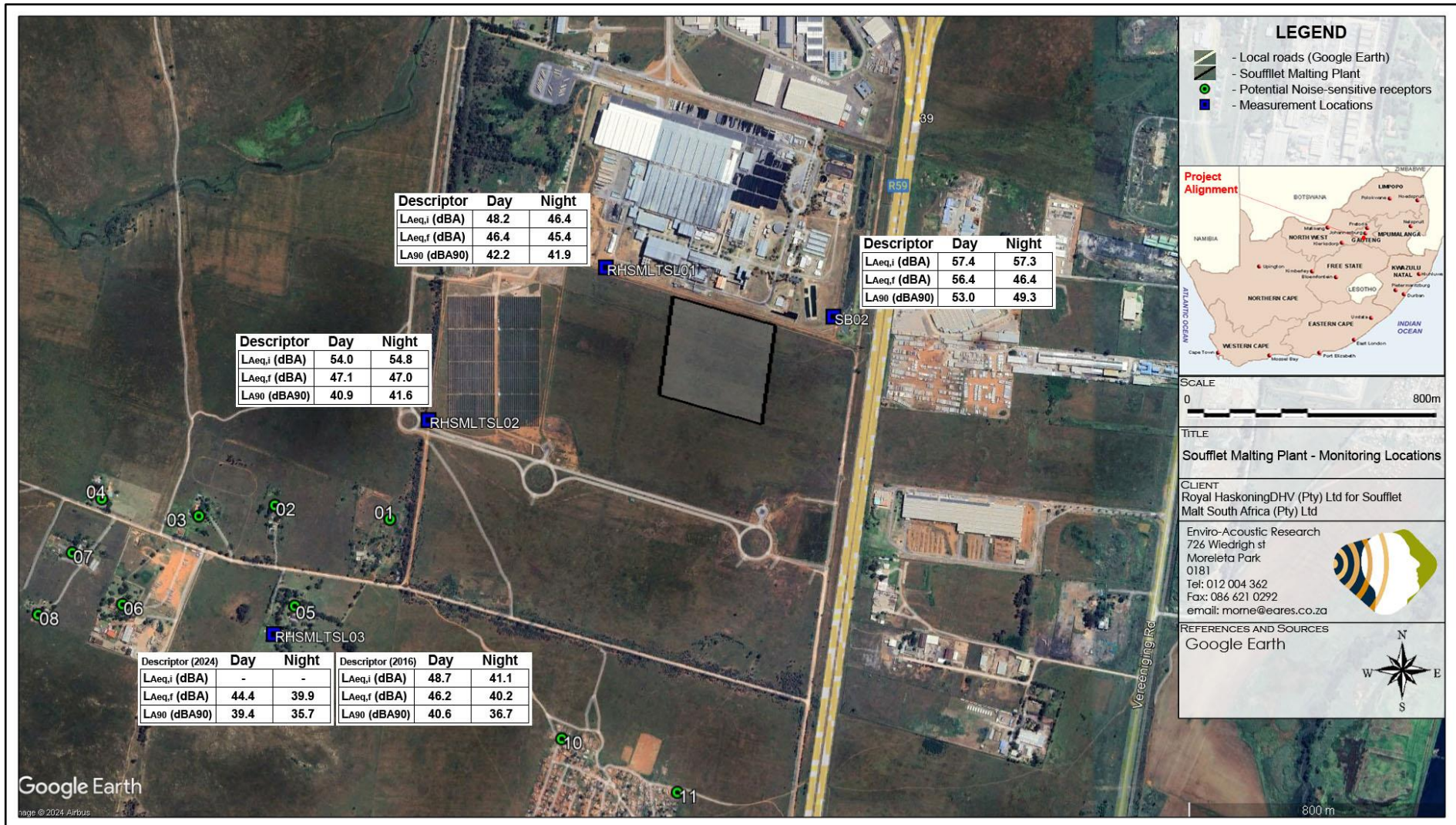


Figure 6-3: Localities where ambient sound levels were measured near the proposed Soufflet Malting Plant

6.2.1 Ambient Sound Level Measurement Location – RHSMLTSL01

The instrument was deployed on the south-west corner of the Heineken Sedibeng Brewery. A constant noise source from Heineken dominated the soundscape in the area.

The equipment defined in **Table 6-1** was used for gathering data with photos of the measurement location presented in [Appendix B.1](#). Refer to **Table 6-2** highlighting sounds heard during equipment deployment and collection.

Table 6-1: Equipment used to gather data at RHSMLTSL01

Equipment	Model	Serial no	Calibration Date
Sound Level Meter	Svan 977	34160	September 2022
Pre-amplifier	SV 12L	32395	September 2022
Microphone	ACO 7052E	54645	September 2022
Calibrator	Quest CA-22	J 2080094	July 2023
Weather Station	WH3081PC	-	-

Table 6-2: Noises/sounds heard during site visits at RHSMLTSL01

Noises/sounds heard during onsite investigations		
Magnitude Scale Code: • Barely Audible + Audible • Dominating	During equipment deployment	
	Faunal and Natural	Birds audible.
	Sounds associated with the area	Voices of security.
	Industrial & transportation	Hum from Heineken.
	During equipment collection	
	Faunal and Natural	Birds audible.
	Sounds associated with the area	Voices of security.
Industrial & transportation	Hum from Heineken.	

Impulse time-weighted equivalent sound levels $L_{A1eq,10min}$ and fast time-weighted equivalent sound levels $L_{AFeq,10min}$ are presented in **Figure 6-4** and summarised in **Table 6-3** below.

The maximum (L_{Amax}), minimum (L_{Amin}) and 90th percentile (L_{A90}) statistical values are illustrated in **Figure 6-5**. The impulse time-weighted sound descriptor is mainly used in South Africa to define sound and noise levels. Fast-weighted equivalent sound levels are included in this report as this is the sound descriptor used in most international countries to define the Ambient Sound Level.

The L_{A90} level is presented in this report to define the “background ambient sound level”, or the sound level that can be expected if there were little single events (loud transient

noises) that impacts on average sound level. The L_{A90} level is elevated due to the constant noise originating from the Heineken Sedibeng Brewery.

Table 6-3: Sound levels considering various sound level descriptors at RHSMLTSL01

	$L_{Amax,i}$ (dBA)	$L_{Aeq,i}$ (dBA)	$L_{Aeq,f}$ (dBA)	$L_{A90,f}$ (dBA90)	$L_{Amin,f}$ (dBA)
Day arithmetic average	-	48.2	46.4	42.2	-
Night arithmetic average	-	46.4	45.4	41.9	-
Day equivalent	-	51.7	50.2	-	-
Night equivalent	-	47.2	46.1	-	-
Day minimum	-	38.3	37.2	-	34.0
Day maximum	106.7	80.7	65.9	-	-
Night minimum	-	41.5	40.2	-	35.6
Night maximum	75.1	53.4	52.2	-	-

The numerous 10-minute measurements are further classified for the day- and night-time periods in terms of the SANS 10103:2008 typical noise district areas (see **Table 8-1**) in **Figure 6-6** (night) and **Figure 6-7** (day).

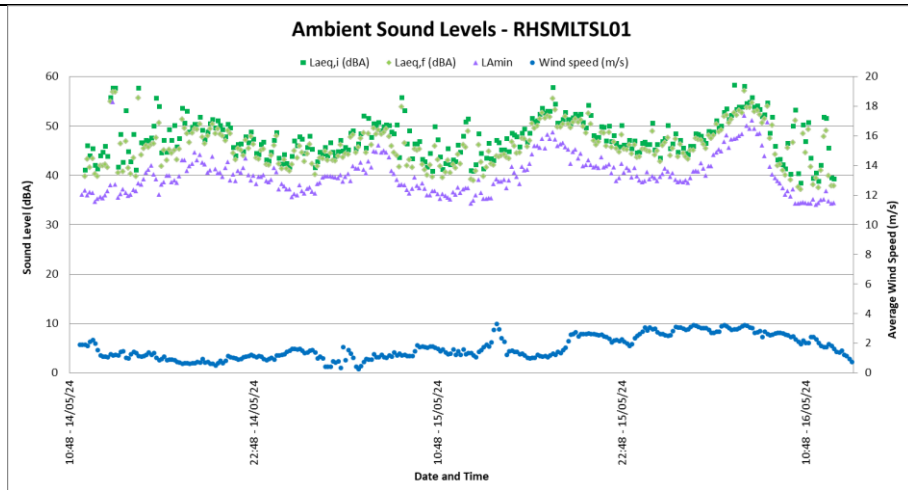


Figure 6-4: Ambient Sound Levels at RHSMLTSL01

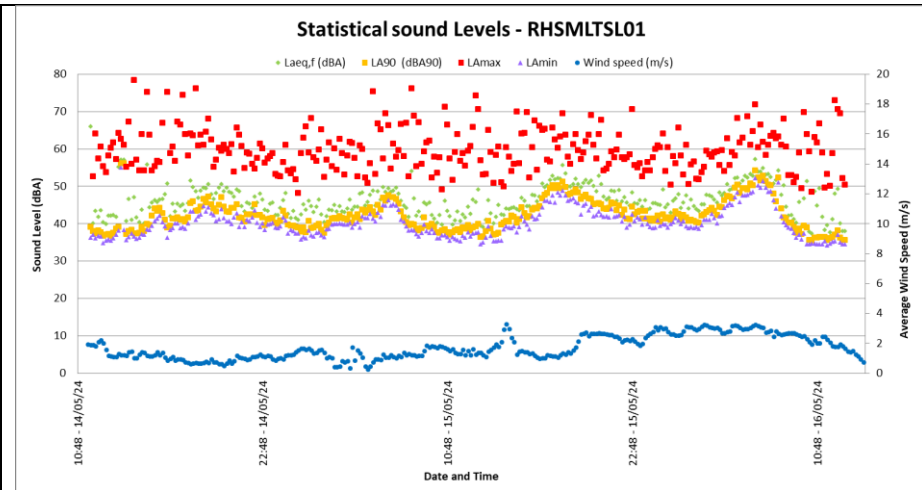


Figure 6-5: Maximum, minimum and Statistical sound levels at RHSMLTSL01

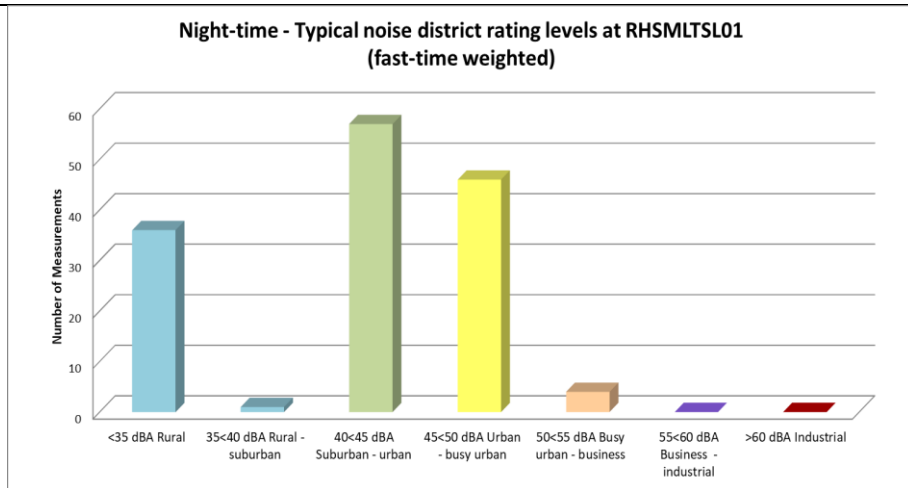


Figure 6-6: Classification of night-time measurements in typical noise districts at RHSMLTSL01

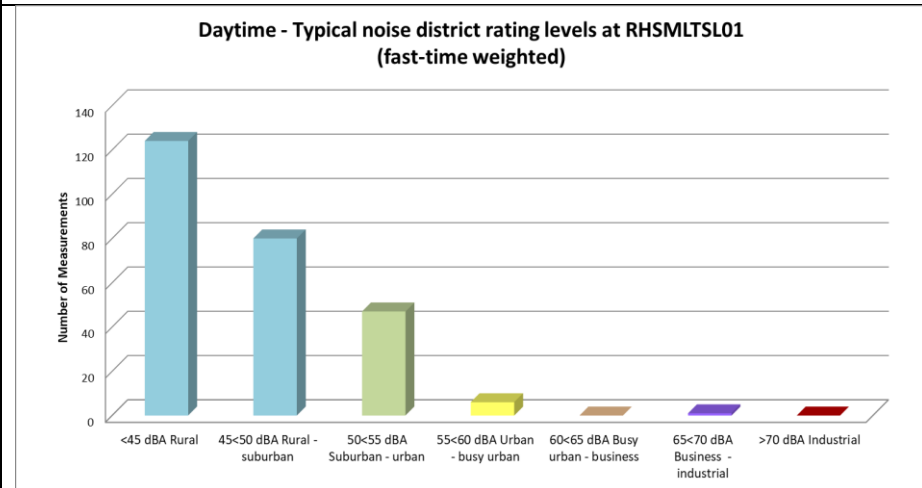


Figure 6-7: Classification of daytime measurements in typical noise districts at RHSMLTSL01

6.2.2 Ambient Sound Level Measurement Location - RHSMLTSL02

The instrument was deployed on the south-west corner of the SOLA Solar Farm. The purpose was to determine what the ambient sound levels are in the area, taking into account the noise generated by the Heineken Sedibeng Brewery as well as the inverters of the solar farm.

The equipment defined in **Table 6-4** was used for gathering data with **Table 6-5** highlighting sounds heard during equipment deployment and collection. Photos of the measurement location are presented in [Appendix B.2](#).

Table 6-4: Equipment used to gather data at RHSMLTSL02

Equipment	Model	Serial no	Calibration Date
Sound Level Meter	SVAN 977	36176	Feb 2024
Pre-amplifier	SV 12L	25685	Feb 2024
Microphone	ACO 7052E	49596	Feb 2024
Calibrator	Quest CA-22	J 2080094	July 2023

Table 6-5: Noises/sounds heard during site visits at RHSMLTSL02

Noises/sounds heard during onsite investigations		
Magnitude Scale Code: • Barely Audible • Audible • Dominating	During equipment deployment	
	Faunal and Natural	Birds dominant.
	Sounds associated with the area	-
	Industrial & transportation	-
	During equipment collection	
	Faunal and Natural	Birds audible.
	Sounds associated with the area	Cattle walking past measurement location with bells ringing.
Industrial & transportation	-	

Impulse time-weighted equivalent sound levels $L_{A_{Ieq},10min}$ and fast time-weighted equivalent sound levels $L_{A_{Feq},10min}$ are presented in **Figure 6-8** and summarised in **Table 6-6** below. The maximum (L_{Amax}), minimum (L_{Amin}) and 90th percentile (L_{A90}) statistical values are illustrated in **Figure 6-9**.

The impulse time-weighted sound descriptor is mainly used in South Africa to define sound and noise levels. Fast-weighted equivalent sound levels are included in this report as this is the sound descriptor used in most international countries to define the Ambient Sound Level.

The L_{A90} level is presented in this report to define the “background ambient sound level”, or the sound level that can be expected if there were little single events (loud transient noises) that impacts on average sound level. The L_{A90} level is elevated during both the day- and night-time. This is likely due to the inverters at the solar farm as well as traffic passing on the R59.

Table 6-6: Sound level descriptors as measured at RHSMLTSL02

	$L_{Amax,i}$ (dBA)	$L_{Aeq,i}$ (dBA)	$L_{Aeq,f}$ (dBA)	$L_{A90,f}$ (dBA90)	$L_{Amin,f}$ (dBA)
Day arithmetic average	-	54.0	47.1	40.9	-
Night arithmetic average	-	54.8	47.0	41.6	-
Day equivalent	-	56.8	51.8	-	-
Night equivalent	-	54.8	48.1	-	-
Day minimum	-	51.8	40.2	-	30.6
Day maximum	85.0	68.8	60.8	-	-
Night minimum	-	53.7	42.5	-	31.0
Night maximum	71.5	57.2	55.5	-	-

The numerous 10-minute measurements are further classified for the day- and night-time periods in terms of the SANS 10103:2008 typical noise district areas (see **Table 8-1**) in **Figure 6-10** (night) and **Figure 6-11** (day).

