

10.4 The Specialist

Note: Duplicate this section where there is more than one specialist.

I Kirsten Collett, as the appointed specialist hereby declare/affirm the correctness of the information provided as part of the application, and that I:

- in terms of the general requirement to be independent (tick which is applicable):

☒	other than fair remuneration for work performed/to be performed in terms of this application, have no business, financial, personal or other interest in the activity or application and that there are no circumstances that may compromise my objectivity; or
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☐	am not independent, but another EAP that is independent and meets the general requirements set out in Regulation 13 has been appointed to review my work (Note: a declaration by the review specialist must be submitted);
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- have expertise in conducting specialist work as required, including knowledge of the Act, regulations and any guidelines that have relevance to the proposed activity;
- will ensure compliance with the EIA Regulations 2014;
- 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 application;
- will take into account, to the extent possible, the matters listed in regulation 18 of the regulations when preparing the application and any report, plan or document relating to the application;
- will disclose to the proponent or applicant, registered interested and affected parties 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 or the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority (unless access to that information is protected by law, in which case I will indicate that such protected information exists and is only provided to the competent authority);
- declare that all the particulars furnished by me in this form are true and correct;
- am aware that it is an offence in terms of Regulation 48 to provide incorrect or misleading information and that a person convicted of such an offence is liable to the penalties as contemplated in section 49B(2) of the National Environmental Management Act, 1998 (Act 107 of 1998).

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Name of company

Date



10.5 The Review Specialist

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- am independent, and other than fair remuneration for work performed in terms of this application, have no business, financial, personal or other interest in the activity or application and that there are no circumstances that may compromise my objectivity;
- am fully aware of and meet all of the requirements of Regulation 13, and that failure to comply with any the requirements may result in disqualification;
- have reviewed/will review all the work undertaken by the specialist;
- have disclosed/will disclose, to the applicant, the EAP, other specialist (if any), the Department and interested and affected parties, all material information that have or may have the potential to influence the decision of the Department or the objectivity of any report, plan or document prepared or to be prepared as part of the application; and
- am aware that a false declaration is an offence in terms of regulation 48 of the 2014 NEMA EIA Regulations.

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McCain Foods (Pty) Ltd

ENVIRONMENTAL ACOUSTIC IMPACT ASSESSMENT

McCain Delmas Wastewater Treatment Plant and
Expansion of Diesel Storage Capacity Project





McCain Foods (Pty) Ltd

ENVIRONMENTAL ACOUSTIC IMPACT ASSESSMENT

McCain Delmas Wastewater Treatment Plant and Expansion
of Diesel Storage Capacity Project

REPORT (VERSION 01) CONFIDENTIAL

PROJECT NO. 41107366

DATE: JANUARY 2026

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GLOSSARY OF TERMS

Sound	Sound is small fluctuations in air pressure, measured in Newtons per square meter (N/m^2) or Pascals (Pa) that are transmitted as vibrational energy via a medium (air) from the source to the receiver. The human ear is a pressure transducer, which converts these small fluctuations in air pressure into electrical signals, which the brain then interprets as sound.
Noise	Noise is generally defined as unwanted sound.
Sound or noise level	A sound or noise level is a sound measurement that is expressed in decibels (dB or dB(A)).
dB or dB(A)	The human ear is a sensitive instrument that can detect fluctuations in air pressure over a wide range of amplitudes. This limits the usefulness of sound quantities in absolute terms. For this reason, a sound measurement is expressed as ten times the logarithm of the ratio of the sound measurement to a reference value, 20 micro (millionth) Pa. This process converts a scale of constant increases to a scale of constant ratios and considerably simplifies the handling of sound measurement quantities. The attached 'A' indicates that the sound measurement has been A-weighted.
dB(Z)	Historically sound levels were read off a hand-held meter and the noise levels were noted in dB, after the development of different weighting curves sound levels were noted as Z-weighting or dB(Z) to reduce the confusion with different type of weighting applied noise levels. dB(Z) refers to linear noise levels.
A-weighting	The human ear is not equally sensitive to sound of all frequencies, i.e., it is less sensitive to low pitched (or 'bass') than high pitched (or 'treble') sounds. In order to compensate when making sound measurements, the measured value is passed through a filter that simulates the human hearing characteristic. Internationally this is an accepted procedure when working with measurements that relate to human responses to sound/noise.
Ambient sound level	Ambient noise will be defined as the totally encompassing sound in a given situation at a given time, and is usually composed of sound from many sources, both near and far.
Annoyance	General negative reaction of the community or person to a condition creating displeasure or interference with specific activities.
Sound pressure	Sound pressure is the force of sound exerted on a surface area perpendicular to the direction of the sound and is measured in N/m^2 or Pa. The human ear perceives sound pressure as loudness and can



also be expressed as the number of air pressure fluctuations that a noise source creates.

Sound pressure level	The sound pressure level is a relative quantity as it is a ratio between the actual sound pressure and a fixed reference pressure. The reference pressure is usually the threshold of hearing, namely 20 microPascals (μPa).
Sound power	Sound power is the rate of sound energy transferred from a noise source per unit of time in Joules per second (J/s) or Watts (W).
Sound power level	The sound power level is a relative quantity as it relates the sound power of a source to the threshold of human hearing (10^{-12} W). Sound power levels are expressed in dB(A), as they are referenced to sound detected by the human ear (A-weighted).
Noise nuisance	Noise nuisance means any sound which disturbs or impairs or may disturb or impair the convenience or peace of any person.
Octave bands	The octave bands refer to the frequency groups that make a sound. The sound is generally divided into nine groups (octave bands) ranging from 32 Hertz (Hz) to 8,000 Hz. The lower frequency ranges of a sound have a vibrating character where the higher frequency of sound has the character of high-pitched sound. In viewing the total octave bands scale from 32 Hz to 8000 Hz the character of the sound can be described.

ACRONYMS AND ABBREVIATIONS

BA	Basic Assessment
CadnaA	Computer Aided Noise Abatement
COD	Chemical oxygen demand
dB	Decibel
dB(A)	A-weighted sound measurement
dB(C)	C-weighted sound measurement
dB(Z)	Z-weighted sound measurement
ECA	Environmental Conservation Act 73 of 1989
EHS	Environmental Health and Safety
EIA	Environmental Impact Assessment
ha	Hectare
Hz	Hertz
IFC	International Finance Corporation
km	Kilometre
L _{A90}	Noise level exceeded for 90% of the measurement period
L _{Aeq}	Equivalent continuous sound pressure level
L _{R,dn}	Equivalent continuous day/night rating level
L _{Req,d}	Equivalent continuous rating level for daytime
L _{Req,n}	Equivalent continuous rating level for night-time
L _{Req,T}	Typical noise rating levels
m	Metre
m/s	Meters per second
McCain	McCain Foods Pty (Ltd)
NEMA	National Environmental Management Act 107 of 1998
NEMAQA	National Environmental Management: Air Quality Act 39 of 2004
PPE	Personal Protective Equipment
SACNASP	South African Council for Natural Scientific Professions
SANS	South African National Standards
TPH	Tons per hour
UASB	Upflow anaerobic sludge blanket



WHO	World Health Organisation
WSP	WSP Group Africa (Pty) Ltd
WWTP	Wastewater Treatment Plant

EXECUTIVE SUMMARY

McCain Foods Pty (Ltd) (McCain) currently operates a production facility in Delmas, Mpumalanga that processes potatoes and sweet potatoes into frozen french fries (chips) for distribution to the retail market. The plant currently operates two french fry lines, each with a capacity of 7.5 tonnes per hour (TPH), resulting in a total finished product output of 15 TPH. It is understood that, in the future, the plant will operate two lines at 8 TPH, with a total finished product output of 16 TPH. To accommodate the proposed changes and increased production capacity, a wastewater treatment plant (WWTP) designed to support the two 8 TPH lines is required. A Biogas Plant linked to the new WWTP is also proposed. Additional diesel storage capacity is also required to operate the relatively new generator facility, that was installed as back-up power for the plant as and when needed.

For the proposed activities (hereafter referred to as the “Project”), environmental authorisation in the form of a Basic Assessment (BA) is required. As part of the BA process, an Environmental Acoustic Specialist Study is required to assess the acoustic impacts associated with the proposed operations. This report details the findings of the Environmental Acoustic Impact Assessment undertaken to investigate noise associated with the operation of the proposed Project.

To assess the existing noise climate in the area surrounding the proposed Project, ambient noise monitoring was conducted at six of the closest off-site sensitive receptor locations surrounding the McCain facility. An acoustic inventory was developed to identify all potential sources of noise associated with the proposed Project. The acoustic impacts of the operation of the proposed Project were then assessed using the CadnaA acoustic model. Due to the erratic and transient nature of the construction phase, as well as the fact that construction noise will be masked by the existing operations, a quantitative assessment of construction phase acoustic impacts was not undertaken, but rather a qualitative discussion thereof.

Baseline monitoring indicated that current daytime noise levels were below the South African National Standards (SANS) urban daytime guideline rating level at all receptor monitoring locations, except for Rec 05 (Delpark Residential 01). At night, average noise levels at all monitoring locations exceeded the respective guideline rating level. From the daytime and night-time monitoring campaigns, it is evident that the current noise climate surrounding the Project site is predominantly traffic-related, with influences from industrial activities at the McCain site as well as neighbouring industries. Natural sources like birds and insects were also evident.