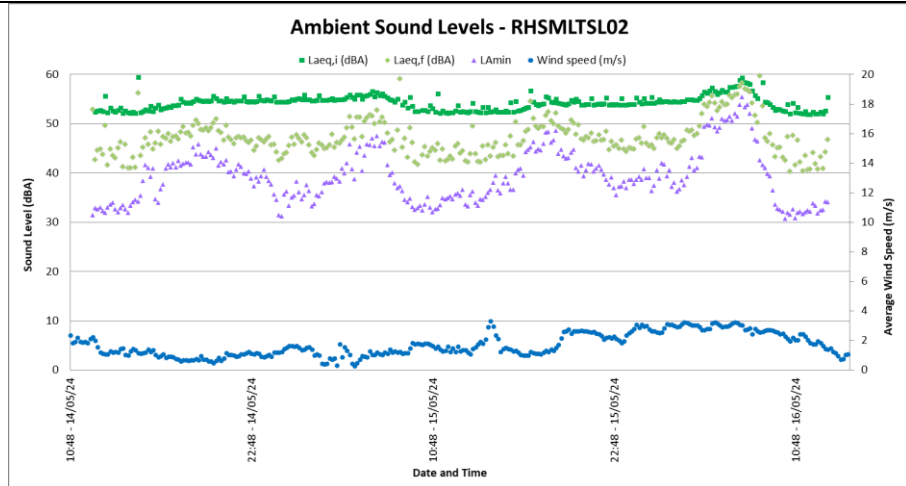


Figure 6-8: Ambient sound levels at RHSMLTSL02

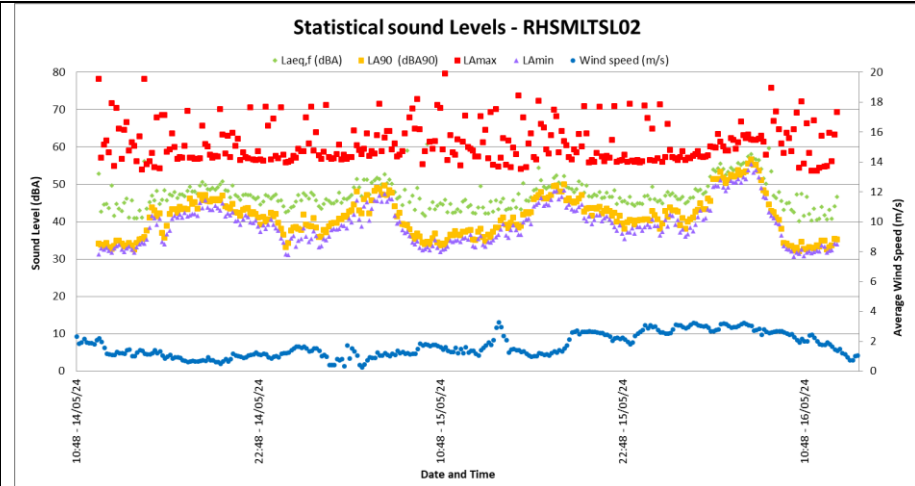


Figure 6-9: Maximum, minimum and statistical values at RHSMLTSL02

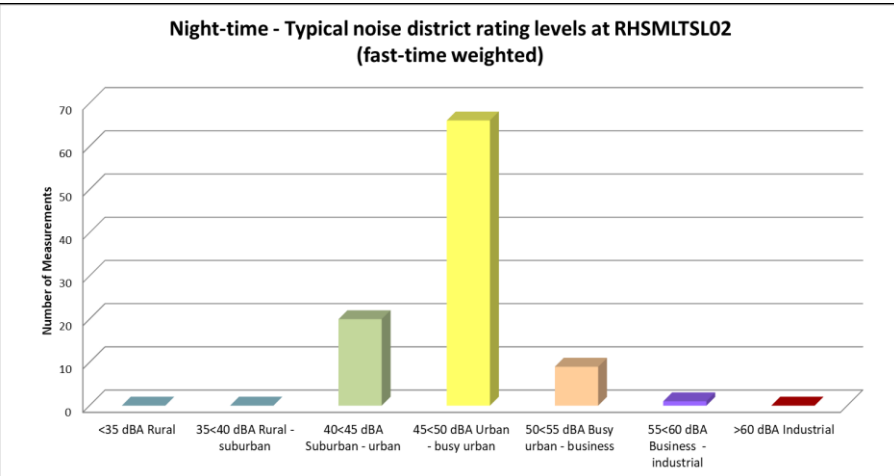


Figure 6-10: Classification of night-time measurements in typical noise districts at RHSMLTSL02

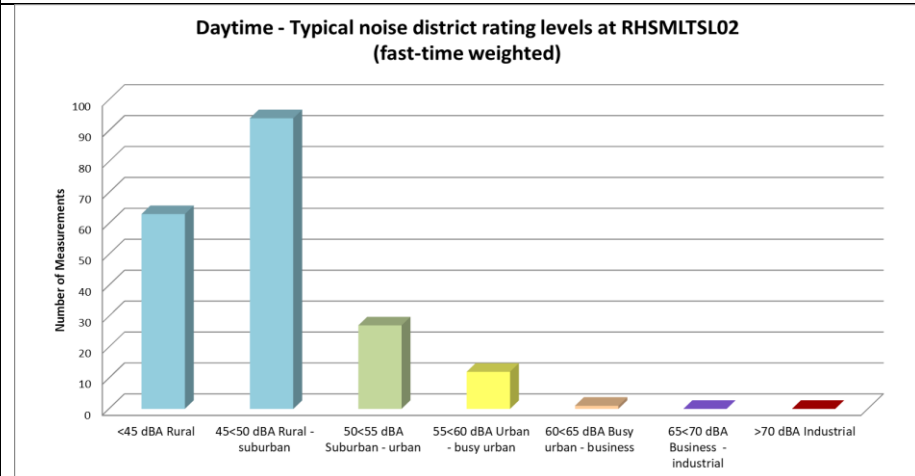


Figure 6-11: Classification of daytime measurements in typical noise districts at RHSMLTSL02

6.2.3 Ambient Sound Level Measurement Location - RHSMLTSL03

6.2.3.1 April 2016

The instrument was deployed on a small holding 1.1km to the south-west of the proposed Soufflet Malting Plant location. The purpose was to determine what the ambient sound levels are in the general area of several small holdings.

The equipment defined in **Table 6-7** was used for gathering data with **Table 6-8** highlighting sounds heard during equipment deployment and collection.

Table 6-7: Equipment used to gather data at RHSMLTSL03 (2016)

Equipment	Model	Serial no	Calibration Date
Sound Level Meter	SVAN 977	36176	September 2015
Pre-amplifier	SV 12L	25685	September 2015
Microphone	ACO 7052E	49596	September 2015
Calibrator	Quest CA-22	J 2080094	September 2015

Table 6-8: Noises/sounds heard during site visits at RHSMLTSL03 (2016)

Noises/sounds heard during onsite investigations		
Magnitude Scale Code: • Barely Audible • Audible • Dominating	During equipment deployment	
	Faunal and Natural	Birds dominant.
	Sounds associated with the area	Resident talking.
	Industrial & transportation	-
	During equipment collection	
	Faunal and Natural	Birds dominant.
	Sounds associated with the area	-
Industrial & transportation	-	

Impulse time-weighted equivalent sound levels $L_{A_{Ieq},10min}$ and fast time-weighted equivalent sound levels $L_{A_{Feq},10min}$ are presented in **Figure 6-12** and summarised in **Table 6-9** below. The maximum (L_{Amax}), minimum (L_{Amin}) and 90th percentile (L_{A90}) statistical values are illustrated in **Figure 6-13**.

The impulse time-weighted sound descriptor is mainly used in South Africa to define sound and noise levels. Fast-weighted equivalent sound levels are included in this report as this is the sound descriptor used in most international countries to define the Ambient Sound Level.

The L_{A90} level is presented in this report to define the “background ambient sound level”, or the sound level that can be expected if there were little single events (loud transient noises) that impacts on average sound level.

Table 6-9: Sound level descriptors as measured at RHSMLTSL03 (2016)

	$L_{Amax,i}$ (dBA)	$L_{Aeq,i}$ (dBA)	$L_{Aeq,f}$ (dBA)	$L_{A90,f}$ (dBA90)	$L_{Amin,f}$ (dBA)
Day arithmetic average	-	48.7	46.2	40.6	-
Night arithmetic average	-	41.1	40.2	36.7	-
Day equivalent	-	41.5	39.7	-	-
Night equivalent	-	37.4	36.3	-	-
Day minimum	-	41.5	38.0	-	28.9
Day maximum	84.0	60.9	57.5	-	-
Night minimum	-	30.6	30.0	-	26.5
Night maximum	61.5	51.0	48.4	-	-

The numerous 10-minute measurements are further classified for the day- and night-time periods in terms of the SANS 10103:2008 typical noise district areas (see **Table 8-1**) in **Figure 6-14** (night) and **Figure 6-15** (day).

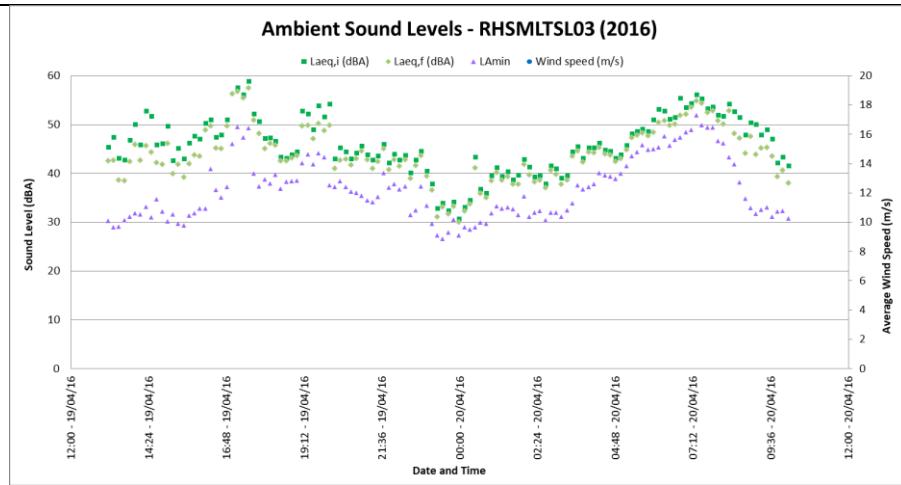


Figure 6-12: Ambient sound levels at RHSMLTSL03 (2016)

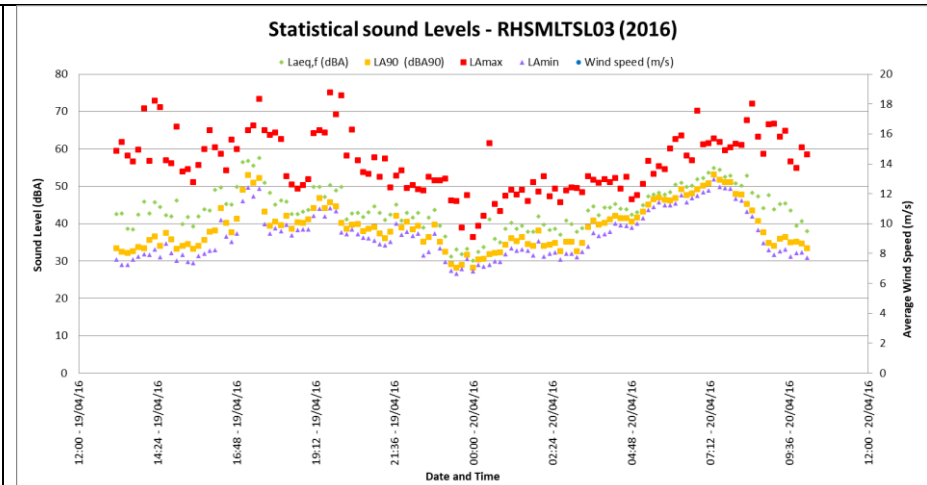


Figure 6-13: Maximum, minimum and statistical values at RHSMLTSL03 (2016)

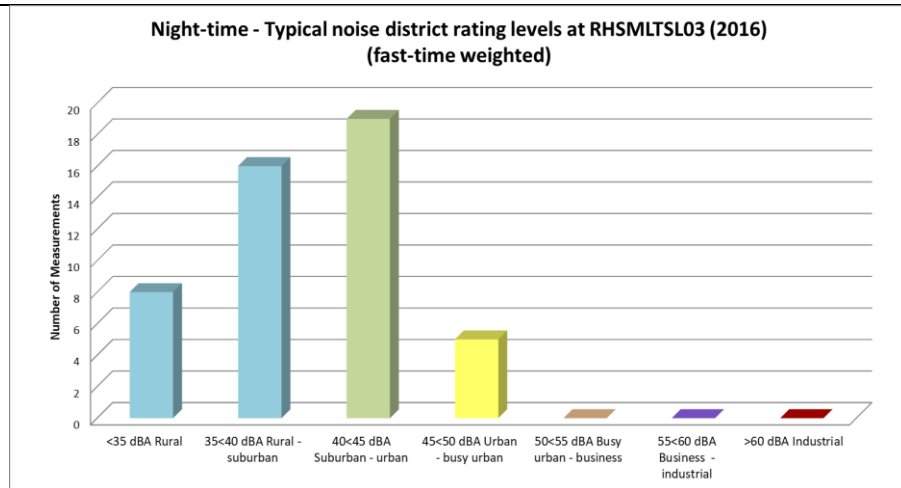


Figure 6-14: Classification of night-time measurements in typical noise districts at RHSMLTSL03 (2016)

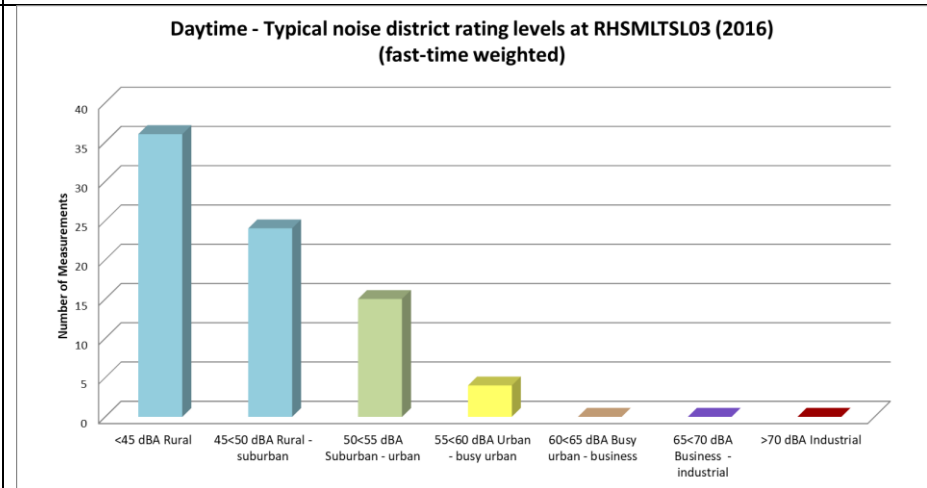


Figure 6-15: Classification of daytime measurements in typical noise districts at RHSMLTSL03 (2016)

6.2.3.2 May 2024:

The instrument was deployed on a small holding 1.1km to the south-west of the proposed Soufflet Malting Plant location. The purpose was to determine what the ambient sound levels are in the general area of several small holdings.

The equipment defined in **Table 6-10** was used for gathering data with **Table 6-11** highlighting sounds heard during equipment deployment and collection. Photos of the measurement location are presented in [Appendix B.3](#).

Table 6-10: Equipment used to gather data at RHSMLTSL03

Equipment	Model	Serial no	Calibration Date
Sound Level Meter	Larson Davis 824	824A0896	Feb 2023
Pre-amplifier	PRM902	1345	Feb 2023
Microphone	2541	6427	Feb 2023
Calibrator	Quest CA-22	J 2080094	July 2023

Table 6-11: Noises/sounds heard during site visits at RHSMLTSL03

Noises/sounds heard during onsite investigations		
Magnitude Scale Code: •Barely Audible •Audible •Dominating	During equipment deployment	
	Faunal and Natural	Birds audible.
	Sounds associated with the area	Cows and horses dominant.
	Industrial & transportation	-
	During equipment collection	
	Faunal and Natural	Birds dominant.
	Sounds associated with the area	Geese audible.
Industrial & transportation	-	

Fast time-weighted equivalent sound levels $L_{AFeq,10min}$ are presented in **Figure 6-16** and summarised in **Table 6-12** below. The maximum (L_{Amax}), minimum (L_{Amin}) and 90th percentile (L_{A90}) statistical values are illustrated in **Figure 6-17**.

Fast-weighted equivalent sound levels are included in this report as this is the sound descriptor used in most international countries to define the Ambient Sound Level. The instrument was not fitted with an impulse detector.

The L_{A90} level is presented in this report to define the “background ambient sound level”, or the sound level that can be expected if there were little single events (loud transient noises) that impacts on average sound level. The L_{A90} level is elevated during both the

day- and night-time. This is likely due to the inverters at the solar farm as well as traffic passing on the R59.

Table 6-12: Sound level descriptors as measured at RHSMLTSL03

	$L_{Amax,i}$ (dBA)	$L_{Aeq,f}$ (dBA)	$L_{A90,f}$ (dBA90)	$L_{Amin,f}$ (dBA)
Day arithmetic average	-	44.4	39.4	-
Night arithmetic average	-	39.9	35.7	-
Day equivalent	-	50.9	-	-
Night equivalent	-	49.8	-	-
Day minimum	-	36.3	-	28.9
Day maximum	95.5	66.4	-	-
Night minimum	-	28.1	-	24.7
Night maximum	97.3	68.7	-	-

The numerous 10-minute measurements are further classified for the day- and night-time periods in terms of the SANS 10103:2008 typical noise district areas (see **Table 8-1**) in **Figure 6-18** (night) and **Figure 6-19** (day).

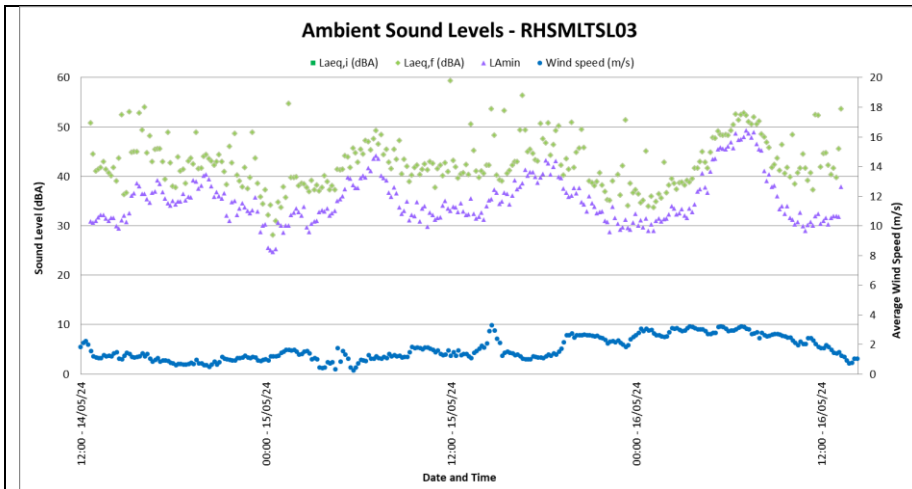


Figure 6-16: Ambient sound levels at RHSMLTSL03

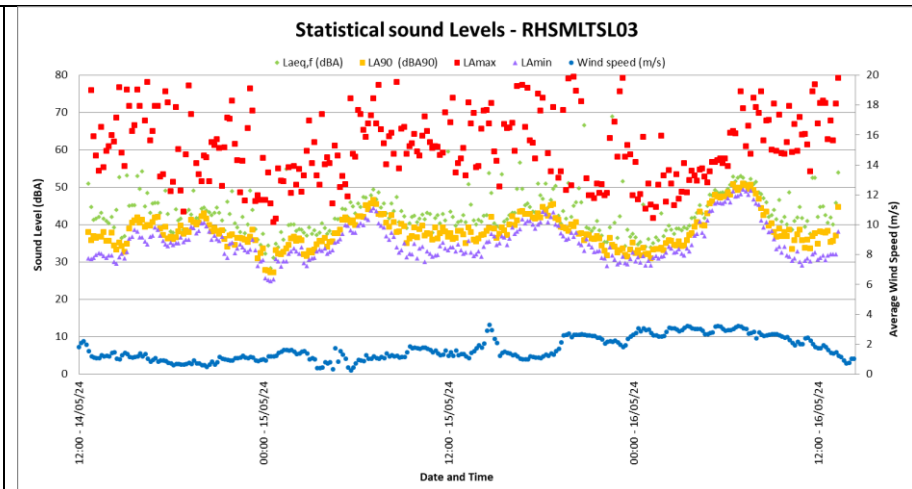


Figure 6-17: Maximum, minimum and statistical values at RHSMLTSL03

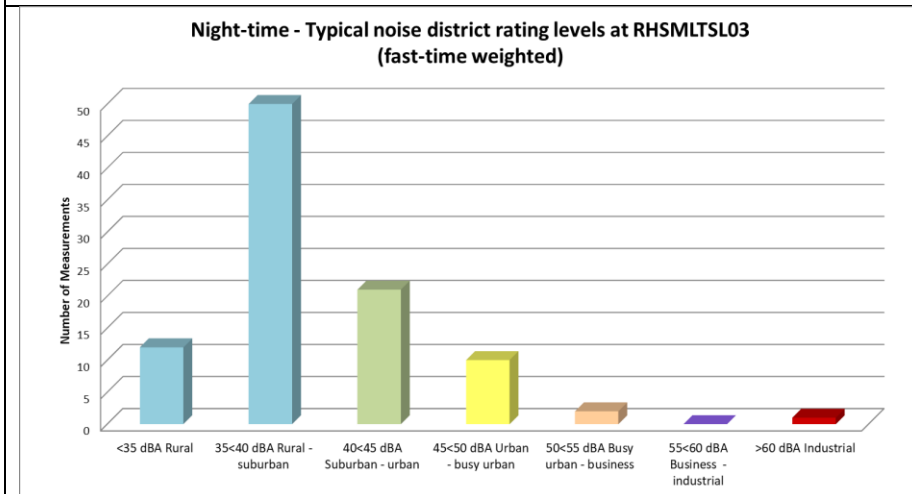


Figure 6-18: Classification of night-time measurements in typical noise districts at RHSMLTSL03

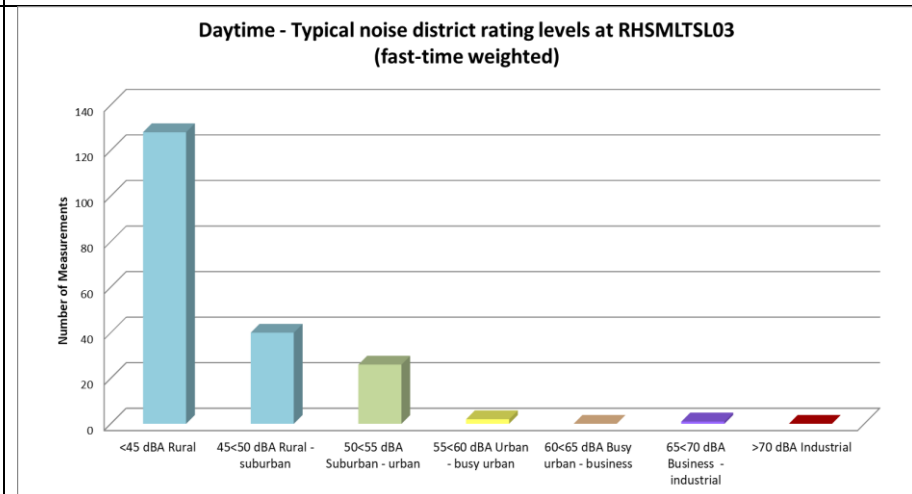


Figure 6-19: Classification of daytime measurements in typical noise districts at RHSMLTSL03

6.2.4 Ambient Sound Level Measurement Location – SB02 (2016)

The instrument was deployed on the south-east corner of the Heineken Brewery. The area contained a football field in 2016. The purpose was to determine what the ambient sound levels are in this area in close proximity to the R59.

The equipment defined in **Table 6-13** was used for gathering data with **Table 6-14** highlighting sounds heard during equipment deployment and collection. Photos of the measurement location are presented in [Appendix B4](#).

Table 6-13: Equipment used to gather data at SB02

Equipment	Model	Serial no	Calibration Date
Sound Level Meter	Svan 977	34160	May 2015
Pre-amplifier	SV 12L	32395	May 2015
Microphone	ACO 7052E	54645	May 2015
Calibrator	Quest CA-22	J 2080094	May 2015

Table 6-14: Noises/sounds heard during site visits at SB02

Noises/sounds heard during onsite investigations		
Magnitude Scale Code: • Barely Audible + Audible • Dominating	During equipment deployment	
	Faunal and Natural	Birds.
	Sounds associated with the area	Noise from Heineken.
	Industrial & transportation	Road noise from R59.
	During equipment collection	
	Faunal and Natural	Birds.
	Sounds associated with the area	Noise from Heineken.
	Industrial & transportation	Road noise from R59.

Impulse time-weighted equivalent sound levels $L_{A_{1eq},10min}$ and fast time-weighted equivalent sound levels $L_{A_{F_{1eq},10min}}$ are presented in **Figure 6-20** and summarised in **Table 6-15** below. The maximum ($L_{A_{max}}$), minimum ($L_{A_{min}}$) and 90th percentile (L_{A90}) statistical values are illustrated in **Figure 6-21**.

The impulse time-weighted sound descriptor is mainly used in South Africa to define sound and noise levels. Fast-weighted equivalent sound levels are included in this report as this is the sound descriptor used in most international countries to define the Ambient Sound Level.

The L_{A90} level is presented in this report to define the “background ambient sound level”, or the sound level that can be expected if there were little single events (loud transient noises) that impacts on average sound level. The L_{A90} level is elevated during both the day- and night-time. This is due to the traffic passing on the R59.

Table 6-15: Sound level descriptors as measured at SB02

The numerous 10-minute measurements are further classified for the day- and night-time periods in terms of the SANS 10103:2008 typical noise district areas (see **Table 8-1**) in **Figure 6-22** (night) and **Figure 6-23** (day).

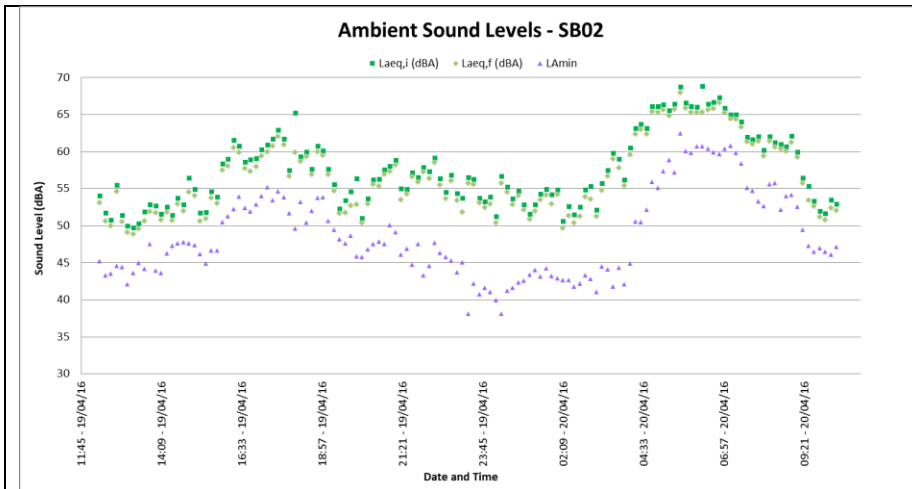


Figure 6-20: Ambient sound levels at SB02

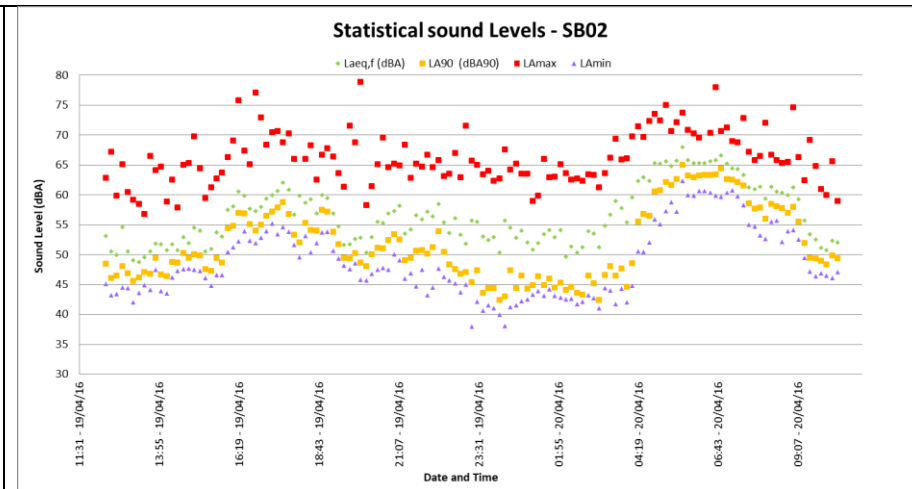


Figure 6-21: Maximum, minimum and statistical values at SB02

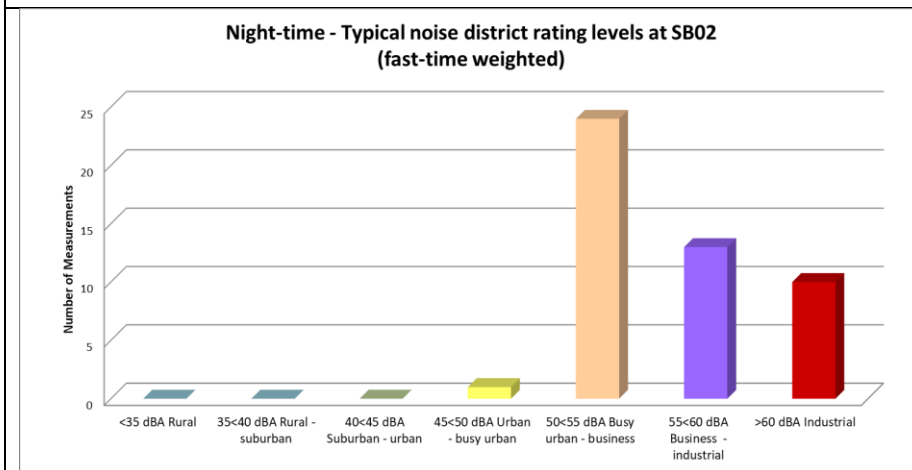


Figure 6-22: Classification of night-time measurements in typical noise districts at SB02

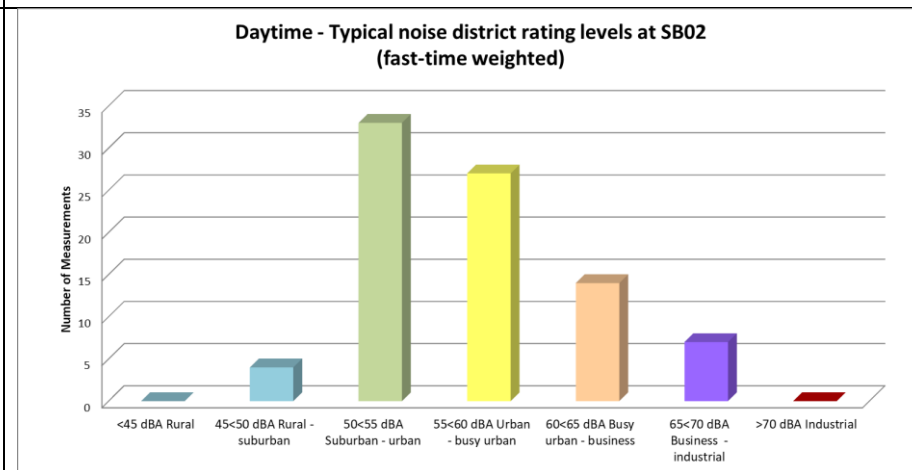


Figure 6-23: Classification of daytime measurements in typical noise districts at SB02

6.3 AMBIENT SOUND LEVELS – FINDINGS AND SUMMARY

Ambient sound levels were measured at three locations in the vicinity of the project area in a semi-continuous manner over a period of 2-nights (more than 700 daytime and 300 night-time measurements – each with a duration of 10-minutes). A measurement was obtained at the Heineken Brewery, the SOLA solar plant and at a small holding 1km south-west of the study area. Measurements were obtained during May 2024, with the data indicating ambient sound levels typical of a rural noise district (daytime period) to urban noise district (night-time period).

Confidence levels in the resulting data are high and it is expected that the ambient sound level data would be applicable of other locations in the area.

Considering the average fast-weighted sound level data collected in the area, average:

- daytime fast-weighted sound levels ranged from 36 to 66 dBA, with average sound levels being 45.3 dBA. Only considering the fast-weighted values, sound levels are typical of a rural noise district, setting a zone sound level of 50 dBA for the daytime period; and
- night-time fast-weighted sound levels ranged from 28 to 69 dBA, with average sound levels being 40.6 dBA. Only considering the fast-weighted values, sound levels are typical of a sub-urban noise district, setting a zone sound level of 40 dBA for the night-time period.

In addition, considering international guidelines, the IFC (relevant for projects financed by the World Bank Group - see **section 5.4.4**) the following noise levels should not be exceeded:

- 55 dBA (as recommended by the IFC) for daytime residential use; and
- 45 dBA (as recommended by the IFC) for night-time residential use.

The plant should also limit the noise level to less than 60 dBA on the boundary (70 dBA during the daytime period, and 60 dBA at night for a 70 dBA day-night noise limit).

7 POTENTIAL NOISE SOURCES

Increased noise levels are directly linked with the various activities associated with the construction, as well as the operational phase of the Soufflet Malting Plant. Noise emitted by the construction and operations can be associated with various noise sources, including mechanical sources due to operation of equipment, material impact noises (such as the noise made when materials are dropped at a height to ground level), electrical noise (reverse hooters from equipment or the “whine” of an electrical pump) and noises from vehicles moving around.