For the acoustic modelling, one scenario was considered, namely the operational phase of the Project. Comparisons of the existing (monitored) and proposed (modelled) noise levels at each specified receptor enabled an assessment of changes in noise levels at these locations as a result of the operation of the proposed Project.

Daytime noise levels at all receptor locations are predicted to increase by between 0.0 and 0.7 dB(A) with the operation of the Project, resulting in “little” community/group response. Night-time noise levels at all the receptor locations are predicted to increase by between 0.0 and 0.3 dB(A), also resulting in “little” community/group response. It is noted that such increases at these locations (during both day and night) are well below the 5 dB(A) threshold for annoyance as per the Nkangala District Municipality Air Quality Management By-Law and as such, these increases are likely to go unnoticed. Based on both the day and night-time results presented here, acoustic impacts of the



operation of the proposed Project are negligible and noise-related complaints from receptors are not anticipated.

Highest noise levels are predicted around the WWTP and Hammermill area, as these areas contain the noisiest sources. It is understood that in reality, some of these sources may be contained within acoustic enclosures, however, these model results represent a worst-case scenario, without sources being contained/enclosed. Noise levels decrease as distance from the sources increase, with levels dropping below the industrial guideline level (70 dB(A) (day) and 60 dB(A) (night)) onsite. Noise levels at all receptor locations are below the respective urban guideline levels (55 dB(A) (day) and 45 dB(A) (night)).

All impacts of the operation of the proposed Project were evaluated using a risk matrix, which is a semi-quantitative risk assessment methodology. This system derives an environmental impact level on the basis of the magnitude, extent, duration and probability of occurrence. Based on the results of this Environmental Acoustic Impact Assessment, the significance of noise-related impacts is rated as “low” for both the construction and operational phases of the Project.

The Project will generate noise, however, sensitive receptors are located at sufficient distances from the site to perceive minimal noise impacts. As such, it is envisaged that the Project can be authorised with no special conditions, compulsory mitigation requirements or monitoring requirements in place. It is noted that noise levels onsite as a result of the proposed Project will increase and occupational health and safety measures for workers on site must remain in place.

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APPENDIX A

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IMPACT ASSESSMENT METHODOLOGY

1. INTRODUCTION

McCain Foods Pty (Ltd) (McCain) operates as a subsidiary of the global McCain Foods Group. McCain's Delmas Plant primarily focuses on processing potatoes and sweet potatoes into frozen french fries (chips) for distribution to the retail market. The plant currently operates two french fry lines, each with a capacity of 7.5 tonnes per hour (TPH), resulting in a total finished product output of 15 TPH.

It is understood that, in the future, the plant will operate two lines at 8 TPH, with a total finished product output of 16 TPH. To accommodate the proposed changes and increased production capacity, a wastewater treatment plant (WWTP) designed to support the two 8 TPH lines is required. A Biogas Plant linked to the WWTP is also proposed. Additional diesel storage capacity is also required to operate the relatively new generator facility, that was installed as back-up power for the plant as and when needed.

For the proposed WWTP and diesel storage activities (hereafter referred to as the "Project"), environmental authorisation in the form of a Basic Assessment (BA) is required. As part of the BA process, an Environmental Acoustic Specialist Study is required to assess the acoustic impacts associated with the proposed operations. This report details the findings of the Environmental Acoustic Impact Assessment undertaken to investigate noise associated with the operation of the proposed Project.

1.1. TERMS OF REFERENCE

The terms of reference, designed to best meet the Project requirements are summarised below:

- Identification of sensitive receptors (noise receivers) in the vicinity of the Project site.
- A baseline assessment of the current noise climate in the vicinity of the Project site, which includes baseline noise level monitoring within the receiving environment.
- Compilation of a comprehensive acoustic inventory to account for all sources of noise during the operational phase of the Project.
- An acoustic modelling investigation to determine the impact of noise associated with the operational phase of the proposed Project.
- Submission of an Environmental Acoustic Impact Assessment report (this report), detailing all findings from the baseline assessment, acoustic inventory and acoustic modelling simulations.
- Provide recommendations on the scope of any mitigation measures that may be applied to reduce noise associated with the proposed Project, if necessary.

1.2. DECLARATION OF INDEPENDENCE

Kirsten Collett is an air quality and acoustic consultant with a Master of Science (Atmospheric Sciences) degree obtained from the University of the Witwatersrand. She is currently employed by WSP and has worked on environmental acoustic impact assessments, monitoring and modelling for a variety of clients over the past thirteen years.



She has provided acoustic consulting support to various client industries including petrochemical, mining and production industries, among others. She is also a registered Professional Natural Scientist (Pr. Nat. Sci.) with the South African Council for Natural Scientific Professions (SACNASP). Please see **Appendix A** for a CV detailing project experience.

I hereby declare that I am fully aware of my responsibilities in terms of the National Environmental Management Act: Environmental Impact Assessment Regulations of 2014 and that I have no financial or other interest in the undertaking of the proposed activity other than the imbursement of consultant's fees.

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Signature:

A handwritten signature in black ink, appearing to read 'K Collett'.

2. BACKGROUND

2.1. LOCALITY

The McCain Delmas Plant is situated on Portion 5 of Farm Leeuwpoort 205 IR approximately 1.3 km north of the town of Delmas in the Nkangala District Municipality, in the Mpumalanga Province. The industrial area is bordered by large farmlands to the west, north and east (with prominent dry land cash crop farming and irrigation systems), and small industries/factories and agricultural plots to the south and southwest. The McCain Plant site is accessible via the R42, with a turn into Harrison Road. A graphical location map is presented in **Figure 1**.

2.2. TOPOGRAPHY

Delmas is situated on the Highveld plateau. The landscape surrounding the McCain facility is predominantly flat and expansive, with sparse vegetation and minimal tree cover. The Bronkhorstspuit River lies approximately 2 km east of the site. The general topography of the site and surrounding areas is depicted in **Figure 2**.

2.3. EXISTING NOISE CLIMATE

The existing noise climate surrounding the Project site is predominantly influenced by road traffic (mainly along the R42 that lies immediately east of the site), industrial activities occurring at McCain and other surrounding industrial sites, as well as natural sources like birds and insects. A baseline monitoring campaign was conducted for the Project, with the methodology and results presented in **Section 5.1** and **7.1**, respectively.

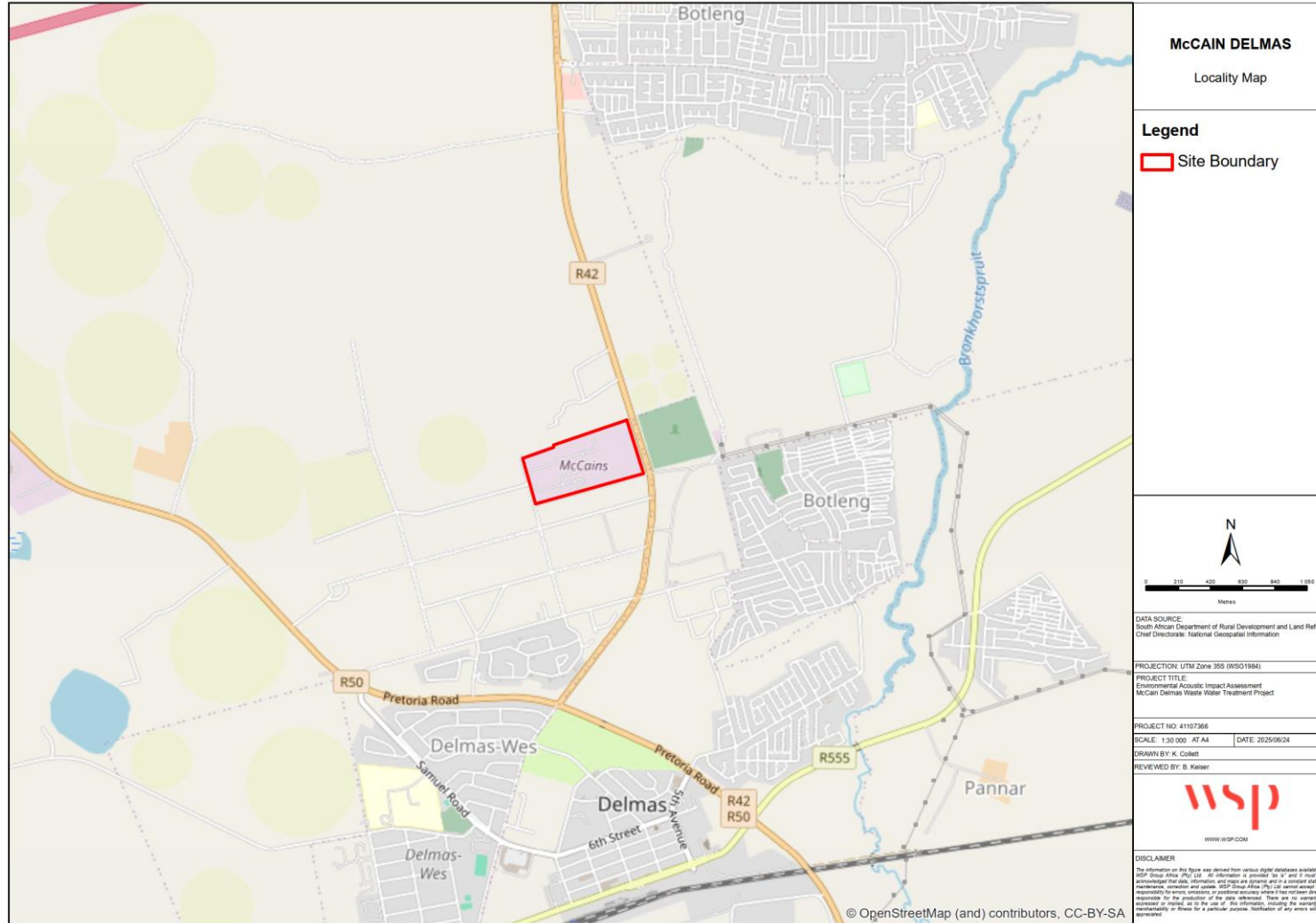


Figure 1: Location of the Project site



Figure 2: Topography surrounding the Project site



2.4. PROJECT DESCRIPTION

2.4.1. CURRENT OPERATIONS

Fresh vegetables, primarily potatoes and sweet potatoes, are transported to the facility by road. Upon arrival, they are stored in ammonia-cooled refrigeration units until required for processing. The preparation involves washing, peeling, and cutting the vegetables to meet specific standards. They are then partially fried using sunflower and palm oils before being rapidly frozen in tunnel freezers. After freezing, the products are packaged and returned to cold storage, awaiting shipment. Final goods are distributed to retailers as needed, following a first-in, first-out inventory system (iSHEcon, 2021).