It should be noted that this noise impact assessment considers conceptual scenarios to estimate the potential impact of noise on the surrounding NSR and should not be seen as a reflection of the plant schedule, or specific noise levels at NSR at any specific times. Conceptual noise modelling does not consider actual operational loads, assuming all equipment operating simultaneously at a 100% load (100% acoustic load factor), illustrating a potential worst-case scenario.

This report will focus on two potential scenarios, namely:

- Construction activities taking place at the start of the project. The scenario investigates worst-case noise emissions, with equipment operating on ground level, with various equipment operating simultaneously under full load (generating most noise). Cumulative effects from noise originating from road traffic noise on the R59 are also considered. The same noise levels however can be used for potential night-time construction activities (although night-time construction activities are not anticipated); and
- A conceptual operational scenario, with various activities taking place at the Malting Plant. The scenario investigates worst-case noise emissions, with equipment operating on ground level, with various equipment operating simultaneously (worst-case scenario). Cumulative effects from noise originating from road traffic noise on the R59 are also considered. The same scenario was also used to estimate potential worst-case night-time noise levels.

7.1 POTENTIAL CONSTRUCTION NOISE-GENERATING ACTIVITIES

7.1.1 Construction Activities

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

The potential extent and impact of construction noises depends on a number of factors, including the prevailing ambient sound levels during the instance the maximum noise event occurred, as well as the spectral character of the noise and the ambient surroundings.

The following could be the main construction related sources:

- Site preparation activities will include clearance of vegetation at the footprint of the site infrastructure;
- Digging of foundations, civils and construction of the infrastructure;
- The digging of the stormwater, drainage and other water management trenches;
- Delivery and assembly of the project infrastructure;

Potential maximum noise levels generated by construction equipment, as well as the potential extent are presented in **Table 7-2**. The potential extent depends on a number of factors, including the prevailing ambient sound levels during the instance the maximum noise event occurred, as well as the spectral characteristics of the noise and the ambient soundscape in the surroundings.

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 sound power levels associated with various activities that may be found at a construction site is presented in **Table 7-3**.

A list of construction equipment and/or activities that may be used at this project (and used in the noise model) are defined in **Table 7-1**. Due to the various activities that may take place at different locations, this assessment will use the sound power emission level of potential noise generating activities and equipment taking place at numerous locations to assess a potential worst-case scenario.

7.1.2 Traffic

The potential significant source of noise during the construction phase is additional traffic to and from the site, as well as traffic on the site.

Construction traffic is expected to be generated throughout the entire construction period, however, the volume and type of traffic generated will be dependent upon the construction activities being conducted, which will vary during the construction period. Noise levels due to traffic were estimated using the methodology stipulated in RLS-90 (Calculating and predicting road traffic noise).

For the purpose of this assessment 10 road trucks and 10 light delivery vehicles (“LDV”) per hour travelling to the project areas (to and from the plant) during the day using the proposed roads at an average speed of 50 km/h. Night-time traffic was not considered.

7.2 POTENTIAL OPERATIONAL NOISE-GENERATING ACTIVITIES

7.2.1 Malt Plant

The following activities will be assumed for the noise model:

- General Noise;
- Fans;
- Kiln Building;
- Boiler; and
- Dryer

The level and character of the noise during this phase is more constant than with the construction phase, but can be more intrusive, especially if an impulsive⁵ component is generated at night. A list of equipment (and activities) that may be used at this project are defined in **Table 7-1**, with this assessment considering a potential worst-case scenario.

As with all noises, the audibility, as well as the potential of a noise impact on receptors, is determined by factors such as the sound character, spectral frequencies, number and magnitude of maximum noise events, the average noise levels etc. Potential maximum noise levels generated by a range of equipment and the potential extent of these sounds

⁵ A sound characterized by brief excursions of sound pressure (transient signal) that significantly exceed the ambient sound level.

are presented in **Table 7-2**, with **Table 7-3** illustrating the equivalent (average) noise levels and potential extent.

7.2.2 Traffic

A source of noise during the operational phase will be traffic to and from the site and traffic around the infrastructure facilities. While trucks moving around on the site do have a clearly audible noise during passing, the average noise contribution during the day is relatively low compared to the other noise sources.

For the purpose of this assessment 10 road trucks and 10 light delivery vehicles (“LDV”) per hour travelling to the project areas (to and from the plant) during the day (and night, even though night-time construction activities are not anticipated) using the proposed roads at an average speed of 50 km/h.

Sound power emission levels as defined in **Table 7-1** will be used in the noise modelling for both the construction and operational phase.

Table 7-1: Sound power emission levels used for modelling

Equipment	Sound power level, dB re1 pW, in octave band, Hz							SPL (dBA)
	63	125	250	500	1000	2000	4000	
Process								
Point noise sources (dBA re 1 pW)								
Crushing / Screening	121.1	122.3	120.1	120.0	117.3	112.5	106.3	121.7
Drilling Machine	121.6	123.3	118.3	115.3	114.2	113.9	111.3	120.8
Dumper/Haul truck/ADT	102.5	108.6	106.5	105.4	104.5	99.2	97.2	113.0
Excavator	113.8	114.2	110.3	108.3	106.3	103.9	103.7	113.0
Front End Loader (“FEL”)	109.0	106.7	107.3	97.9	95.8	92.5	87.6	115.0
General noise (high-intensity)	95.0	100.0	103.0	105.0	105.0	100.0	100.0	108.8
Material handling	111.6	104.1	105.2	102.2	97.1	91.3	87.9	113.6
Milling Plant	86.0	95.0	95.0	101.0	101.0	103.0	102.0	107.0
Pumps/Motors	90.0	101.0	102.0	105.0	105.0	104.0	99.0	108.0
Area noise sources (dBA/m ² re 1 pW)								
General Noise (High-intensity)	95.0	100.0	103.0	105.0	105.0	100.0	100.0	65.0

Table 7-2: Potential maximum noise levels generated by construction equipment

Equipment Description ⁶	Impact Device?	Maximum Sound Power Levels (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
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
Chain Saw	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
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
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
Dump Truck	No	118.7	93.7	87.7	81.6	73.7	67.7	64.1	61.6	58.1	53.7	50.2	47.7	41.6
Excavator	No	119.7	94.7	88.7	82.6	74.7	68.7	65.1	62.6	59.1	54.7	51.2	48.7	42.6
Flat Bed Truck	No	118.7	93.7	87.7	81.6	73.7	67.7	64.1	61.6	58.1	53.7	50.2	47.7	41.6
Front End Loader	No	114.7	89.7	83.7	77.6	69.7	63.7	60.1	57.6	54.1	49.7	46.2	43.7	37.6
Generator	No	116.7	91.7	85.7	79.6	71.7	65.7	62.1	59.6	56.1	51.7	48.2	45.7	39.6
Grader	No	119.7	94.7	88.7	82.6	74.7	68.7	65.1	62.6	59.1	54.7	51.2	48.7	42.6
Impact Pile Driver	Yes	129.7	104.7	98.7	92.6	84.7	78.7	75.1	72.6	69.1	64.7	61.2	58.7	52.6
Mounted Impact Hammer	Yes	124.7	99.7	93.7	87.6	79.7	73.7	70.1	67.6	64.1	59.7	56.2	53.7	47.6
Pickup Truck	No	89.7	64.7	58.7	52.6	44.7	38.7	35.1	32.6	29.1	24.7	21.2	18.7	12.6
Pumps	No	111.7	86.7	80.7	74.6	66.7	60.7	57.1	54.6	51.1	46.7	43.2	40.7	34.6
Roller	No	119.7	94.7	88.7	82.6	74.7	68.7	65.1	62.6	59.1	54.7	51.2	48.7	42.6
Slurry Plant	No	112.7	87.7	81.7	75.6	67.7	61.7	58.1	55.6	52.1	47.7	44.2	41.7	35.6
Soil Mix Drill Rig	No	114.7	89.7	83.7	77.6	69.7	63.7	60.1	57.6	54.1	49.7	46.2	43.7	37.6
Tractor	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
Vibratory Pile Driver	No	129.7	104.7	98.7	92.6	84.7	78.7	75.1	72.6	69.1	64.7	61.2	58.7	52.6
Warning Horn	No	119.7	94.7	88.7	82.6	74.7	68.7	65.1	62.6	59.1	54.7	51.2	48.7	42.6
Welder/Torch	No	107.7	82.7	76.7	70.6	62.7	56.7	53.1	50.6	47.1	42.7	39.2	36.7	30.6

⁶Equipment list and Sound Power Level source: http://www.fhwa.dot.gov/environment/noise/construction_noise/handbook/handbook09.cfm

Table 7-3: Potential equivalent noise levels generated by various equipment

Equipment Description	Equivalent (average) Sound Levels (dBA)	Operational Noise Level at given distance considering equivalent (average) sound power emission levels (Cumulative as well as the mitigatory effect of potential barriers or other mitigation not included – simple noise propagation modelling only considering distance) (dBA)											
		5 m	10 m	20 m	50 m	100 m	150 m	200 m	300 m	500 m	750 m	1000 m	2000 m
Ball Mill (Secondary) (FM)	107.0	82.1	76.1	70.0	62.1	56.1	52.5	50.0	46.5	42.1	38.6	36.1	30.0
Bulldozer CAT D10	111.9	86.9	80.9	74.9	66.9	60.9	57.4	54.9	51.3	46.9	43.4	40.9	34.9
Cyclone (dewatering)	109.0	84.1	78.0	72.0	64.1	58.0	54.5	52.0	48.5	44.1	40.5	38.0	32.0
Crusher (Primary, hard rock)	122.4	97.5	91.4	85.4	77.5	71.4	67.9	65.4	61.9	57.5	53.9	51.4	45.4
Drilling Machine	120.3	95.3	89.3	83.2	75.3	69.3	65.7	63.2	59.7	55.3	51.8	49.3	43.2
Dumper/Haul truck - Bell 25 ton	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
Dryer Stack	102.0	77.0	71.0	65.0	57.0	51.0	47.5	45.0	41.5	37.0	33.5	31.0	25.0
Dryer Gas Generator	104.6	79.6	73.6	67.6	59.6	53.6	50.1	47.6	44.1	39.6	36.1	33.6	27.6
Excavator	112.0	87.0	81.0	75.0	67.0	61.0	57.5	55.0	51.4	47.0	43.5	41.0	35.0
Feed Screen (crusher, mill etc.)	108.1	83.2	77.1	71.1	63.2	57.1	53.6	51.1	47.6	43.2	39.6	37.1	31.1
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
Flotation (Agitation gearbox)	104.4	79.4	73.4	67.3	59.4	53.4	49.8	47.3	43.8	39.4	35.9	33.4	27.3
General noise	108.8	83.8	77.8	71.8	63.8	57.8	54.2	51.8	48.2	43.8	40.3	37.8	31.8
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
Grizzly Feeder	96.1	71.2	65.1	59.1	51.2	45.1	41.6	39.1	35.6	31.2	27.6	25.1	19.1
JBL TLB	108.8	83.8	77.8	71.8	63.8	57.8	54.3	51.8	48.3	43.8	40.3	37.8	31.8
Pumps (Cavity, slurry, 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 truck (30t, FM)	109.6	84.7	78.7	72.6	64.7	58.7	55.1	52.6	49.1	44.7	41.1	38.7	32.6
Screen	87.1	62.2	56.1	50.1	42.2	36.1	32.6	30.1	26.6	22.2	18.6	16.1	10.1
Substation	80.9	55.9	49.9	43.9	35.9	29.9	26.4	23.9	20.4	15.9	12.4	9.9	3.9
Thickener (Concentrate)	106.7	81.7	75.7	69.7	61.7	55.7	52.2	49.7	46.2	41.7	38.2	35.7	29.7
Thickener (Tailings)	104.7	79.7	73.7	67.7	59.7	53.7	50.2	47.7	44.2	39.7	36.2	33.7	27.7

7.3 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 significantly 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 noise levels during decommissioning.

8 METHODS: NOISE IMPACT ASSESSMENT AND SIGNIFICANCE

8.1 NOISE IMPACT ON ANIMALS⁷

A significant amount of research was undertaken during the 1960's and 70's on the effects of aircraft noise on animals. While aircraft noise has a specific characteristic that might not be comparable to industrial noise, the findings should be relevant to most noise sources. A general animal behavioural reaction to aircraft noise is the startle response with the strength and length of the startle response to be dependent on the following:

- which species is exposed;
- whether there is one animal or a group of animals, and
- whether there have been some previous exposures.

Overall, the research suggests that species differ in their response to noise depending on the duration, magnitude, characteristics and source of the noise, as well as how accustomed the animals are to the noise (previous exposure).

Extraneous noises impact on animals as it can increase stress levels and even impact on their hearing. Masking sounds may affect their ability to react to threats, compete and seek mates and reproduce, hunt and forage, communicate and generally to survive.

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

The only animal species studied in detail are humans, and studies are still continuing in this regard. These studies also indicate that there is considerable variation between individuals, highlighting the loss of sensitivity to higher frequencies as human's age. Sensitivity also varies with frequency with humans. Considering the variation in the sensitivity to frequencies and between individuals, this is likely similar to all faunal species. Some of these studies are repeated on animals, with behavioural hearing tests being able to define the hearing threshold range for some animals as indicated in **Figure 8-1** below.

⁷Report to Congressional Requesters, 2005; USEPA, 1971; Autumn, 2007; Noise quest, 2010

Only a few faunal (animal) species have been studied in a bit more detail so far, with the potential noise impact on marine animals most likely the most researched subject, with a few studies that discuss behavioural changes in other faunal species due to increased noises. Few studies indicate definitive levels where noises start to impact on animals, with most based on laboratory level research that subject animals to noise levels that are significantly higher than the noise levels these animals may experience in their environment (excluding the rare case where bats and avifauna fly extremely close to an anthropogenic noise, such as from a moving car or the blades of a wind turbine).

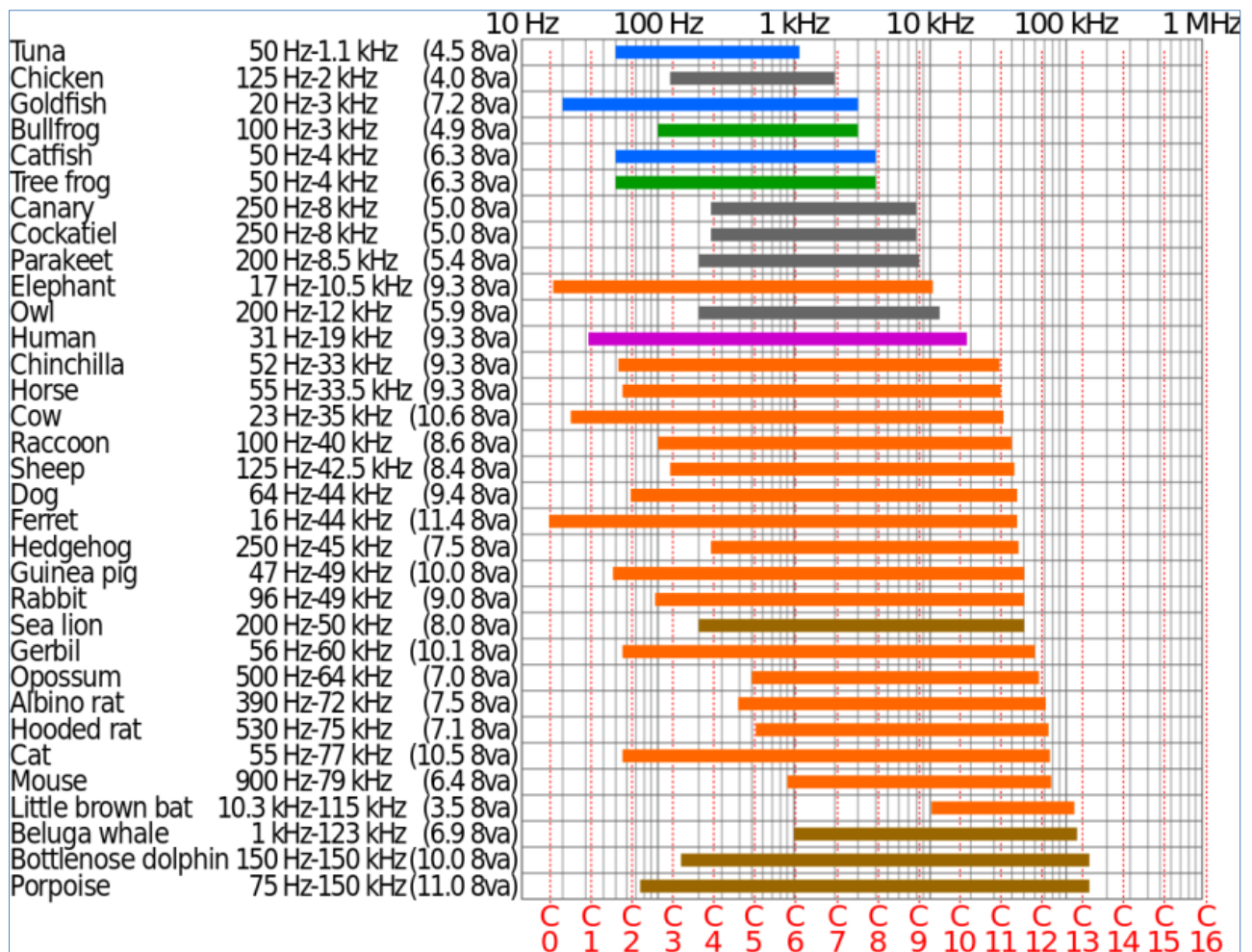


Figure 8-1: Logarithmic Chart of the Hearing Ranges of Some Animals⁸

From these and other studies, the following can be concluded that:

- Animals respond to impulsive (sudden) noises (higher than 90 dBA) by running/flying away. If the noises continue, animals would try to relocate (Drooling, 2007).

⁸ https://en.wikipedia.org/wiki/Hearing_range

- Animals start to respond to increased noise levels with elevated stress hormone levels and hypertension. These responses begin to appear at exposure levels of 55 to 60 dBA (Baber, 2009).
- Animals of most species exhibit adaptation to noise (Broucek, 2014), including impulsive noises, by changing their behaviour.
- More sensitive species would relocate to a quieter area, especially species that depend on hearing to hunt or evade prey, or species that makes use of sound/hearing to locate a suitable mate (Drooling, 2007).
- Noises associated with helicopters, motor- and quad bikes do significantly impact on animals. This is due to the sudden and significant increase in noise levels due to these activities.

To date, there are, however, no guidelines or sound limits with regards to noise levels that can be used to estimate the potential significance of noises on animals.

8.1.1 Domestic Animals

It may be that domesticated animals are more accustomed to noise sources of an industrial, commercial or other anthropogenic nature, although exposure to high noise levels may still affect domestic animals' well-being. Sound levels in animal shelters can exceed 100 dB, much more than what can be expected at a domestic dwelling from an industrial, commercial or transportation noise source (10-minute equivalent)^{9&10}. The high noise levels may see negative influences on animals' cardiovascular systems and behaviour.

According to Šottník, 2011, noise as high as 80 dB had no negative effect on dairy cows. As noise levels increased (up to 105 dB), feed consumption, milk yield and intensity of milk release decreased.

Unexpected high intensity noise (above 110 dB), such as low altitude jet aircraft overflights at milking time could reduce effectiveness of the milk ejection reflex, decrease efficiency of milk removal, increase residual milk, and lead to overall reduction in milk yield. However, a majority of the studies reviewed suggests that there is little or no effect of aircraft noise on cattle. Adverse effects of low-altitude flights have been noted in some studies but have not been uniformly reproduced in other reports (Manci, 1988).

⁹Crista L. Coppola. Noise in the Animal Shelter Environment: Building Design and the Effects of Daily Noise Exposure.

¹⁰ David Key, Essential Kennel Designs.

Domesticated animals may also respond differently to noises than animals in the wild. Domesticated dogs are pack animals and may respond excitedly or vocally to other noises, smells, visual and other stimulants, in contrast to wild animals that may flee due to a slight unfamiliar sound. Animals that are transported at least once in their life (such as pigs to an abattoir) would endure high noise levels for the duration of the delivery period. A change in the heart rate, renal blood flow and blood pressure of study subjects were noted in the above studies. How small changes (in environmental noise levels) may impact on domesticated animals have however not yet been studied.

8.1.2 Wildlife

Many natural based acoustics themselves may be loud or impulsive. Examples include thunder, wind-induced noises that could easily exceed 35 dBA ($L_{A90,fast}$) above wind speeds averaging 6 m/s, noise levels during early morning dawn chorus or loud cicada noises during late evening or early morning.

Potential noise impacts on wildlife are very highly species dependent. Studies showed that most animals adapt to noises and would even return to a site after an initial disturbance, even if the noise continues. The more sensitive animals that might be impacted by noise would most likely relocate to a quieter area. Stress levels can increase in animals restricted to areas where the sound levels are impacting on them (due to the level, character or both).

There are a few specific studies discussing the potential impacts of noise on wildlife associated with construction, transportation and industrial facilities. Available information indicates that noises from transportation and industrial sources may mask the sound of a predator approaching; similarly, predators depending on hearing would not be able to locate their prey.

Studies indicated that most animals adapt to noises, and would even return to a site after an initial disturbance, even if the noise is continuous. The more sensitive animals that might be impacted by noise would most likely relocate to a quieter area. Helldin (2012) however highlights that the network of access road could be a significant factor impacting on animals. Noise impacts are therefore very highly species-dependent, but there are also other factors that could impact on animals (such as visibility and increased movement of people and vehicles)¹¹.

¹¹ Blickley, 2010; Cummings, 2012; Cummings, 2009; Łopucki, 2016; Noise Quest, 2010; Rabin, 2006

8.1.3 Avifauna¹²

Noise impacts on birds include:

- causing hearing damage (very loud or loud impulsive sounds);
- increasing stress levels (directly and indirectly);
- Masking (directly or indirectly) the sounds of their food, predators or mates;
- Their typical food sources may move;
- Relocation to less suitable habitats; and
- other behavioural reactions.

As with the impact on other wildlife, the impact of noise on avifauna depends on the character of the noise (including the impulsive character), the magnitude or intensity of the noise as well as the familiarity the birds have with the sound.

Similarly, different birds change their response to these sounds differently. Some may not be impacted while other species may:

- avoid noisy areas or completely relocate;
- may start to sing at different times;
- may change the frequency, pitch or character of their calls/singing/signals;
- increase the volume of their calls/singing/signals; or/and
- changes in reproductive success.

As with other animals, there are no guidelines or even studies highlighting acceptable sound levels or other criteria before noise may start to impact on birds.

8.1.4 Laboratory Animal Studies

Although many laboratory animals have wild counterparts (rats, mice) the laboratory test subjects differ in many aspects (genetics, behaviour etc.). Also, noise levels of studies are conducted at generally very high levels at over 100 dB, much more than what would be experienced in environmental settings around industrial, commercial or transportation activities¹³. Other dissimilarities to laboratory tests and a natural environment include the time exposure (duration of noise), the spectral and noise character (impulsive noise vs. constant noise) etc. Although there exist dissimilarities in tests conducted and noise levels around commercial and industrial environments, laboratory rodents exposed to

¹² Autumn, 2007; Brumm, 2004; Cummings, 2009; Dooling, 2007; Francis, 2012; Francis, 2011; Ortega, 2012; Halfwerk, 2011; Parris, 2009; Zwart, 2014.

¹³USEPA, 1971.

high noise levels did indicate physiological, behavioural changes, hearing loss and other such effects¹⁴.

8.1.5 Concluding Remarks - Noise Impacts on Animals

From these and other studies the following can be concluded:

- To date there are no guidelines or sound limits with regards to noise levels that can be used to estimate the potential significance of noises on animals (Blickley *et al.* 2010).
- Animals respond to impulsive (sudden) noises (higher than 90 dBA) by running away. If the noises continue, animals would try to relocate (Dooling, 2007).
- Terrestrial wildlife responses begin at noise levels of approximately 40 dBA, with 20% of papers documenting impacts below 50 dBA (Shannon *et al.* 2015).
- Animals start to respond to increased noise levels with elevated stress hormone levels and hypertension. These responses begin to appear at exposure levels of 55 to 60 dBA (Baber, 2010), with Helldin *et al.* (2012) reporting that levels of 60–75 dBA have been shown to cause stress, e.g., increased respiration and heart rate, increased vigilance, and decreased time for grazing in domestic animals such as sheep and horses.
- Animals of most species exhibit adaptation with noise (Broucek, 2014), including impulsive noises, by changing their behaviour.
- More sensitive species would relocate to a quieter area, especially species that depend on hearing to hunt or evade prey, or species that makes use of sound/hearing to locate a suitable mate (Dooling, 2007).
- Noises associated with helicopters, motor- and quad bikes significantly impact on animals (startle response). This is due to the sudden and significant increase in noise levels as well as the presence of humans (Autumn, 2007; USEPA, 1971).

8.2 WHY NOISE CONCERNS COMMUNITIES¹⁵

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;

¹⁴ Baldwin, 2007.

¹⁵World Health Organization, 1999; Noise quest, 2010; Journal of Acoustical Society of America, 2009

- Obstructs activities (work, leisure and sleeping); and
- Presents a health risk due to hearing damage.

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

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

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

Severity of the annoyance depends on factors such as:

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

8.3 IMPACT ASSESSMENT CRITERIA

8.3.1 Overview: The common characteristics

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

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

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

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

8.3.2 Noise criteria of concern

The criteria used in this report were drawn from the criteria for the description and assessment of environmental impacts considering the latest EIA Regulations, SANS 10103:2008 as well as guidelines from the World Health Organization.

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

- *Increase in noise levels:* People or communities often react to an increase in the ambient noise level they are used to, which is caused by a new source of the noise. With regards to the Noise Control Regulations (promulgated in terms of the ECA), an increase of more than 5 dBA is considered a disturbing noise. See also **Figure 8-2**.
- *Zone Sound Levels:* Previously referred to as the acceptable rating levels, it sets acceptable noise levels for various areas. See also **Table 8-1**.
- *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 8-1**). It provides the equivalent ambient noise levels (referred to as Rating Levels), $L_{Req,d}$ and $L_{Req,nr}$ during the day and night respectively to which different types of developments may be exposed.

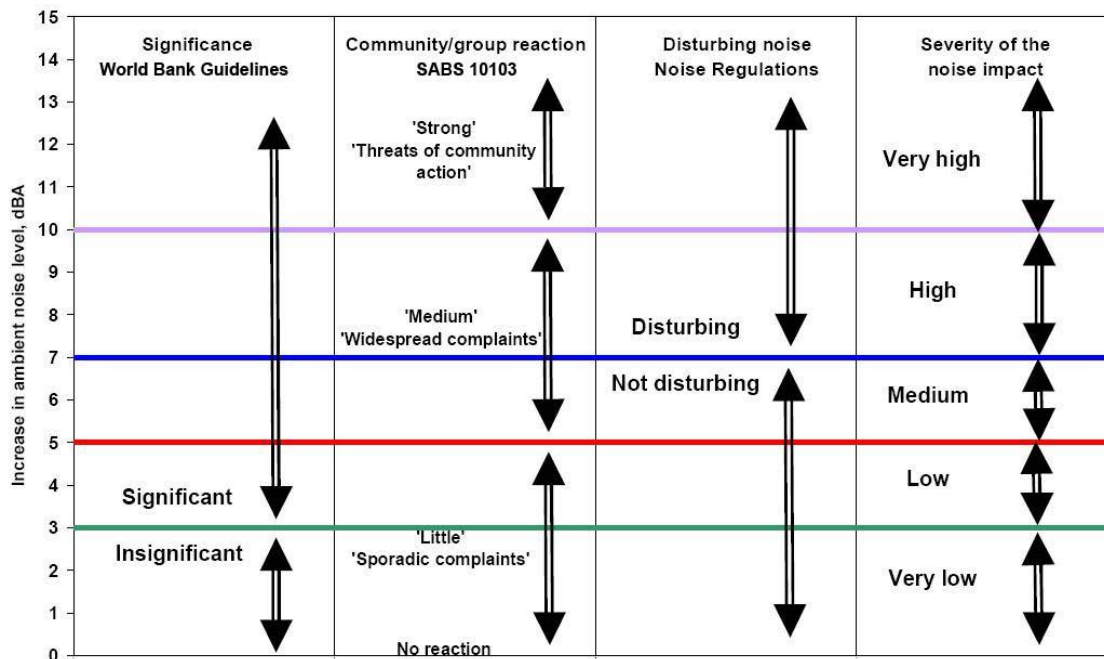


Figure 8-2: Criteria to assess the significance of impacts stemming from noise

The plant should also limit the noise level to less than 60 dBA on the boundary (70 dBA during the daytime period, and 60 dBA at night for a 70 dBA day-night noise limit).

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 (National Noise Control Regulations).

Table 8-1: Acceptable Zone Sound Levels for noise in districts (SANS 10103:2008)

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

8.3.3 Determining the Significance of the Noise Impact

The level of detail as depicted in the EIA Guidelines (DEAT, 1998) (DEAT, 2002)) 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, ranging from one (1) to five (5), depending on its definition. This assessment is a relative evaluation within the context of all the activities and the other impacts within the framework of the Project.

The impact consequence is determined by summing the scores of Magnitude (**Table 8-2**), Duration (**Table 8-3**) and Spatial Extent (**Table 8-4**). The impact significance (see **Sections 8.3.4** and **Section 0**) is determined by multiplying the Consequence result with the Probability score (**Table 8-5**). An explanation of the impact assessment criteria is defined in the following tables.

Table 8-2: 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
<i>Low</i>	Increase in average sound pressure levels between 0 and 3 dB from the expected ambient sound levels. Ambient sound levels are defined by the average of the measured day- or night-time fast-weighted sound levels during measurement dates. Total projected noise rating level is less than the Zone Sound Level (the rating level) and/or WHO/IFC noise limits in wind-still conditions.	2
<i>Low Medium</i>	Increase in average sound pressure levels between 3 and 5 dB from the expected ambient sound levels. Total projected noise rating level between 3 and 5 above the Zone Sound Level (the rating level) and/or WHO/IFC noise limits (wind-less conditions).	4
<i>Medium</i>	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 (the rating level) and/or WHO/IFC noise limits (wind-less conditions). Sporadic complaints expected.	6
<i>High</i>	Increase in average sound pressure levels between 7 and 10 from the ambient sound level. Total projected noise rating level between 7 and 10 dBA above the Zone Sound Level (the rating level) and/or WHO/IFC noise limits (wind-less condition). Medium to widespread complaints expected.	8
<i>Very High</i>	Increase in average ambient sound pressure levels higher than 10 dBA. Total projected noise rating level higher than 10 dB above the Zone Sound Level (the rating level) and/or WHO/IFC noise limits (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 8-3: Impact Assessment Criteria - Duration

The lifetime of the impact that is measured in relation to the lifetime of the proposed development (construction, operational 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 short duration (portion of construction period) and intermittent/occasional.	1
<i>Short term</i>	Impacts that are predicted to last only for the duration of the construction period.	2
<i>Long-term</i>	Impacts that will continue for the life of the Project, but ceases when the Project stops operating.	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/last substantially beyond the Project lifetime.	5

Table 8-4: 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 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 8-5: 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>	Daytime noise levels are less than 45 dBA; Night-time noise levels less than 35 dBA.	1
<i>Possible</i>	Daytime noise levels are less than 50 dBA; Night-time noise levels less than 40 dBA.	2
<i>Likely</i>	Daytime noise levels are less than 55 dBA; Night-time noise levels less than 45 dBA.	3
<i>Highly Likely</i>	Daytime noise levels are less than 60 dBA; Night-time noise levels less than 50 dBA.	4
<i>Definite</i>	Daytime noise levels exceeding 60 dBA; Night-time noise levels higher than 50 dBA.	5

8.3.4 Identifying the Potential Impacts without Mitigation Measures (WOM)

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).

Significance without mitigation is rated on the following scale:

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)	The 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.

8.3.5 Identifying the Potential Impacts with Mitigation Measures (WM)

In order to gain a comprehensive understanding of the overall significance of the impact, after the implementation of the mitigation measures, it was necessary to re-evaluate the impact.

Significance with mitigation is rated on the following scale:

SR<30	Low (L)	The impact is mitigated to the point where it is of limited importance.
30<SR <60	Medium (M)	Notwithstanding the successful implementation of the mitigation measures, to reduce the negative impacts to acceptable levels, the negative impact will remain of significance. However, taken within the overall context of the project, the persistent impact does not constitute a fatal flaw.
SR>60	High (H)	The impact is of major importance. Mitigation of the impact is not possible on a cost-effective basis. The impact is regarded of high importance and taken within the overall context of the project, is regarded as a fatal flaw. An impact regarded as high significance after mitigation could render the entire development option or entire project proposal unacceptable.

9 ASSUMPTIONS AND LIMITATIONS

9.1 MEASUREMENTS OF AMBIENT SOUND LEVELS

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⁽¹⁶⁾ 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. Availability of a measurement location (access to a certain area suitable for monitoring, or permission to deploy instruments at a location);
2. Security of the instrument (minimise risk to the technician; prevent theft; sabotage of the equipment);
3. 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,
4. 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⁽¹⁷⁾;

⁽¹⁶⁾ Environ. We Int. Sci. Tech. *Ambient noise levels due to dawn chorus at different habitats in Delhi*. 2001. Pg. 134.