Wastewater generated at the plant is currently sent to a rotary screening reel and a primary clarifier. Effluent clarified by the primary unit is released into the sewer system. Additionally, an oily water system is in place, consisting of an oily water screen, a separation tank, a dissolved air flotation unit, and a separate oil storage tank. This system is designed to handle oily wastewater generated in the fryer sections of the facility. Fryer caustic sanitation is intended to be bypassed around the oily water system (WSP E&I Canada Limited, 2024).

The Victor Khanye Local Municipality has specified specific discharge compliance targets for the facility. McCain has indicated interest in retaining the flexibility to either release treated effluent directly to the environment or implement additional treatment processes to enable water recycling within the facility (WSP E&I Canada Limited, 2024).

2.4.2. PROPOSED OPERATIONS

2.4.2.1. Proposed Wastewater Treatment Plant

The proposed WWTP is required to treat effluent that is generated from the manufacturing process. The plant will have a maximum daily treatment volume flowrate of 3,457 m³/day and will be located in the north-eastern corner of the site, on McCain-owned property.

The effluent will be treated to meet the quality requirements that would be suitable for direct discharge to the environment, or for plant use (potable water quality). Waste activated sludge from the treatment plant will be temporarily stored in hoppers on site and ultimately disposed offsite.

The plant will include an anaerobic digestion process that will cater for chemical oxygen demand (COD) containing wastes on-site, such as fryer waste, slivers, and other materials that are collected in the main wastewater screen and oily water screen. The anaerobic digester will convert the COD into biogas, which can be used to either generate power or displace natural gas in the processing plant's boilers. Biogas blowers will feed the combined biogas to the H₂S scrubber system for desulfurization. Following the scrubber, the biogas will be discharged either to the factory boilers or to a biogas engine. A biogas flare is provided for combusting excess biogas either in an emergency or when there is more biogas being generated than is required at the end use. The digester feed flow will be approximately 385 m³/day, with a total digestion volume of 9,074 m³ (WSP E&I Canada Limited, 2024).



The current site layout of the McCain plant together with the proposed WWTP infrastructure is presented in **Figure 3**.

2.4.2.2. Proposed Diesel Tank

McCain cumulatively stores approximately 44 m³ of diesel in various tanks on site. McCain proposes to install an additional 79 m³ diesel storage tank where the current 30 m³ diesel tank is located. There is limited space to accommodate both tanks at this location, therefore the existing 30 m³ tank will be moved next to generator 4, replacing the current generator 4 storage tank.

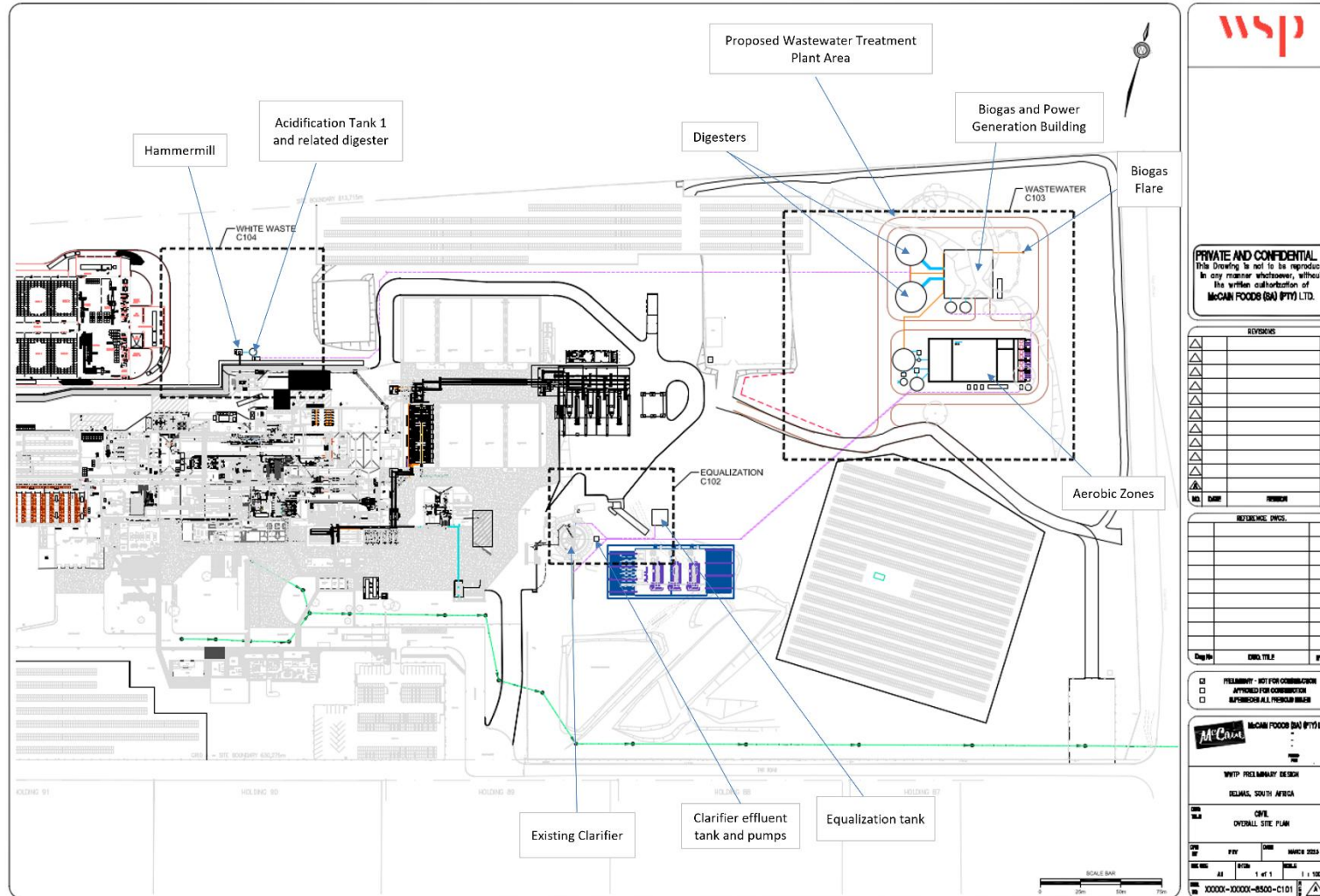


Figure 3: Site layout of the McCain plant with the proposed WWTP infrastructure

3. ACOUSTIC FUNDAMENTALS

3.1. PRINCIPLES

Sound is defined as any pressure variation (in air, water or other medium) that the human ear can detect. Noise is defined as “unwanted sound”. Noise can lead to health impacts and can negatively affect people’s quality of life. Hearing impairment is typically defined as a decrease in the threshold of hearing. Severe hearing deficits may be accompanied by tinnitus (ringing in the ears). Noise-induced hearing impairment occurs predominantly in the higher frequency range of 3,000 to 6,000 Hertz (Hz), with the largest effect at 4,000 Hz. With increasing L_{Aeq} and increasing exposure time, noise-induced hearing impairment occurs even at frequencies as low as 2,000 Hz. However, hearing impairment is not expected to occur at L_{Aeq} levels of 75 dB(A) or below, even for prolonged occupational noise exposure.

Speech intelligibility is adversely affected by noise. Most of the acoustical energy of speech is in the frequency range of 100 to 6,000 Hz, with the most important cue-bearing energy being between 300 and 3,000 Hz. Speech interference is basically a masking process in which simultaneous interfering noise renders speech incapable of being understood. Environmental noise may also mask other acoustical signals that are important for daily life such as doorbells, telephone signals, alarm clocks, music, fire alarms and other warning signals.

Sleep disturbance is a major effect of environmental noise. It may cause primary effects during sleep and secondary effects that can be assessed the day after night-time noise exposure. Uninterrupted sleep is a prerequisite for good physiological and mental functioning and the primary effects of sleep disturbance are: (a) difficulty in falling asleep; and (b) awakenings and alterations of sleep stages or depth. The difference between the sound levels of a noise event and background sound levels, rather than the absolute noise level, may determine the reaction probability.