⁽¹⁷⁾ Clyne, D. "Cicadas: Sound of the Australian Summer, *Australian Geographic*" Oct/Dec Vol 56. 1999.

- 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;
- 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.

9.2 CALCULATING NOISE EMISSIONS – ADEQUACY OF PREDICTIVE METHODS

The noise emissions into the environment from the various sources as defined were calculated for the operational phase in detail, using the sound propagation model described in ISO 9613-2.

The following was considered:

- The octave band sound pressure emission levels of processes and equipment;
- The time the activities and equipment are operational and generating the noise rating levels as assumed. For this project a worst-case was assessed, assuming that most equipment (excluding the bulldozer used for clearing of vegetation) would be operating at a 100% load (generating the maximum noise rating levels), 100% of the time. In practice this is inaccurate as no activity or equipment are 100% operational of the time and the assumption will result in an over-estimated noise rating levels;
- The distance of the receiver 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;
- Topographical layout; and

The noise emission into the environment due to potential project traffic was calculated using the sound propagation model described in RLS-90 used in Germany. Corrections such as the following were considered:

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

This noise model generates the potential LA10 noise level, which is used in various countries (such as the United States of America, United Kingdom, Germany, Canada, Australia, New Zealand, etc.) to define potential road traffic noise analysis (and abatement). In this project, it illustrates the potential extent of the calculated noises (the noise rating level) of the complete project and not noise levels at a specific moment in time. It is used to define potential issues of concern and not to predict an actual noise level at a potential noise-sensitive receptor. For this, the selected model is internationally recognised and considered adequate. This noise model is recommended for use to calculate potential traffic noises in Germany, Switzerland, Netherlands, United Kingdom, France, Denmark, Italy, Denmark and Austria.

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 may depend on a 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 that any mitigation measures proposed for the construction phase (if any), will be implemented and continued during the operational phase (if required).

9.5 UNCERTAINTIES OF INFORMATION PROVIDED

While it is difficult to define the character of a measured noise in terms of numbers (third octave sound power levels), it is difficult to accurately model noise rating levels at a receptor from any operation. The projected noise rating 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 sound power levels selected for processes and equipment accurately represent the sound character and power levels of these processes and

equipment. The determination of octave sound power levels in itself is subject to errors, limitations and assumptions with any potential errors carried over to any model making use of these results;

- Sound power emission levels from processes and equipment changes depending on the load the process and equipment are subject to. While the octave sound power level 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 rating 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 activities are proposed is well vegetated and sufficiently uneven to allow the consideration of medium ground conditions.

10 PROJECTED NOISE RATING LEVELS

10.1 CONCEPTUAL FUTURE SCENARIO – NOISE FROM CONSTRUCTION ACTIVITIES

A noise model was developed considering the construction activities as discussed in **Section 7.1** and conceptualised in **Figure 10-1** for the Soufflet Malting Plant.

The projected noise rating levels for the construction phase are defined per NSR:

- in **Appendix C, Table 1** for the daytime period, with the future noise rating level contours illustrated in **Figure 10-5**;
- in **Appendix C, Table 2** (even if no night-time construction activities are expected) with the potential night-time noise rating level contours illustrated in **Figure 10-6**;

10.2 CONCEPTUAL FUTURE SCENARIO – NOISE FROM OPERATIONAL ACTIVITIES

A noise model was developed considering the conceptual operational activities as discussed in **Section 7.2** and conceptualised in **Figure 10-2**. The scenario was selected to illustrate noise rating levels close to the NSRs in the vicinity of the project.

The projected noise rating levels for the operational phase are defined per NSR:

- in **Appendix C, Table 3** for the daytime period, with the future noise rating level contours illustrated in **Figure 10-7**; and
- in **Appendix C, Table 4** for the night-time period, with the potential night-time noise rating level contours illustrated in **Figure 10-8**.

10.3 POTENTIAL DECOMMISSIONING AND 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 construction and/or operational phases. This is because:

1. Decommissioning activities normally are limited to the daytime period, due to the lower urgency to complete this phase; and
2. Decommissioning activities normally use smaller and less equipment, generating less noise than the typical construction or operational phases.

If required, the noise levels for decommissioning can be compared with the daytime construction phase noise rating levels, and the noise impact are similar or less.

10.4 POTENTIAL POST-CLOSURE NOISE LEVELS

The potential for a noise impact to occur during the post-closure phase will be minimal and mainly relate to monitoring activities. The noise impact from this phase will not be investigated further.

10.5 EVALUATION OF ALTERNATIVES

10.5.1 Alternative 1: No-go option

The ambient sound levels will remain as is and the area would keep the existing noise character.

10.5.2 Alternative 2: Proposed development of the Soufflet Malting Plant

The proposed development will slightly raise the noise levels at the closest potential noise-sensitive receptor, with the highest impact relating to locations within 1000 m from the project activities (with no NSR identified within 500m from project infrastructure). It is unlikely that members of the local community will consider the slightly increased noise levels to be annoying and disturbing at night.

The project however will greatly assist in the economic growth and development challenges South Africa is facing by allowing the beer industry to improve. This will assist in providing employment and other business opportunities. Considering only noise¹⁸, people in the area not directly affected by increased noise levels may have a positive perception of the project and could see the need and desirability of the project.

¹⁸ Considering only noise as other environmental factors may affect other people.



Figure 10-1: Conceptual noise-generating activities and equipment considered for modelling purposes – Construction Phase



Figure 10-2: Conceptual noise-generating activities and equipment considered for modelling purposes – Operational Phase

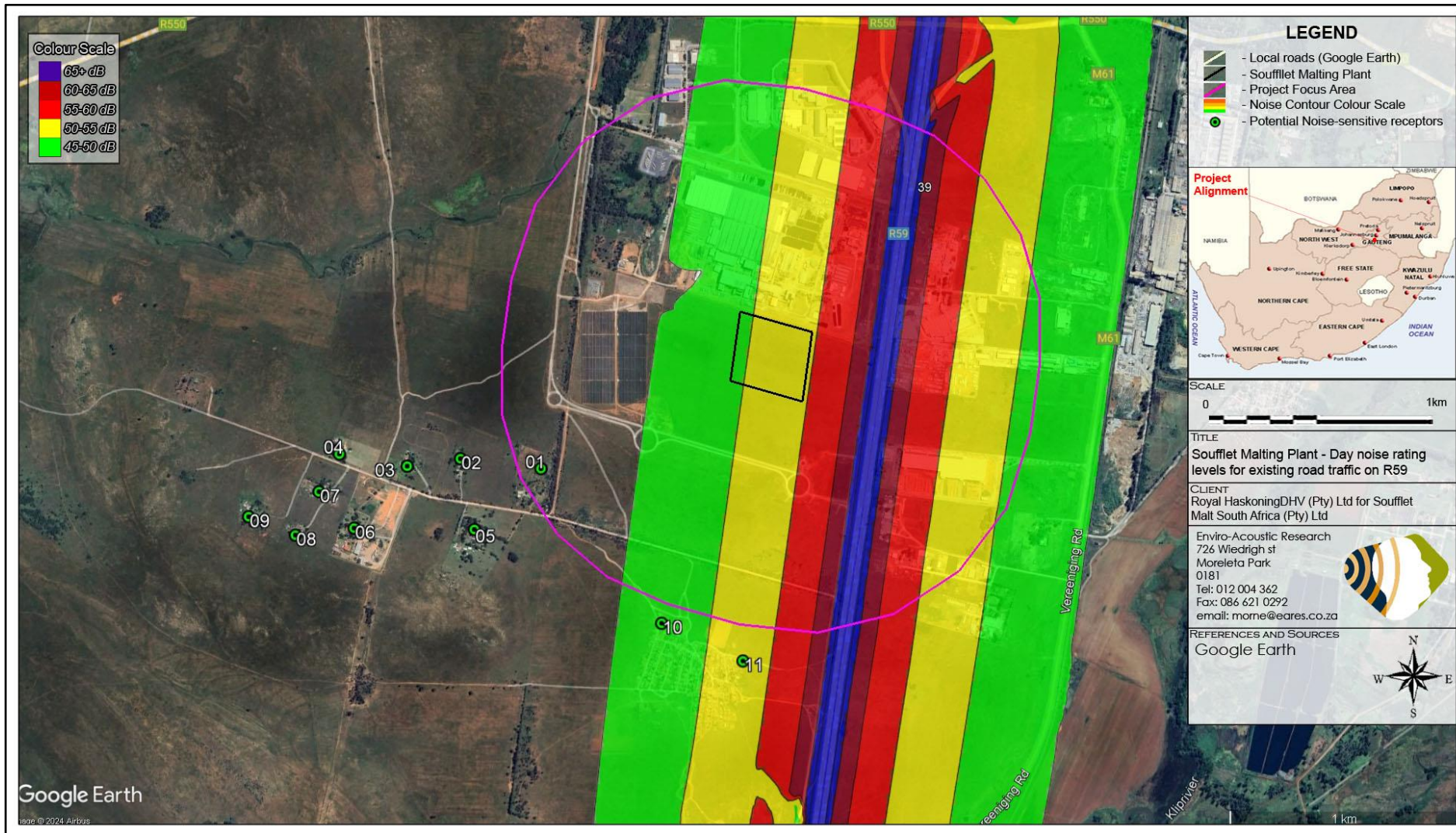


Figure 10-3: Projected existing daytime noise rating levels relating to road traffic on R59

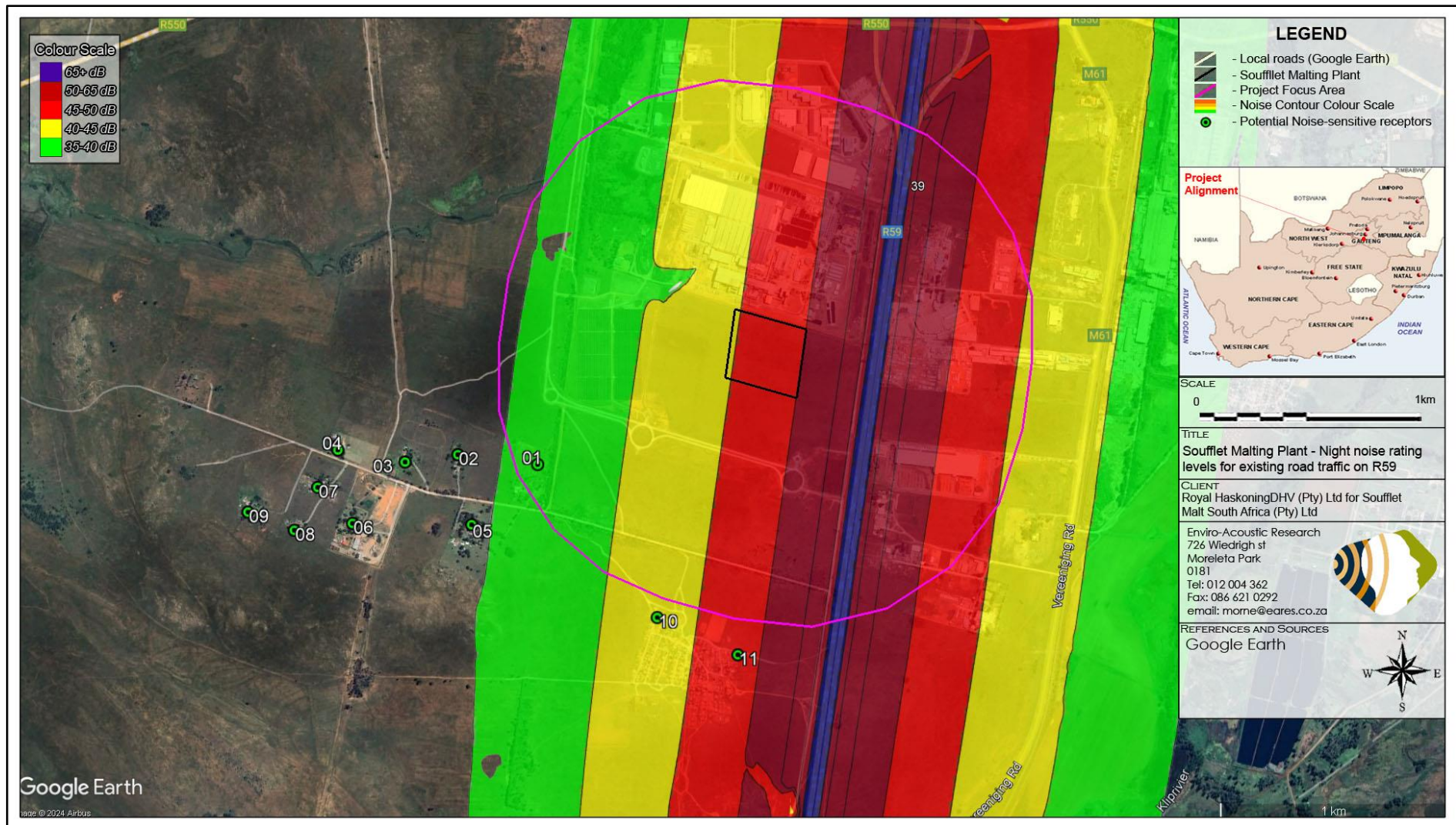


Figure 10-4: Projected existing night-time noise rating levels relating to road traffic on R59

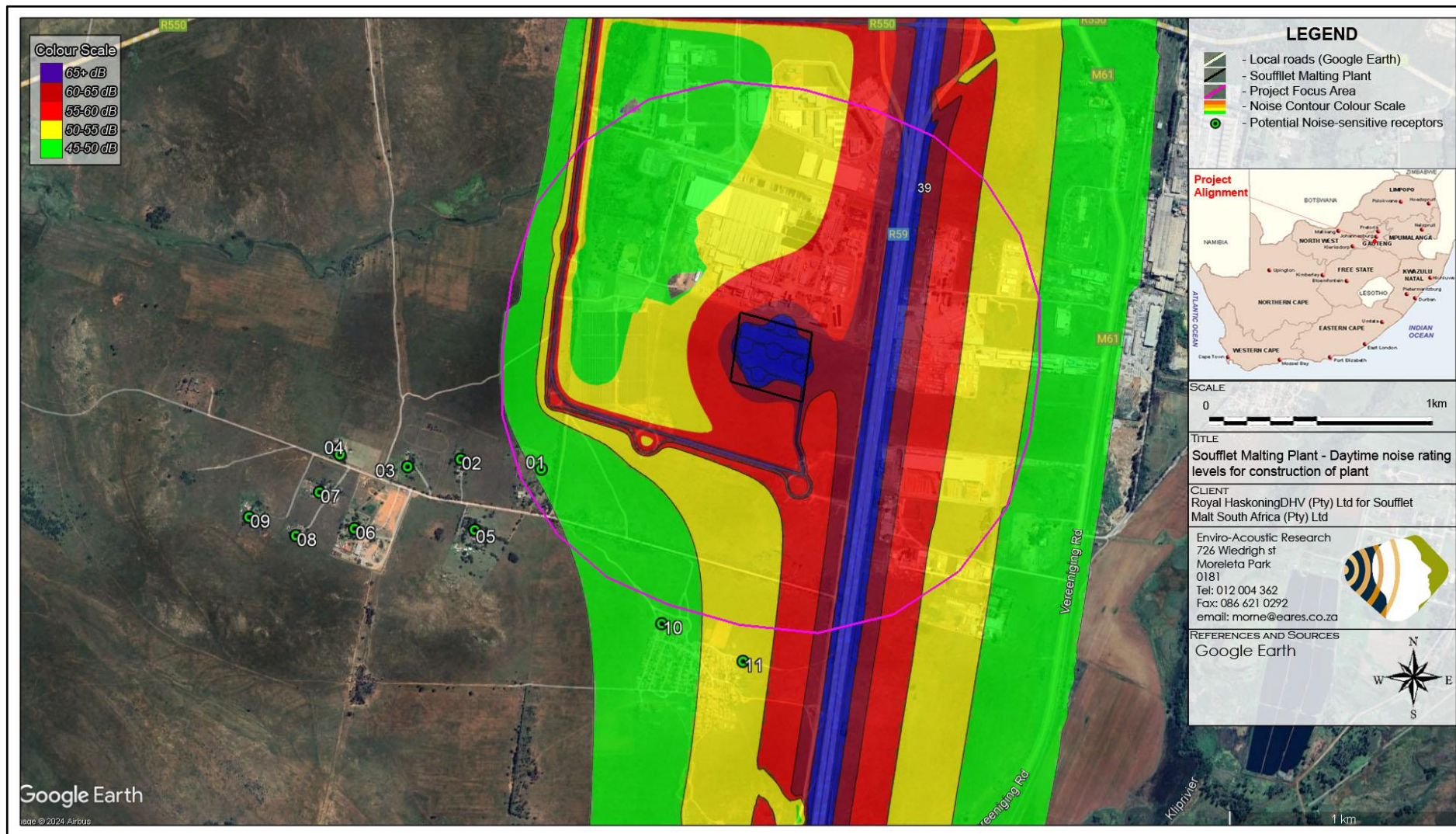


Figure 10-5: Projected daytime noise rating levels relating to the construction of the Soufflet Malting Plant