The annoyance due to a given noise source is subjective from person to person and is also dependent upon many non-acoustic factors such as the prominence of the source, its importance to the listener’s economy (wellbeing), and his or her personal opinion of the source. Increased exposure to noise can have negative effects on individuals, both physiological (influence on communication, productivity and even impaired hearing) and psychological effects (stress, frustration and disturbed sleep). As such, noise impacts need to be understood to mean one or a combination of negative physical, physiological or psychological responses experienced by individuals, whether consciously or unconsciously, caused by exposure to noise.

More technically, noise impacts are defined as the capacity of noise to induce annoyance depending upon its physical characteristics, including the sound pressure level, spectral characteristics and variations of these properties with time. During daytime, individuals may be annoyed at L_{Aeq} levels below 55 dB(A), while very few individuals are moderately

annoyed at L_{Aeq} levels below 50 dB(A). Sound levels during the evening and night should be 5 to 10 dB(A) lower than during the day (World Health Organisation, 1999).

Table 1: Typical noise levels

Sound Pressure Level (dB(A))	Typical Source	Subjective Evaluation
130	threshold of pain	intolerable
120	heavy rock concert	extremely noisy
110	grinding on steel	
100	loud car horn at 3 m	very noisy
90	construction site with pneumatic hammering	
80	kerbside of busy street	loud
70	loud radio or television	
60	department store	moderate to quiet
50	general office	
40	inside private office	quiet to very quiet
30	inside bedroom	
20	unoccupied recording studio	almost silent

3.2. NOISE PROPAGATION

Sound is a pressure wave that diminishes with distance from source. Depending on the nature of the noise source, sound propagates at different rates. The three most common categories of noise are point sources (specified single point of noise generation), line sources (multiple linear noise generating points, such as a road) and area sources (specified single area of noise generation). The most important factors affecting noise propagation are:

- The type of source (point, line or area).
- Obstacles such as barriers and buildings.
- Distance from source.
- Atmospheric absorption.
- Ground absorption.
- Reflections.

Research has shown that doubling the distance from a noise source results in a proportional decline in noise level. Sound propagation in air can be compared to ripples on a pond. The ripples spread out uniformly in all directions, decreasing in amplitude as they move further from the source. An acoustically hard site exists where sound travels away from the source over a generally flat, hard surface such as water, concrete, or hard-packed soil. These are examples of reflective ground, where the ground cover provides little or no attenuation. The standard attenuation rate for hard site conditions is 6 dB(A) per doubling of distance for point sources. Thus, if you are at a position one meter from the source and move one meter further away from the source, the sound pressure level will drop by 6 dB(A), moving to 4 meters, the drop will be a further 6 dB(A), and so on. When ground cover or normal unpacked earth (i.e., a soft site) exists between the source and receptor, the ground

becomes absorptive to sound energy. Absorptive ground results in an additional noise reduction of approximately 1.5 dB(A) per doubling of distance.

This methodology is only applicable when there are no reflecting or screening objects in the sound path. When an obstacle is in the sound path, part of the sound may be reflected, and part absorbed, and the remainder may be transmitted through the object. How much sound is reflected, absorbed and/or transmitted depends on many factors, including the properties of the object. When receptor locations are not in the line of sight of the noise source, there may be up to 20 dB(A) attenuation for broadband noise, with a further 10 to 15 dB(A) attenuation when inside the average residence and the windows are open.

3.3. CHARACTERISTICS OF NOISE

The human ear simultaneously receives sound (normal un-weighted sound or Z-weighting dB(Z)) at many frequencies (octave bands) at different amplitudes. The ear then adjusts its sensitivity based on the amplitude of the sound observed. This focuses the sound and makes it audible by adjusting the amplitude of the low, middle and high frequencies. To measure how a person experiences sound, an electronic weighting adjusted to the Z-weighted sound was developed, including three different weighting curves, namely:

- A-weighting - This measurement is often noted as dB(A) and this weighting curve attempts to make the noise level meter respond closely to the characteristics of a human ear. It adjusts the frequencies at low and high frequencies. Various national and international standards relate to measurements recorded in the A-weighting of sound pressure levels.
- B-weighting - is similar to A-weighting but with less attenuation. The B-weighting is very seldom, if ever, used. The B-weighting follows the C-weighted trend.
- C-weighting - is intended to represent how the ear perceives sound at high decibel levels. C-weighted measurements are reported as dB(C).
- Z-weighting - this refers to linear, un-weighted noise levels.

The weighting is employed by arithmetically adding a table of values (**Table 2**), listed by octave bands, to the measured linear sound pressure levels for each specific octave band. The resulting octave band measurements are logarithmically added to provide a single weighted value describing the sound, based on the applied weighting curve (**Figure 4**). Thus, if the A-weighted curve was applied to the sound, the noise level is noted as dB(A).

Table 2: Frequency weighting table for the different weighting curves

Frequency (Hz)	32 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1k Hz	2k Hz	4k Hz	8k Hz
A-weighting	-39.4	-26.2	-16.1	-8.6	-3.2	0	1.2	1	1.1
B-weighting	-17.1	-9.3	-4.2	-1.3	-0.3	0	-0.1	-0.7	-2.9
C-weighting	-3	-0.8	-0.2	0	0	0	-0.2	-0.8	-3
Z-weighting	0	0	0	0	0	0	0	0	0

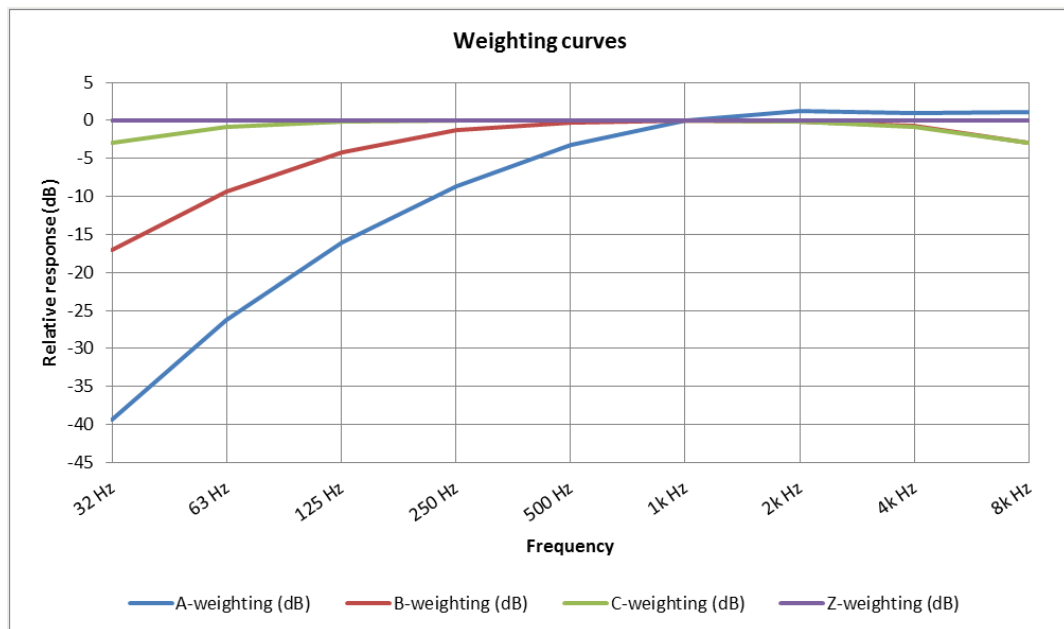


Figure 4: Weighting curves

4. LEGISLATIVE FRAMEWORK

4.1. SOUTH AFRICAN LEGISLATION

4.1.1. SOUTH AFRICAN NOISE CONTROL REGULATIONS

In South Africa, environmental noise control has been in place for three decades, beginning in the 1980s with codes of practice issued by the South African National Standards (formerly the South African Bureau of Standards, SABS) to address noise pollution in various sectors of the country. Under the previous generation of environmental legislation, specifically the Environmental Conservation Act 73 of 1989 (ECA), provisions were made to control noise from a national level in the form of the Noise Control Regulations (GNR 154 of January 1992). In later years, the ECA was replaced by the National Environmental Management Act 107 of 1998 (NEMA) as amended. The National Environmental Management: Air Quality Act 39 of 2004 (NEMAQA) was published in line with NEMA and contains noise control provisions under Section 34:

“(1) The minister may prescribe essential national standards –

(a) for the control of noise, either in general or by specific machinery or activities or in specified places or areas; or

(b) for determining –

(i) a definition of noise; and

(ii) the maximum levels of noise.

(2) When controlling noise, the provincial and local spheres of government are bound by any prescribed national standards.”

Under NEMAQA, the Noise Control Regulations were updated and are to be applied to all provinces in South Africa. The Noise Control Regulations give all the responsibilities of enforcement to the Local Provincial Authority, where location specific by-laws can be created and applied to the locations with approval of Provincial Government. Where province-specific regulations have not been promulgated, acoustic impact assessments must follow the Noise Control Regulations. These regulations define the following:

- **Ambient Sound Level:** 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 meter had been put into operation.
- **Zone Sound Level:** a derived dB(A) value determined indirectly by means of a series of measurements, calculations or table readings and designated by a local authority for an area.
- **Disturbing Noise:** a noise level which exceeds the zone sound level or, if no zone sound level has been designated, a noise level which exceeds the ambient sound level at the same measuring point by 7 dB(A) or more.