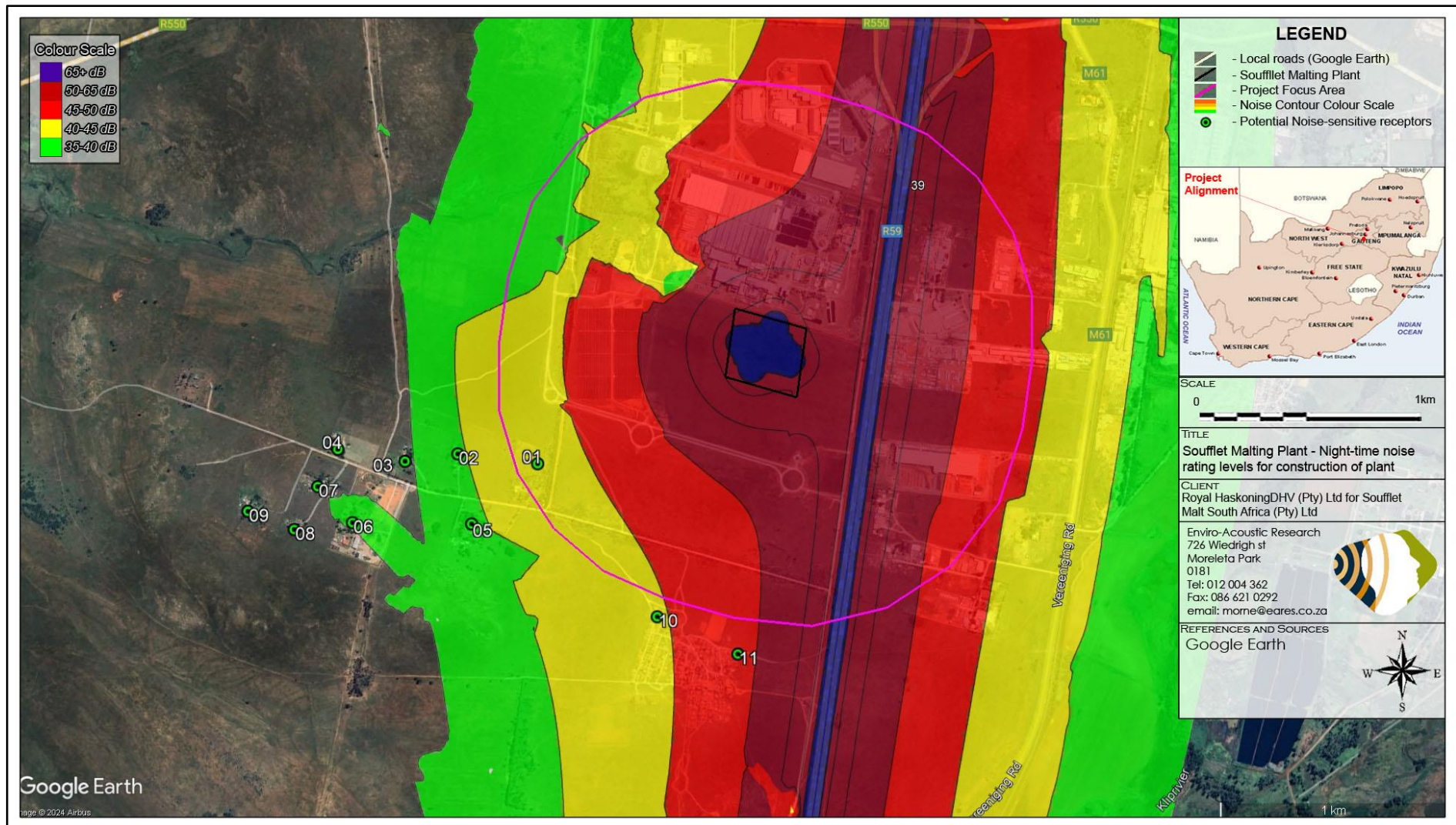


Figure 10-6: Projected night-time noise rating levels relating to the construction of the Soufflet Malting Plant

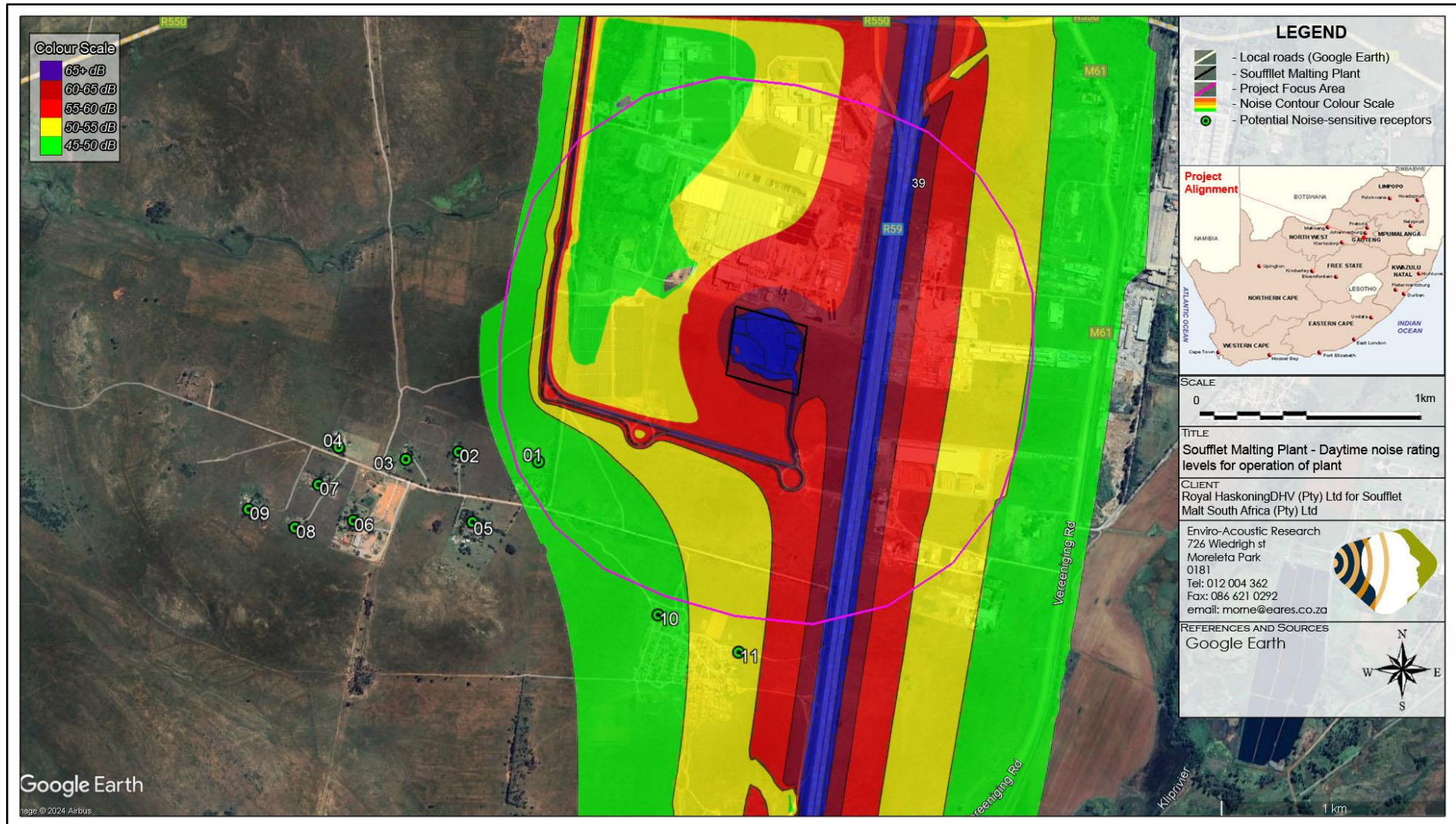


Figure 10-7: Projected daytime noise rating levels relating to the operation of the Soufflet Malting Plant

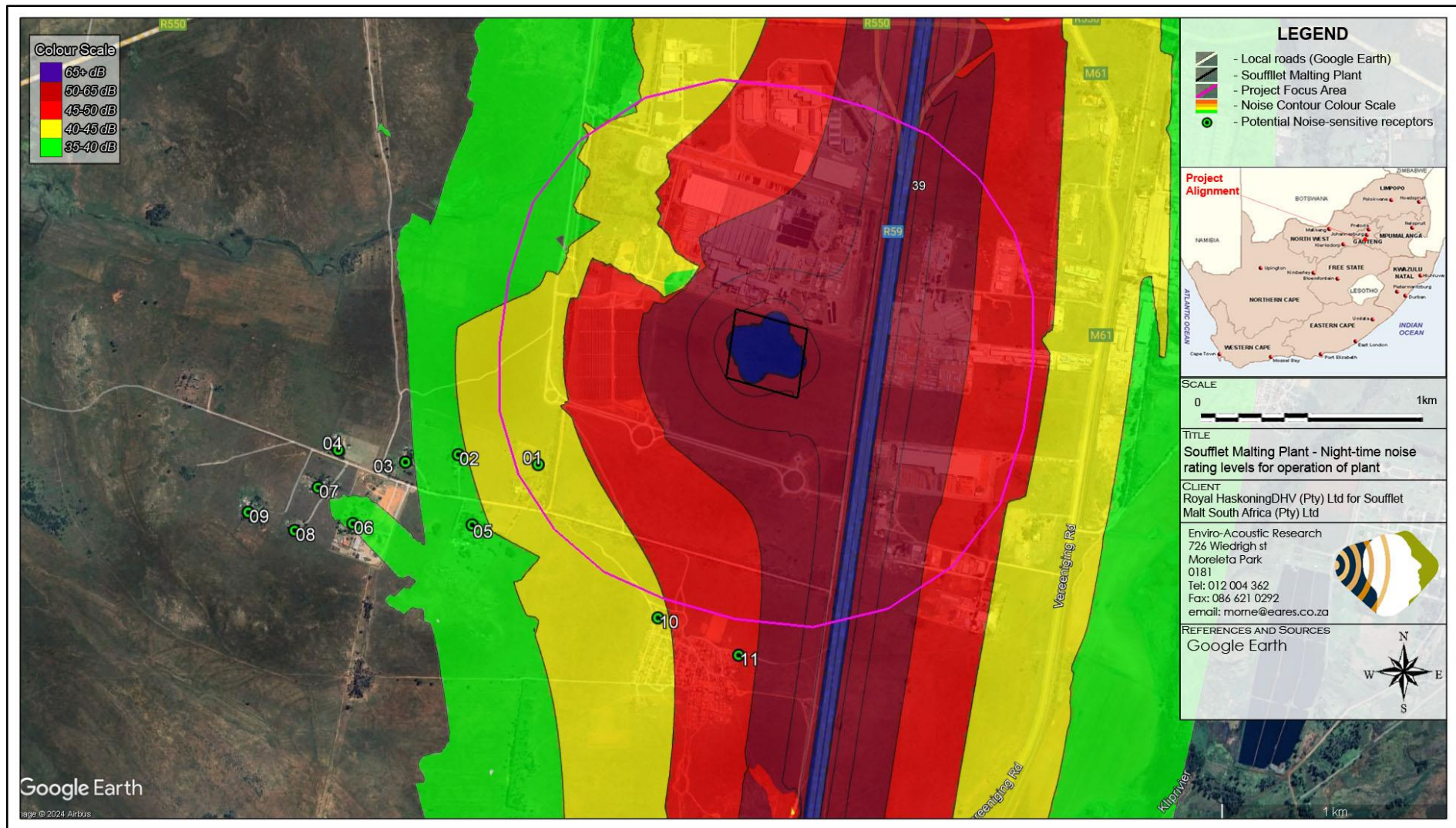


Figure 10-8: Projected night-time noise rating levels relating to the operation of the Soufflet Malting Plant

11 SIGNIFICANCE OF THE NOISE IMPACT

11.1 CONSTRUCTION PHASE NOISE IMPACT

The various construction activities as defined in **section 7.1** was conceptualised, with potential noise rating levels calculated in **section 10.1**.

The potential significance of the noise impact is defined per NSR for the construction phase

- in **Appendix C, Table 1** for worst-case noise generating activities associated with daytime construction activities, with the potential significance of the daytime construction noise impact summarised in **Table 11-1**;
- **Appendix C, Table 2** for worst-case noise generating activities associated with night-time construction activities, with the potential significance of the night-time noise impact summarised in **Table 11-2** (even though night-time construction activities are not anticipated);

Table 11-1: Impact Assessment: Daytime Construction Activities

Nature:	Numerous simultaneous construction activities during the day at the Central decline	
Acceptable Rating Level	<p>Ambient sound levels were measured at a number of locations over a 2 night-period with the average daytime sound level being 45.3 dBA (average long-term daytime fast-weighted sound level). Ambient sound levels ranged between 36 and 66 dBA.</p> <p>Considering the ambient sound levels measured, the developmental character of the area as well as audible observations, the recommended daytime zone sound level is 50 dBA. The upper noise limit at NSR would be 55 dBA (as per IFC's recommended noise limit for residential use).</p> <p>The potential noise rating levels, as well as the significance are defined per NSR in Appendix C, Table 1.</p>	
	Without Mitigation	With Mitigation
Magnitude (Table 8-2)	Low Medium (4)	Low Medium (4)
Duration (Table 8-3)	Short-term (2)	Short-term (2)
Extent ($\Delta L_{Aeq,D} > 7\text{dBA}$) (Table 8-4)	Local (2)	Local (2)
Probability (Table 8-5)	Possible (2)	Possible (2)
Significance of Impact	Low (16)	Low (16)
Status	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	None.	
Comments	Worst-case scenario with numerous simultaneous construction activities modelled.	

Mitigation:	The potential significance of the noise impact of construction activities at the plant would be low and additional mitigation measures are not required or recommended. General mitigation measures are included in section 12.1 to ensure that annoyance with the project is minimised.
Cumulative Impacts:	Construction activities and road noise from the R59 could cumulatively increase noise levels in the area.
Residual Impacts:	This impact will only disappear after plant decommissioning and closure is completed.

Table 11-2: Impact Assessment: Night-time Construction Activities

Nature:	Numerous simultaneous construction activities at night at the Central decline	
Acceptable Rating Level	<p>Ambient sound levels were measured at a number of locations over a 2 night-period the average night-time sound level being 40.6 dBA (average long-term night-time fast-weighted sound level) with night-time ambient sound levels ranging between 28 and 69 dBA.</p> <p>Considering the ambient sound levels measured, the developmental character of the area as well as audible observations, the recommended night-time zone sound level was 40 dBA, with a night-time noise limit of 45 dBA.</p> <p>The potential noise rating levels, as well as the significance are defined per NSR in Appendix C, Table 2.</p>	
	Without Mitigation	With Mitigation
Magnitude (Table 8-2)	Low Medium (4)	Low Medium (4)
Duration (Table 8-3)	Short-term (2)	Short-term (2)
Extent ($\Delta L_{Aeq,D} > 7\text{dBA}$) (Table 8-4)	Regional (3)	Regional (3)
Probability (Table 8-5)	Possible (2)	Possible (2)
Significance of Impact	Low (18)	Low (18)
Status	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	None.	
Comments	Worst-case scenario with numerous simultaneous construction activities modelled.	
Mitigation:	The potential significance of the noise impact of construction activities at the plant would be low and additional mitigation measures are not required or recommended. General mitigation measures are included in section 12.1 to ensure that annoyance with the project is minimised.	
Cumulative Impacts:	Construction activities and road noise from the R59 could cumulatively increase noise levels in the area.	
Residual Impacts:	This impact will only disappear after plant decommissioning and closure is completed.	

11.2 OPERATIONAL PHASE NOISE IMPACT

The impact assessment for the various operational activities defined in **section 7.2** was conceptualised and calculated in **section 10.2**.

The potential significance of the noise impacts is defined per NSR for operational activities:

- in **Appendix C, Table 3** for the daytime period, with the potential significance of the daytime operational noise impact summarised in **Table 11-3**; and
- in **Appendix C, Table 4** for the night-time period, with the potential significance of the night-time operational noise impact summarised in **Table 11-4**.