With the above definitions in mind, regulation 4 of the Noise Control Regulations stipulate that no person shall make, produce or cause a disturbing noise, or allow it to be made, produced or caused by any person, machine, device or apparatus or any combination thereof.

Furthermore, NEMAQA prescribes that the Minister must publish maximum allowable noise levels for different districts and National noise standards. These have not yet been accomplished and as a result all monitoring and assessments are done in accordance with the SANS 10103:2008 and 10328:2008 as discussed in the sections that follow.

4.1.2. SOUTH AFRICAN NATIONAL STANDARDS (SANS)

The SANS 10328:2008 (*Methods for Environmental Noise Impact Assessments*) presently inform environmental acoustic impact assessments in South Africa. This standard defines that the purpose of an Environmental Acoustic Impact Assessment is to determine and quantify the acoustical impact of, or on, a proposed development. It also stipulates the methods used to assess impacts as well as the minimum requirements to be investigated and included in the Environmental Acoustic Impact Assessment report as part of an Environmental Impact Assessment (EIA) or BA. These minimum requirements include:

- 1) The purpose of the investigation.
- 2) A brief description of the planned development or the changes that are being considered.
- 3) A brief description of the existing environment including, where relevant, the topography, surface conditions and meteorological conditions during measurements.
- 4) The identified noise sources together with their respective sound pressure levels or sound power levels (or both) and, where applicable, the operating cycles, the nature of sound emission, the spectral composition and the directional characteristics.
- 5) The identified noise sources that were not taken into account and the reasons as to why they were not investigated.
- 6) The identified noise-sensitive developments and the noise impact on them.
- 7) Where applicable, any assumptions, with references, made with regard to any calculations or determination of source and propagation characteristics.
- 8) An explanation, either by a brief description or by reference, of all measuring and calculation procedures that were followed, as well as any possible adjustments to existing measuring methods that had to be made, together with the results of calculations.
- 9) An explanation, either by description or by reference, of all measuring or calculation methods (or both) that were used to determine existing and predicted rating levels, as well as other relevant information, including a statement of how the data were obtained and applied to determine the rating level for the area in question.
- 10) The location of measuring or calculating points in a sketch or on a map.

- 11) Quantification of the noise impact with, where relevant, reference to the literature consulted and the assumptions made.
- 12) Alternatives that were considered and the results of those that were investigated.
- 13) A list of all the interested or affected parties that offered any comments with respect to the environmental noise impact investigation.
- 14) 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.
- 15) Conclusions that were reached.
- 16) Proposed recommendations.
- 17) If remedial measures will provide an acceptable solution which would prevent a significant impact, these remedial measures should be outlined in detail and included in the final record of decision if the approval is obtained from the relevant authority. If the remedial measures deteriorate after time and a follow-up auditing or maintenance programme (or both) is instituted, this programme should be included in the final recommendations and accepted in the record of decision if the approval is obtained from the relevant authority.
- 18) Any follow-up investigation which should be conducted at completion of the project as well as at regular intervals after the commissioning of the project so as to ensure that the recommendations of this report will be maintained in the future.

The SANS 10103:2008 document (*The measurement and rating of environmental noise with respect to speech communication*) provides methods and guidelines to assess working and living environments with respect to acoustic comfort as well as respect to possible annoyance by noise. As applicable to this assessment, SANS 10103 provides guideline typical rating levels for noise in different districts. These rating levels are presented in **Table 3**.

Table 3: Typical rating levels for noise in districts (adapted from SANS 10103:2008)

Type of District	Classification	Equivalent Continuous Rating level for Noise ($L_{Req, T}$) (dB(A)) Outdoors	
		Daytime ($L_{Req, d}$)	Night-time ($L_{Req, n}$)
a) Rural	A	45	35
b) Suburban (with little road traffic)	B	50	40
c) Urban	C	55	45
d) Urban (with one or more of the following: workshops, business premises and main roads)	D	60	50
e) Central Business Districts	E	65	55
f) Industrial District	F	70	60

* Guidelines highlighted in red are applicable to this assessment

As stipulated in SANS 10103:2008, noise can pose as an annoyance to a community if the increase in average noise levels exceeds the ambient noise by a certain degree. These specified increases together with the relevant estimated community responses are presented in **Table 4**.

Table 4: Categories of community/group response (adapted from SANS 10103:2008)

Excess ($\Delta L_{Req,T}$) ^a dB(A)	Estimated Community or Group Response	
	Category	Description
0 – 10	Little	Sporadic Complaints
5 – 15	Medium	Widespread Complaints
10 – 20	Strong	Threats of community/group action
>15	Very Strong	Vigorous community/group action

Overlapping ranges for the excess values are given because a spread in the community reaction might be anticipated.

^a $\Delta L_{Req,T}$ should be calculated from the appropriate of the following:

- 1) $L_{Req,T} = L_{Req,T}$ of ambient noise under investigation MINUS $L_{Req,T}$ of the residual noise (determined in the absence of the specific noise under investigation);
- 2) $L_{Req,T} = L_{Req,T}$ of ambient noise under investigation MINUS the maximum rating level of the ambient noise given in Table 1 of the code;
- 3) $L_{Req,T} = L_{Req,T}$ of ambient noise under investigation MINUS the typical rating level for the applicable district as determined from Table 2 of the code; or
- 4) $L_{Req,T} =$ Expected increase in $L_{Req,T}$ of ambient noise in the area because of the proposed development under investigation.

4.1.3. NKANGALA DISTRICT MUNICIPALITY: AIR QUALITY MANAGEMENT BY-LAW

Being located within the Nkangala District Municipality, noise from the McCain facility is governed under Part 3 of the Nkangala District Municipality Air Quality Management By-Law of 2015. The By-Law defines the following:

- **Ambient Sound Level:** 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 meter had been put into operation.
- **Measuring Point:** this relates to a) a piece of land from which an alleged disturbing noise emanates, means a point outside the property projection plane where noise shall be measured in accordance with the provisions of SANS 10103 and/or SANS 10328; b) a building with more than one occupant, means a point in or outside the building where noise shall be measured in accordance with the provisions of SANS 10103 and/or SANS 10328; and c) a stationary vehicle, means a point as described in SANS 10181 where a measuring microphone shall be placed.
- **Disturbing Noise:** a noise level that causes the ambient sound level measured continuously at the same measuring point to rise by 5 dB(A) or more.

With the above definitions in mind, the By-Law stipulates that no person may cause a disturbing noise, or allow it to be caused by any person, animal, machine, device, vehicle or apparatus or any combination thereof.

4.2. INTERNATIONAL GUIDELINES

4.2.1. WORLD HEALTH ORGANISATION GUIDELINES FOR COMMUNITY NOISE

The World Health Organisation (WHO) together with the Organisation for Economic Co-operation and Development (OECD) are the main international bodies that have collected data and developed assessments on the effects of exposure to environmental noise. This has provided the following summary of thresholds for noise nuisance in terms of the outdoor daytime equivalent continuous A-weighted sound pressure level (L_{Aeq}) in residential districts:

- At 55 - 60 dB(A) noise creates annoyance.
- At 60 - 65 dB(A) annoyance increases considerably.
- Above 65 dB(A) constrained behaviour patterns, symptomatic of serious damage caused by noise.

The WHO therefore recommends a maximum outdoor daytime (07:00 – 22:00) L_{Aeq} of 55 dB(A) in residential areas and schools in order to prevent significant interference with normal activities. It further recommends a maximum night-time (22:00 – 07:00) L_{Aeq} of 45 dB(A) outside dwellings. No distinction is made as to whether the noise originates from road traffic, from industry, or any other noise source.

The WHO guideline for industrial noise is set at 70 dB(A) over a period of 24 hours. Anything above this level would cause hearing impairment, however, a peak noise level of 110 dB(A) is allowable on a fast response measurement.

4.2.2. INTERNATIONAL FINANCE CORPORATION GUIDELINES

From the International Finance Corporation (IFC) Environmental, Health and Safety (EHS) Guidelines, the impacts of noise beyond the property boundary of a facility are addressed in section 1.7 (IFC, 2007a). The noise guidelines stipulated by the IFC are grouped into two categories, namely “Residential; institutional; educational” and “Industrial; commercial” (**Table 5**). Such guidelines are in-line with the WHO guidelines as discussed above and are as such applicable to this assessment. Noise impacts should not exceed these levels or result in a maximum increase in background noise levels of 3 dB(A) at the nearest off site receptor location.

Table 5: IFC Environmental Noise Level Guidelines

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

The guideline also states that highly intrusive noise, such as noise from aircraft flyovers and passing trains should not be included when establishing background noise levels.

5. METHODOLOGY

To assess the environmental acoustic impacts of the operation of the proposed Project, both baseline (monitored) and predicted (modelled) noise levels were assessed. Comparisons of the existing and predicted noise levels at various specified sensitive receptors (noise receivers) enabled an assessment of changes in noise levels at these locations as a result of the operation of the proposed Project. Such changes were then assessed against the SANS community or group responses (**Table 4**) in order to assess the anticipated impacts/responses as a result of such increases.

Due to the erratic and transient nature of the construction phase, a quantitative assessment of construction phase acoustic impacts was not undertaken, but rather a qualitative discussion thereof.

5.1. ACOUSTIC MONITORING

Ambient noise level measurements were undertaken from 18 to 20 March 2025 at six off-site sensitive receptor locations (**Table 6** and **Figure 5**). All noise level measurements were free-field measurements (i.e. at least 3.5 m away from any vertical reflecting surfaces).

Measurement procedures were undertaken according to the relevant South African Code of Practice, namely SANS 10103:2008. This guides the selection of monitoring locations, microphone positioning and equipment specifications. Noise level measurements were taken with a SABS-calibrated Type 1 Integrating Sound Level Meter. The sound level meter was calibrated before and after measurements were conducted and no significant drifts (differences greater than 0.5 dB(A)) were found to occur. The make and model as well as serial number and calibration validity of the sound level meter and calibrator are presented in **Table 7**.

Daytime and night-time measurements were conducted for fifteen minutes each, allowing monitoring to be adequately representative. The monitoring was conducted during the relevant timeframe for day (06:00 to 22:00) and night (22:00 to 06:00) in accordance with the SANS methodology. As per the NEMA Noise Protocols for Specialist Assessment (GNR 320 of 2020), night-time monitoring took place over two nights, at two different times on each night during the campaign. The noise parameters recorded included:

- L_{Aeq} The equivalent continuous sound pressure level, normally measured (A-weighted).
- L_{Amax} The maximum sound pressure level of a noise event measured (A-weighted).
- L_{Amin} The minimum sound pressure level of a noise event measured (A-weighted).
- L_{A90} The average noise level a receptor is exposed to for 90% of the monitoring period.

Table 6: Noise monitoring locations

ID	Description	Latitude (°S)	Longitude (°E)	Distance from Site Boundary (m)	Direction from Site Boundary	SANS Classification *
Rec 01	Buhle Farmers' Academy	26.122389	28.679667	235	N	Urban C
Rec 02	Farmstead Resident 01	26.127583	28.675944	78	W	Urban C
Rec 03	Farmstead Resident 02	26.132475	28.678117	450	S	Urban C
Rec 04	Birchwood Ext. 4 Residential	26.135417	28.679194	780	S	Urban C
Rec 05	Delpark Residential 01	26.132194	28.690472	885	SE	Urban C
Rec 06	Delpark Residential 02	26.126306	28.689077	505	E	Urban C

* As per Table 3

Table 7: Sound level meter and calibrator specifications

Sound level meter	Calibrator
Make & model: Casella CEL-633C	Make & model: Casella CEL-120/1
Serial number: 3134723	Serial number: 3939145
Date calibrated: 09 May 2024	Date calibrated: 07 May 2024
Calibration due date: May 2025	Calibration due date: May 2025



Figure 5: Receptor (noise monitoring) locations surrounding the site

5.2. ACOUSTIC INVENTORY

The sources of noise identified during the operational phase of the Project are presented in **Table 8**. These sources and sound power level specifications (HSE, 2005; BSI, 2009; Berger *et al.*, 2016; Brown, 2017; Air Solutions, 2019; Marshall Day Acoustics, 2019; Mivalt, 2024) were used as input into the acoustic model. It is noted that all sources will be operational 24 hours a day and as such, day and night-time model predictions are identical.

5.3. ACOUSTIC MODELLING

Acoustic modelling was used to calculate noise contours indicating the spatial extent of predicted noise levels from the proposed Project within a specified grid area (10 km x 10 km) as well as the noise levels at specific receivers (sensitive receptors). The acoustic modelling software used in this study is the internationally recognised package, CadnaA (Computer Aided Noise Abatement). The CadnaA software provides an integrated environment for noise predictions under varying scenarios and calculates the cumulative effects of various sources. The model uses ground elevations in the calculation of the noise levels in a grid and uses standard meteorological parameters that have an effect on the propagation of noise. CadnaA has been utilised in many countries across the globe for the modelling of environmental noise and town planning. It is comprehensive software for three-dimensional calculations, presentation, assessment and prediction of environmental noise emitted from industrial plants, parking lots, roads, railway schemes or entire towns and urbanized areas.

5.4. SENSITIVE RECEPTORS

Sensitive receptors are identified as areas that may be impacted negatively due to noise associated with the proposed Project. Examples of receptors include, but are not limited to, schools, shopping centres, hospitals, office blocks and residential areas. The specific sensitive receptors considered in this study are the same as those locations selected in the monitoring campaign, as presented in **Table 6** and **Figure 5**.

Table 8: Project noise sources and sound power levels

Location	Source	Quantity	Height (m)	Source Type	Sound Power Level (dB(A))	Sound Pressure Level at 1m (dB(A))	Mitigation*
Wastewater Treatment Plant	Primary Clarifier Feed Pumps (P-0301A/B)	2	1	Point	96.0	88.0	Weather cover
	Hammermill (HM-0301)	1	2	Point	102.6	94.6	Insulated building for acoustics
	Clarifier Effluent Transfer Pumps (P-0401A/B)	2	1	Point	96.0	88.0	Weather cover
	Open Hopper White Waste Transfer Pump (P-0302)	1	1	Point	96.0	88.0	Indoor – Hammer mill area
	Recirculation Pump (P-1002A/B)	1	1	Point	96.0	88.0	Weather cover
	White Waste Transfer Pump (P-1001A/B)	2	1	Point	96.0	88.0	Weather cover
	Jet Mix Pump (P-1102 & 1202)	2	1	Point	96.0	88.0	Weather cover
	Membrane Air Blower (B-1101&1201)	1	1	Point	107.5	99.5	Acoustic enclosure
	Dilution Water Pump (P-0503)	1	1	Point	96.0	88.0	Indoor – Hammer mill area
	Digestate Transfer Pumps (P-1101A/B & 1201A/B)	4	1	Point	96.0	88.0	Weather cover
	Centrifuge Feed Pump(P-1301A/B/C/D)	4	1	Point	96.0	88.0	Weather cover
	Centrifuge (CNT-1301)	1	1	Point	110.0	102.0	Insulated building
	WAS Pump (P-0803A/B/C)	1	1	Point	96.0	88.0	Weather cover
	Bypass Pump (P-0502A/B)	1	1	Point	96.0	88.0	Weather cover
	UASB Feed Pump (P- 0501A/B)	1	1	Point	96.0	88.0	Weather cover
	Recycle Pump (P-0504A/B)	2	1	Point	96.0	88.0	Weather cover
	Sludge Decant Pump (P-0505A/B)	2	1	Point	96.0	88.0	Weather cover
	Biogas Flare	1	10	Point	93.0	85.0	None
	Biogas Blower (B-1401A/B)	2	1	Point	107.5	99.5	Acoustic enclosure
	Condensate Pump (P-1401A/B)	1	1	Point	96.0	88.0	Weather cover
	Mixed Liquor Recycle Pump (P-0601A/B)	2	These are submersible pumps, with noise levels being dampened and therefore considered negligible, and excluded from this assessment				
	Aeration Blower (B-0701A/B/C)	3	1	Point	107.5	99.5	Weather cover
	MBR Blower (B-0801A/B/C)	1	1	Point	107.5	99.5	Weather cover
	MBR Permeate / Backpulse Pump (P-0801A/B/C)	1	1	Point	96.0	88.0	Weather cover
	RAS Pump (P-0802 ^a /B/C)	1	1	Point	96.0	88.0	Weather cover
	Final Effluent Pump (P-0901A/B)	2	1	Point	96.0	88.0	Weather cover
	Trucks – chemical delivery	3 per month	1.5	Moving Point	110.0	102.0	None
	Trucks – removing dewatered solids	2 per day	1.5	Moving Point	110.0	102.0	None
	Biogas Engine	1	4	Point	85.0	77.0	None
Existing McCain Delmas Plant	New Liquitainer Diesel Containerised Tank Pump (Pedrollo CK80)	2	1	Point	96.0	88.0	None

*Note: As a worst-case assessment, all sources were run as unenclosed in the model, due to uncertainties with building and enclosure types to be used.

6. ASSUMPTIONS AND LIMITATIONS

In this Environmental Acoustic Impact Assessment, various assumptions were made and limitations experienced that may impact on the results obtained. These include:

- The information provided regarding the proposed operational activities is assumed to be representative of what will occur in reality.
- Due to the erratic nature of the construction phase, a quantitative assessment of construction phase acoustic impacts was not undertaken, but rather a qualitative discussion thereof.
- The acoustic model considered surrounding terrain, however, buildings were not included. Such an approach represents a worst-case scenario with all sound propagating away from the source and not reflecting off/attenuating through surrounding structures.
- The height of the biogas flare was assumed to be 10 m.
- As a worst-case scenario, it was assumed that the biogas will be discharged to a new biogas engine.
- It is assumed that the biogas engine will be located alongside the biogas and power generation building of the WWTP.
- Specifications of all listed equipment is unknown, so sound power level data for generic sources was utilised.
- As a worst-case assessment all sources were run as unenclosed in the model, due to uncertainties with building and enclosure types to be used.

7. RESULTS

7.1. CURRENT NOISE CLIMATE

It is important to note that wind speed and direction play a vital role in determining baseline noise levels. Noise monitoring is usually discouraged when wind speeds exceed 5 m/s (>18 km/h) as wind noise distorts the baseline noise levels by masking other noise sources. However, no wind speeds exceeding 5 m/s were recorded during the monitoring period.

7.1.1. DAYTIME

The results from the daytime noise monitoring campaign conducted on 18 March 2025 are presented in **Table 9** and **Figure 6**. Conditions during the campaign were warm and partly cloudy with intermittent light winds (up to 2.0 m/s). Noise levels at all receptor locations were compared to the typical daytime rating level for noise in urban (Class C) areas (55 dB(A)).