Table 11-3: Impact Assessment: Worst-case daytime operational activities

Nature:	Numerous simultaneous operational activities during the day	
Acceptable Rating Level	<p>Ambient sound levels were measured at a number of locations over a 2 night-period with the average daytime sound level being 45.3 dBA (average long-term daytime fast-weighted sound level). Ambient sound levels ranged between 36 and 66 dBA.</p> <p>Considering the ambient sound levels measured, the developmental character of the area as well as audible observations, the recommended daytime zone sound level is 50 dBA. The upper noise limit at NSR would be 55 dBA (as per IFC's recommended noise limit for residential use).</p> <p>The potential noise rating levels, as well as the significance are defined per NSR in Error! Reference source not found..</p>	
	Without Mitigation	With Mitigation
Magnitude (Table 8-2)	Low (2)	Low (2)
Duration (Table 8-3)	Permanent (5)	Permanent (5)
Extent ($\Delta L_{Aeq,D} > 7\text{dBA}$) (Table 8-4)	Local (2)	Local (2)
Probability (Table 8-5)	Possible (2)	Possible (2)
Significance of Impact	Low (18)	Low (18)
Status	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	None.	
Mitigation:	The potential significance of operational noise impact would be low and additional mitigation measures are not required or recommended. Additional general mitigation measures are included in section 12.2 to ensure that annoyance with the project is minimised.	
Cumulative Impacts:	Operational activities and road noise from the R59 could cumulatively increase noise levels in the area.	
Residual Impacts:	This impact will only disappear after plant decommissioning and closure is completed.	

Table 11-4: Impact Assessment: Worst-case operational activities at night

Nature:	Numerous simultaneous operational activities at night	
Acceptable Rating Level	<p>Ambient sound levels were measured at a number of locations over a 2 night-period the average night-time sound level being 40.6 dBA (average long-term night-time fast-weighted sound level) with night-time ambient sound levels ranging between 28 and 69 dBA.</p> <p>Considering the ambient sound levels measured, the developmental character of the area as well as audible observations, the recommended night-time zone sound level was 40 dBA, with a night-time noise limit of 45 dBA.</p> <p>The potential noise rating levels, as well as the significance are defined per NSR in Error! Reference source not found..</p>	
	Without Mitigation	With Mitigation
Magnitude (Table 8-2)	Medium (6)	Medium (6)
Duration (Table 8-3)	Permanent (5)	Permanent (5)
Extent ($\Delta L_{Aeq,D} > 7\text{dBA}$) (Table 8-4)	Regional (3)	Regional (3)
Probability (Table 8-5)	Possible (2)	Possible (2)
Significance of Impact	Medium (28)	Medium (28)
Status	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	None.	
Mitigation:	The potential significance of operational noise impact would be low and additional mitigation measures are not required or recommended. Additional general mitigation measures are included in section 12.2 to ensure that annoyance with the project is minimised.	
Cumulative Impacts:	Operational activities and road noise from the R59 could cumulatively increase noise levels in the area.	
Residual Impacts:	This impact will only disappear after plant decommissioning and closure is completed.	

12 MITIGATION OPTIONS

This study considers the potential noise impact on the surrounding environment due to the construction, operational and future decommissioning activities associated with the development of the Soufflet Malting Plant. Using conceptual worst-case noise models, it was determined that the potential noise impacts at the project would be:

- of a **low significance** for daytime construction activities;
- of **low significance** for night-time construction activities (even though night-time construction are not anticipated);
- of a **low significance** for daytime operational activities; and
- of a **low significance** for night-time operational activities.

The development of the Soufflet Malting Plant could increase noise levels at NSR1 (the closest noise-sensitive receptor), although this is considering a worst-case scenario and it is not deemed as a noise impact.

At all stages, surrounding receptors should be informed about the project, providing them with factual information without setting unrealistic expectations. It is counterproductive to suggest that the activities will be inaudible due to existing high ambient sound levels, or that noise levels will be low (based on the noise assessment). The magnitude of the sound levels will depend on a multitude of variables and will vary from day to day and from place to place with environmental and operational conditions. Audibility is distinct from the sound level, because it depends on the relationship between the sound level from the activities, the spectral character and that of the surrounding soundscape (both level and spectral character).

The project applicant must implement a line of communication (i.e., a help line where complaints could be lodged). All potential sensitive receptors should be made aware of these contact numbers. The plant should maintain a commitment to the local community (people staying within 1,000 m from construction or operational activities) and respond to noise concerns in an expedient fashion. Sporadic and legitimate noise complaints could be raised. For example, sudden and sharp increases in sound levels could result from mechanical malfunctions or maintenance issues. Problems of this nature can be corrected quickly and it is in the plant's interest to do so.

12.1 CONSTRUCTION PHASE MITIGATION MEASURES

The noise study considers the potential noise impact on the surrounding environment due to construction activities as conceptualized. It was determined that the potential noise impact would be of a **low significance** and additional mitigation is not recommended or required.

General measures are however included to ensure that annoyance with the project is minimised. These measures could include:

- All employees and contractors should receive Health and Safety induction that includes an environmental awareness component (noise). This is to allow employees and contractors to the potential noise risks that activities (especially night-time activities) pose to the realise surrounding environment;
- The applicant must implement a line of communication (i.e., a helpline where complaints could be lodged). All potential sensitive receptors should be made aware of these contact numbers, or alternative means to communicate issues. The plant should maintain a commitment to the local community and respond to concerns in an expedient fashion. Sporadic and legitimate noise complaints could develop and if valid, should be investigated. Feedback must be provided to the affected stakeholder(s) with details of any steps taken to mitigate the impact (if valid complaint) or preventative steps to minimise this from happening again;
- The plant must investigate any reasonable and valid noise complaint if registered by a receptor staying within 1,000 m from the processing plant.

12.2 OPERATIONAL PHASE MITIGATION MEASURES

The study considers the potential noise impact on the surrounding environment due to operational activities at the plant. The potential noise impact would be of a **low** significance during the operational phase for both the day- and night-time activities.

Continued management measures as highlighted for the construction phase will allow the reduction in potential noise annoyance with the project. General mitigation measures recommended for the applicant to note include:

- The continued commitment to consider the potential sensitivity of the surrounding communities to increased noises. Management measures as highlighted for the construction phase should continue;
- The plant must investigate any reasonable and valid noise complaint if registered by a receptor staying within 1,000 m from the plant.

12.3 MITIGATION OPTIONS THAT SHOULD BE INCLUDED IN THE EMP AND EA

- All employees and contractors should receive Health and Safety induction that includes an environmental awareness component (noise). This is to allow employees and contractors to the potential noise risks that activities (especially night-time activities) pose to the realise surrounding environment;
- The applicant must implement a line of communication (i.e., a helpline where complaints could be lodged). All potential sensitive receptors should be made aware of these contact numbers, or alternative means to communicate issues. The plant should maintain a commitment to the local community and respond to concerns in an expedient fashion. Sporadic and legitimate noise complaints could develop and if valid, should be investigated. Feedback must be provided to the affected stakeholder(s) with details of any steps taken to mitigate the impact (if valid complaint) or preventative steps to minimise this from happening again;
- The plant must investigate any reasonable and valid noise complaint if registered by a receptor staying within 1,000 m from the processing plant;

13 ENVIRONMENTAL MANAGEMENT OBJECTIVES

Environmental Management Objectives is difficult to define for noise because ambient sound levels would slowly increase as development pressures increase in the area. This is due to increased traffic and human habitation and is irrespective whether the malting activity starts. The moment the plant stops noise levels will drop similar to the pre-activity levels (typical of other areas with a similar developmental character).

However, as there are a number of NSR in the area, Environmental Management Objectives will be proposed. These objectives are based on the sound levels criteria for Residential Use (International Best Practice) while considering the National Noise Control Regulations.

While routine noise monitoring is not recommended or required, the following management objectives can be used as a performance indicator should a potential noise complaint be investigated. These management objectives would be:

- Less than 55 dBA during the day at all NSR when measured over a period of 16-hours (06:00 – 22:00);
- Less than 45 dBA at night at all NSR when measured over a period of 8-hours (22:00 – 06:00).
- The plant should ensure that night-time noise levels are less than 60 dBA at the boundary (70 dBA during the day).

14 RECOMMENDATIONS AND CONCLUSIONS

This ENIA covers the proposed development of the Soufflet Malting Plant south in the Sedibeng District, Gauteng Province. The potential worst-case noise rating levels were calculated using a sound propagation model using conceptual scenarios for the construction and operational phases.

Using conceptual worst-case noise models, it was determined that the potential noise impacts at the project would be:

- of a **low significance** for daytime construction activities;
- of **low significance** for night-time construction activities (even though night-time construction are not anticipated);
- of a **low significance** for daytime operational activities; and
- of a **low significance** for night-time operational activities.

The construction and operational scenarios all consider worst-case noise emission levels from various simultaneous activities. The scenarios consider numerous activities at various locations, which would increase cumulative effects.

It is expected that the plant could be audible at the closest NSR (NSR01) during the night-time, though it is not regarded as a noise impact. While complaints about noise might be possible (though considered unlikely), the implementation of the general mitigation measures could assist in reducing annoyance with the project.

It is therefore recommended that the Soufflet Malting Plant be authorized (from a noise impact perspective).

This noise impact assessment is considered sufficient and further acoustic studies will not be required, with bi-annual noise monitoring is recommended at NSR01 for the first year of operation (summer and during winter). Noise monitoring should consider the requirements of SANS 10103:2008.

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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>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>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 <i>SPL</i> or <i>PWL</i> 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>Controlled area (as per National Noise Control Regulations)</i>	<p>a piece of land designated by a local authority where, in the case of-</p> <p>(a) road transport noise in the vicinity of a road-</p> <p>(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 65dBA; or</p> <p>(ii) the equivalent continuous "A"-weighted sound pressure level at a height of at least 1,2metres, but not more than 1,4 metres, above the ground for a period extending from 06:00 to 24:00 as calculated in accordance with SABS 0210-1986, titled: "Code of Practice for calculating and predicting road traffic noise", published under Government Notice No. 358 of 20 February 1987, and projected for a period of 15 years following the date on which the local authority has made such designation, exceeds 65 dBA;</p> <p>(b) aircraft noise in the vicinity of an airfield, the calculated noisiness index, projected for a period of 15 years following the date on which the local authority has made such designation, exceeds 65 dBA; or</p>

	<p>(c) industrial noise in the vicinity of an industry-</p> <p>(i) the reading on an integrating impulse sound level meter, taken outdoors at the end of a period of 24 hours while such meter is in operation, exceeds 61 dBA; or</p> <p>(ii) the calculated outdoor equivalent continuous "A"-weighted sound pressure level at a height of at least 1,2 metres, but not more than 1,4 metres, above the ground for a period of 24 hours, exceeds 61 dBA;</p>
<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 5 dBA or more.
<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 have 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>	<p>(1) Averaging detection time used in sound level meters.</p> <p>(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.</p>
<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 are 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>Greenfield</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 exists.
<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, workforce, consumers, environmental interest groups and the general public.
<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>L_{A90}</i>	the sound level exceeded for the 90% of the time under consideration
<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>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>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>	<p>developments that could be influenced by noise such as:</p> <p>a) districts (see table 2 of SANS 10103:2008)</p> <ol style="list-style-type: none"> 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; <p>b) educational, residential, office and healthcare buildings and their surroundings;</p> <p>c) churches and their surroundings;</p> <p>d) auditoriums and concert halls and their surroundings;</p> <p>e) recreational areas; and</p> <p>f) nature reserves.</p> <p>In this report, Noise-sensitive developments are also referred to as a Potential Sensitive Receptor</p>
<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>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>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>	<p>(1) Averaging times used in sound level meters.</p> <p>(2) Time constant of one [1]second that gives a slower response which helps average out the display fluctuations.</p>
<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>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>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 SANS10103:2008.

APPENDIX B

Site Investigation – Photos of monitoring locations

Photo B.1: Photos of measurement location RHSMLTSL01



Photo B.2: Photos of measurement location RHSMLTSL02



Photo B.3: Photos of measurement location RHSMLTSL03



Photo B.4: Photos of measurement location SB02



APPENDIX C

Calculated conceptual noise rating levels and
potential significance

Appendix C, Table 1: Projected noise rating levels and impact – Conceptual daytime construction activities

Potential Noise-sensitive development / Receptor(s)	Recommended Rating Levels	Potential Existing Residual Noise Levels (long-term average - Fast-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
NSR01	50	45.3	55.0	45.5	3.1	Low	Short	Local	Possible	Low
NSR02	50	45.3	55.0	38.3	0.8	Minor	Short	Local	Improbable	Low
NSR03	50	45.3	55.0	35.9	0.5	Minor	Short	Local	Improbable	Low
NSR04	50	45.3	55.0	41.9	1.6	Minor	Short	Local	Improbable	Low
NSR05	50	45.3	55.0	40.9	1.3	Minor	Short	Local	Improbable	Low
NSR06	50	45.3	55.0	37.8	0.7	Minor	Short	Local	Improbable	Low
NSR07	50	45.3	55.0	35.2	0.4	Minor	Short	Local	Improbable	Low
NSR08	50	45.3	55.0	34.3	0.3	Minor	Short	Local	Improbable	Low
NSR09	50	45.3	55.0	34.5	0.3	Minor	Short	Local	Improbable	Low

Appendix C, Table 2: Projected noise rating levels and impact – Conceptual night-time construction activities

Potential Noise-sensitive development / Receptor(s)	Recommended Rating Levels	Potential Existing Residual Noise Levels (long-term average - Fast-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
NSR01	40	40.0	45.0	42.7	4.6	Low	Short	Regional	Possible	Low
NSR02	40	40.0	45.0	34.6	1.1	Minor	Short	Regional	Improbable	Low
NSR03	40	40.0	45.0	32.4	0.7	Minor	Short	Regional	Improbable	Low
NSR04	40	40.0	45.0	39.3	2.7	Minor	Short	Regional	Improbable	Low
NSR05	40	40.0	45.0	37.5	1.9	Minor	Short	Regional	Improbable	Low
NSR06	40	40.0	45.0	35.5	1.3	Minor	Short	Regional	Improbable	Low
NSR07	40	40.0	45.0	31.8	0.6	Minor	Short	Regional	Improbable	Low
NSR08	40	40.0	45.0	30.9	0.5	Minor	Short	Regional	Improbable	Low
NSR09	40	40.0	45.0	32.6	0.7	Minor	Short	Regional	Improbable	Low

Appendix C, Table 3: Projected noise rating levels and impact – Conceptual daytime construction activities

Potential Noise-sensitive development / Receptor(s)	Recommended Rating Levels	Residual Noise Levels (long-term average - Fast-weighted, low wind) [as measured, estimated]	Recommended Noise Limit	Projected Noise Rating Level, construction phase - Day	Change in rating level	Magnitude / Intensity	Duration	Extent	Probability of Impact Occurring	Significance
NSR01	50	45.3	55.0	46.4	1.6	Minor	Permanent	Local	Possible	Low
NSR02	50	45.3	55.0	39.2	0.3	Minor	Permanent	Local	Improbable	Low
NSR03	50	45.3	55.0	37.0	0.2	Minor	Permanent	Local	Improbable	Low
NSR04	50	45.3	55.0	42.8	0.8	Minor	Permanent	Local	Improbable	Low
NSR05	50	45.3	55.0	41.7	0.6	Minor	Permanent	Local	Improbable	Low
NSR06	50	45.3	55.0	39.4	0.4	Minor	Permanent	Local	Improbable	Low
NSR07	50	45.3	55.0	36.7	0.2	Minor	Permanent	Local	Improbable	Low
NSR08	50	45.3	55.0	35.4	0.1	Minor	Permanent	Local	Improbable	Low
NSR09	50	45.3	55.0	36.6	0.2	Minor	Permanent	Local	Improbable	Low

Appendix C, Table 4: Projected noise rating levels and impact – Conceptual night-time construction activities

Potential Noise-sensitive development / Receptor(s)	Recommended Rating Levels	Residual Noise Levels (long-term average - Fast-weighted, low wind) [as measured, estimated]	Recommended Noise Limit	Projected Noise Rating Level, construction phase - Night	Change in rating level	Magnitude / Intensity	Duration	Extent	Probability of Impact Occurring	Significance
NSR01	40	40.0	45	44.2	5.6	Moderate	Permanent	Regional	Possible	Low
NSR02	40	40.0	45	36.5	1.6	Minor	Permanent	Regional	Improbable	Low
NSR03	40	40.0	45	34.5	1.1	Minor	Permanent	Regional	Improbable	Low
NSR04	40	40.0	45	40.8	3.4	Low	Permanent	Regional	Possible	Low
NSR05	40	40.0	45	39.1	2.6	Minor	Permanent	Regional	Improbable	Low
NSR06	40	40.0	45	37.9	2.1	Minor	Permanent	Regional	Improbable	Low
NSR07	40	40.0	45	34.6	1.1	Minor	Permanent	Regional	Improbable	Low
NSR08	40	40.0	45	33.0	0.8	Minor	Permanent	Regional	Improbable	Low
NSR09	40	40.0	45	35.4	1.3	Minor	Permanent	Regional	Improbable	Low

End of Report