Noise levels (L_{Aeq}) at one (Rec 05) of the six monitoring locations exceeded the guideline rating level. Noise levels at all other locations were below the guideline rating level. The main sources of noise identified at each location included:

- Rec 01 (Buhle Farmers' Academy): Traffic on the R42, people talking, birds, insects and a constant hum from the McCain facility.
- Rec 02 (Farmstead Resident 01): Traffic on nearby roads, activities at McCain (including a reverse alarm) and birds.
- Rec 03 (Farmstead Resident 02): Traffic on the R42, activities (grinding, humming and loading) at the neighbouring B&T Steel facility, birds and insects. Noise from McCain was faintly audible.
- Rec 04 (Birchwood Ext. 4 Residential): Traffic on nearby roads, activities at the neighbouring B&T Steel facility, insects and birds. McCain was not audible at this location.
- Rec 05 (Delpark Residential 01): Traffic on nearby community roads, music, an offsite grinder, birds and insects. McCain was not audible at this location.
- Rec 06 (Delpark Residential 02): Traffic on the R42 and other nearby gravel roads, people talking, music, birds, insects and a constant hum from the McCain facility.

From the daytime monitoring campaign, it is evident that the current noise climate surrounding the McCain site is predominantly traffic-related, with influences from industrial activities at the site itself as well as neighbouring industries. Natural sources like birds and insects are also evident.

Table 9: Daytime noise monitoring results

ID	Time	L _{Amax} (dB(A))	L _{Amin} (dB(A))	L _{Aeq} (dB(A))	L _{A90} (dB(A))	SANS Guideline (dB(A))	Compliant
Rec 01	15:20	72.6	39.1	48.5	43.0	55	Yes
Rec 02	17:11	74.8	47.5	51.7	49.0	55	Yes
Rec 03	16:44	64.5	39.6	47.4	44.0	55	Yes
Rec 04	16:25	71.6	44.7	54.0	47.0	55	Yes
Rec 05	16:04	81.7	45.3	58.7	49.5	55	No
Rec 06	15:43	66.6	41.2	50.0	45.0	55	Yes

Note: Exceedances of the SANS guideline are highlighted in red

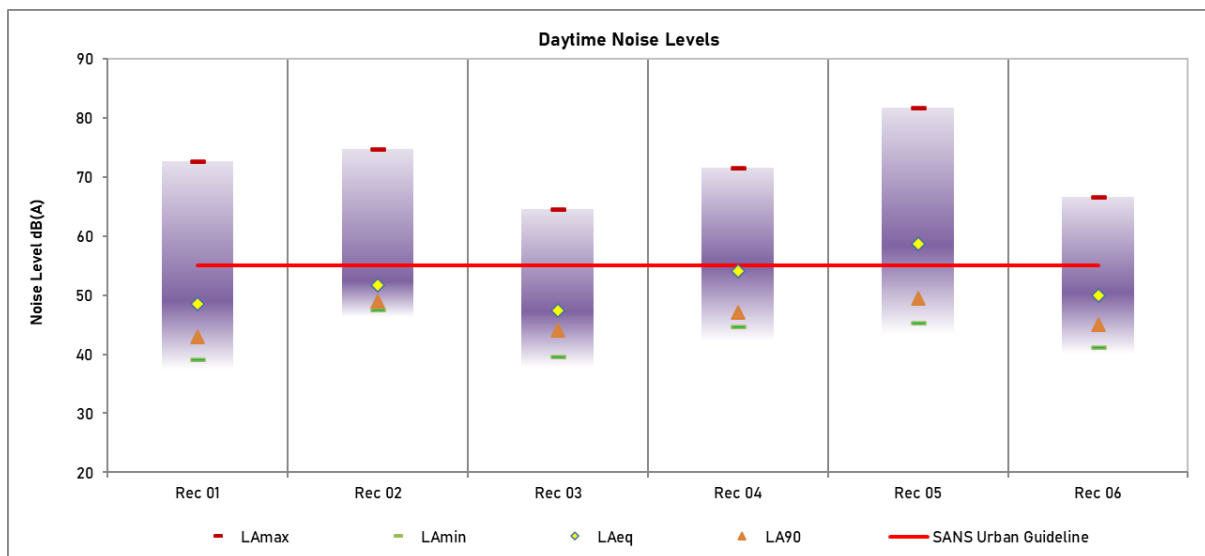


Figure 6: Daytime monitored noise levels. L_{Aeq} (yellow diamond) is compared with the SANS guideline.

7.1.2. NIGHT-TIME

The results from the night-time noise monitoring campaign conducted from 18 to 20 March 2025 are presented in **Table 10** and **Figure 7**. Conditions during the campaign were cool and partly cloudy, with intermittent light winds (up to 2.2 m/s) on the first night and cool and clear with generally calm conditions on the second night. Noise levels at all receptor locations were compared to the typical night-time rating level for noise in urban (Class C) areas (45 dB(A)).

Average L_{Aeq} noise levels at all six monitoring locations exceeded the guideline level. The main sources of noise identified at each location include:

- Rec 01 (Buhle Farmers' Academy): Traffic on the R42, birds, dogs and insects. A constant humming noise from the McCain facility was noticeable at this location.
- Rec 02 (Farmstead Resident 01): McCain activities in the form of a constant hum, intermittent traffic on the R42, insects and birds.
- Rec 03 (Farmstead Resident 02): Traffic on the R42, activities at the neighbouring B&T Steel facility, dogs and insects. McCain was audible as a faint hum at this location.
- Rec 04 (Birchwood Ext. 4 Residential): Traffic on nearby roads, activities at the neighbouring B&T Steel facility, insects, birds and dogs. Noise from McCain was faintly audible.
- Rec 05 (Delpark Residential 01): Traffic on distant and nearby community roads, music, dogs and insects. McCain was faintly audible at this location.
- Rec 06 (Delpark Residential 02): Traffic on the R42 and other nearby gravel roads, people talking, insects, dogs and a constant hum from the McCain facility.

From the night-time monitoring campaign, it is evident that the current noise climate surrounding the site is predominantly traffic-related, with natural sources (insects, birds and dogs) also dominant. Industrial activities (from both McCain and surrounding industries) also contribute to the night-time noise climate.

Table 10: Night-time noise monitoring results

ID	Time	L _{Amax} (dB(A))	L _{Amin} (dB(A))	L _{Aeq} (dB(A))	L _{AF90} (dB(A))	SANS Guideline (dB(A))	Compliant
18 March 2025 (late night)							
Rec 01	22:00	82.4	33.7	61.1	36.5	45	No
Rec 02	00:17	57.2	48.2	51.3	49.5	45	No
Rec 03	23:56	63.3	41.5	47.5	44.5	45	No
Rec 04	23:38	63.0	37.6	44.7	40.0	45	Yes
Rec 05	23:17	73.0	35.9	56.0	40.0	45	No
Rec 06	22:55	60.9	37.9	46.7	42.0	45	No
19 March 2025 (early morning)							
Rec 01	00:41	84.2	33.5	60.7	35.5	45	No
Rec 02	02:22	63.8	45.6	49.1	47.5	45	No
Rec 03	02:03	86.0	43.1	71.7	46.0	45	No
Rec 04	01:45	71.5	35.3	42.0	38.0	45	Yes
Rec 05	01:20	56.0	41.4	47.5	45.0	45	No
Rec 06	01:00	56.9	42.9	53.2	47.0	45	No
19 March 2025 (late night)							
Rec 01	23:52	85.9	35.6	60.2	37.5	45	No
Rec 02	22:08	57.0	45.6	50.2	47.5	45	No
Rec 03	22:29	59.9	42.2	47.8	44.5	45	No
Rec 04	22:47	74.0	39.1	49.2	41.0	45	No
Rec 05	23:12	68.5	38.0	46.8	42.0	45	No
Rec 06	23:33	53.9	40.3	44.2	42.5	45	Yes
20 March 2025 (early morning)							
Rec 01	01:57	74.1	33.7	47.6	35.5	45	No
Rec 02	00:13	59.7	46.2	49.2	48.0	45	No
Rec 03	00:34	59.2	37.4	42.1	40.0	45	Yes
Rec 04	00:52	66.4	31.9	45.7	34.0	45	No
Rec 05	01:12	58.6	31.8	40.6	35.5	45	Yes
Rec 06	01:33	63.1	38.6	43.3	41.5	45	Yes
Logarithmic Averages							
Rec 01		83.3	34.2	59.5	36.3	45	No
Rec 02		60.4	46.5	50.0	48.2	45	No
Rec 03		80.0	41.5	65.7	44.2	45	No
Rec 04		70.6	36.7	46.2	39.0	45	No
Rec 05		68.5	38.0	51.1	41.8	45	No
Rec 06		60.0	40.4	48.8	43.9	45	No

Note: Exceedances of the SANS guideline are highlighted in red

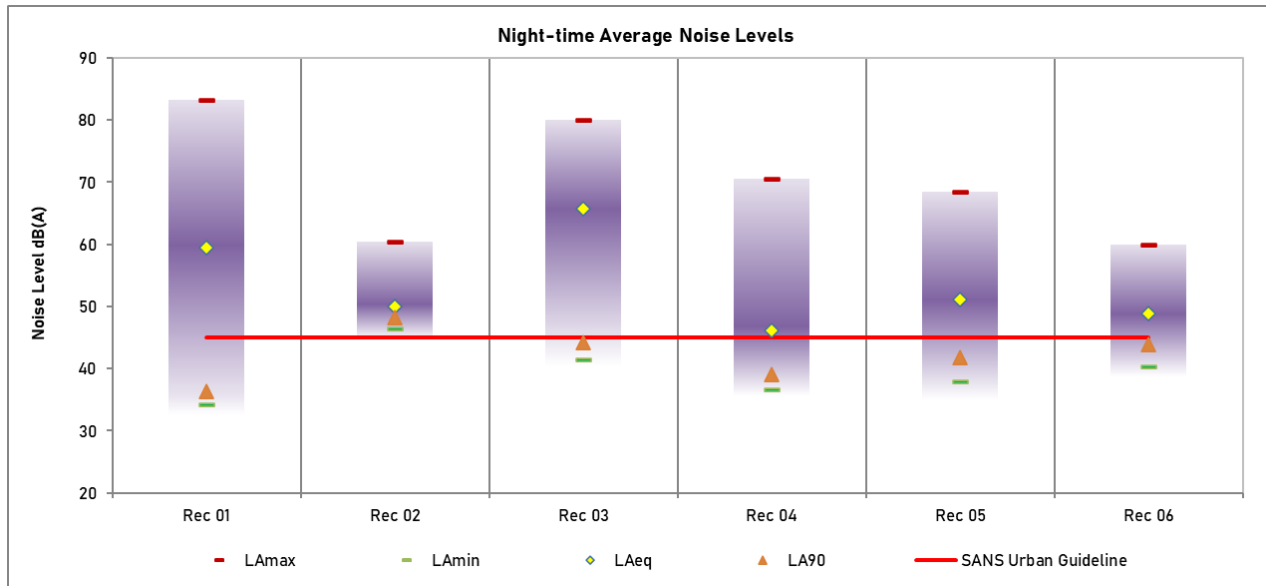


Figure 7: Night-time average (logarithmic) monitored noise levels. LAeq (yellow diamond) is compared with the SANS guideline.

7.2. PREDICTED NOISE CLIMATE AND RECOMMENDED MITIGATION MEASURES

7.2.1. CONSTRUCTION PHASE

Unlike general industry, construction activities are not always stationary or in one location. Construction activities at the site will include civil works (including surveying), reinforced concrete works, masonry works, façade works, floor works, carpentry works as well as mechanical and electrical installation works. Due to the erratic and transient nature of such construction activities as well as the fact that detailed construction phase plans have not yet been developed for the proposed Project, noise impacts from the construction phase of the facility could not be quantified.

During the construction phase of the Project various noise sources may be present on site, including earth-moving equipment (trucks, cranes, scrapers and loaders), compressors and generators, pumps, rotary drills, concrete mixers and materials handling activities, among others. All these sources will generate substantial amounts of noise and may impact on neighbouring sensitive receptors, although over the short term. As such, mitigation interventions are advised during the construction phase. These mitigation recommendations are detailed in the section that follows.

7.2.1.1. Mitigation Recommendations

Construction activities can pose different noise control problems compared with most other types of industrial activity as (BSI, 2009):

- They are mainly carried out in the open.
- They are of temporary duration but can cause great disturbance while they are occurring.

- The noise emanates from many different activities, and its intensity and character can vary greatly at different phases of the work.
- The sites cannot be excluded by planning control, as industry can, from areas that are sensitive to noise.

Much of the noise from construction sites is generated by plants and machinery. The noise levels generated are unacceptable in many instances and reductions are necessary for the benefit of both the industry and the public (BSI, 2009).

To minimise the acoustic impacts from the construction phase of the proposed Project, various mitigation techniques can be employed. These include both management and technical options (IFC, 2007a; IFC, 2007b; BSI 2009; ISHN, 2011), as detailed here:

- Planning construction activities in consultation with local communities so that activities with the greatest potential to generate noise are planned during periods of the day that will result in least disturbance. Information regarding construction activities should be provided to all local communities. Such information includes:
 - Proposed working times.
 - Anticipated duration of activities.
 - Explanations on activities to take place and reasons for activities.
 - Contact details of a responsible person on site should complaints arise.
- When working near a potential sensitive receptor, limit the number of simultaneous activities to a minimum as far as possible.
- Selecting equipment with the lowest possible sound power levels.
- Ensuring equipment is well-maintained to avoid additional noise generation.
- Avoiding unnecessary revving of engines and switching equipment off when not required.
- Using rubber linings in, for example, chutes and dumpers to reduce impact noise.
- Using noise control devices, such as temporary noise barriers and deflectors for high impact activities, and exhaust muffling devices for combustion engines.
- Minimising drop height of materials or lowering materials whenever practical instead of dropping.
- Starting up plant and vehicles sequentially rather than simultaneously.
- Installing acoustic enclosures for equipment causing radiating noise, where practical.
- Reducing any Project traffic through community areas where possible.
- Developing a mechanism to record and respond to complaints.
- Ensuring all on-site personnel are equipped with the correct personal protective equipment (PPE) including noise control hearing devices.

7.2.2. OPERATIONAL PHASE

The predicted daytime and night-time noise levels at the specified receptor locations associated with the operation of the proposed Project are presented in **Table 11** and **Table 12**, respectively. The predicted noise levels were compared with the current baseline noise levels (monitored) to assess any changes (cumulative impact) and the resultant impacts on the surrounding receptors.



Daytime noise levels at all receptor locations are predicted to increase by between 0.0 and 0.7 dB(A) with the operation of the proposed Project, resulting in “little” community/group response. Night-time noise levels at all the receptor locations are predicted to increase by between 0.0 and 0.3 dB(A), also resulting in “little” community/group response. It is noted that such increases at these locations (during both day and night) are well below the 5 dB(A) threshold for annoyance as per the Nkangala District Municipality Air Quality Management By-Law and as such, these increases are likely to go unnoticed.

Based on both the day and night-time results presented here, acoustic impacts of the operation of the proposed Project are negligible and noise-related complaints from receptors are not anticipated.

Table 11: Predicted daytime noise levels at specified receptor locations during the operational phase proposed Project

Receptor	Current Noise Level (dB(A))	Predicted Noise Level (dB(A))	Cumulative Noise Level (dB(A))*	Change (dB(A))	Estimated Community Response**
Rec 01	48.5	41.2	49.2	+0.7	Little
Rec 02	51.7	38.3	51.9	+0.2	Little
Rec 03	47.4	32.4	47.5	+0.1	Little
Rec 04	54.0	29.1	54.0	0.0	Little
Rec 05	58.7	29.2	58.7	0.0	Little
Rec 06	50.0	34.8	50.1	+0.1	Little

* It is noted that noise levels are logarithmically added due to their logarithmic nature

**As per SANS 10103:2008 (see Table 4)

Table 12: Predicted night-time noise levels at specified receptor locations during the operational phase of the proposed Project

Receptor	Current Noise Level (dB(A))	Predicted Noise Level (dB(A))	Cumulative Noise Level (dB(A))*	Change (dB(A))	Estimated Community Response**
Rec 01	59.5	41.2	59.6	+0.1	Little
Rec 02	50.0	38.3	50.3	+0.3	Little
Rec 03	65.7	32.4	65.7	0.0	Little
Rec 04	46.2	29.1	46.3	+0.1	Little
Rec 05	51.1	29.2	51.1	0.0	Little
Rec 06	48.8	34.8	49.0	+0.2	Little

* It is noted that noise levels are logarithmically added due to their logarithmic nature

**As per SANS 10103:2008 (see Table 4)

A visual output of the modelled results is presented in **Figure 8**. It must be noted that the visual output is associated with the proposed Project alone and is not cumulative (i.e. taking the existing background noise levels into account). Only one output plot is presented, representing day and night-time noise levels, as it is understood that the facility will be operational for 24 hours a day. Therefore, day and night-time predictions will be identical.

Highest noise levels are predicted around the WWTP and Hammermill area, as these areas contain the noisiest sources. It is understood that in reality, some of these sources may be contained within acoustic enclosures, however, these model results represent a worst-case scenario, without sources being contained/enclosed. Noise levels decrease as distance from the sources increase, with levels dropping below the industrial guideline level (70 dB(A) (day) and 60 dB(A) (night)) onsite. Noise levels at all receptor locations are below the respective urban guideline levels (55 dB(A) (day) and 45 dB(A) (night)).

7.2.2.1. Mitigation Recommendations

Although the acoustic impact of the Project on surrounding sensitive receptors is low, the following recommendations are provided should McCain ever find the need to manage/mitigate noise onsite (IFC, 2007a):

- Ensuring equipment is well-maintained to avoid excessive noise generation.
- When replacing equipment, ensure that equipment with the lowest sound power level specifications is selected, where possible.
- Installing suitable mufflers on engine exhausts.
- Installing acoustic enclosures for equipment causing radiating noise, where possible.
- Equipment must be suitably sized for the proposed task.
- Developing a mechanism to record and respond to complaints.
- Should any complaints arise, annual fenceline noise monitoring campaigns should be established to determine the source of such noise, which will allow for the implementation of correct mitigation strategies.
- It is noted that the noise climate on site is industrial in nature, with elevated noise levels expected. As such, onsite personnel must ensure compliance with the use of the correct PPE.

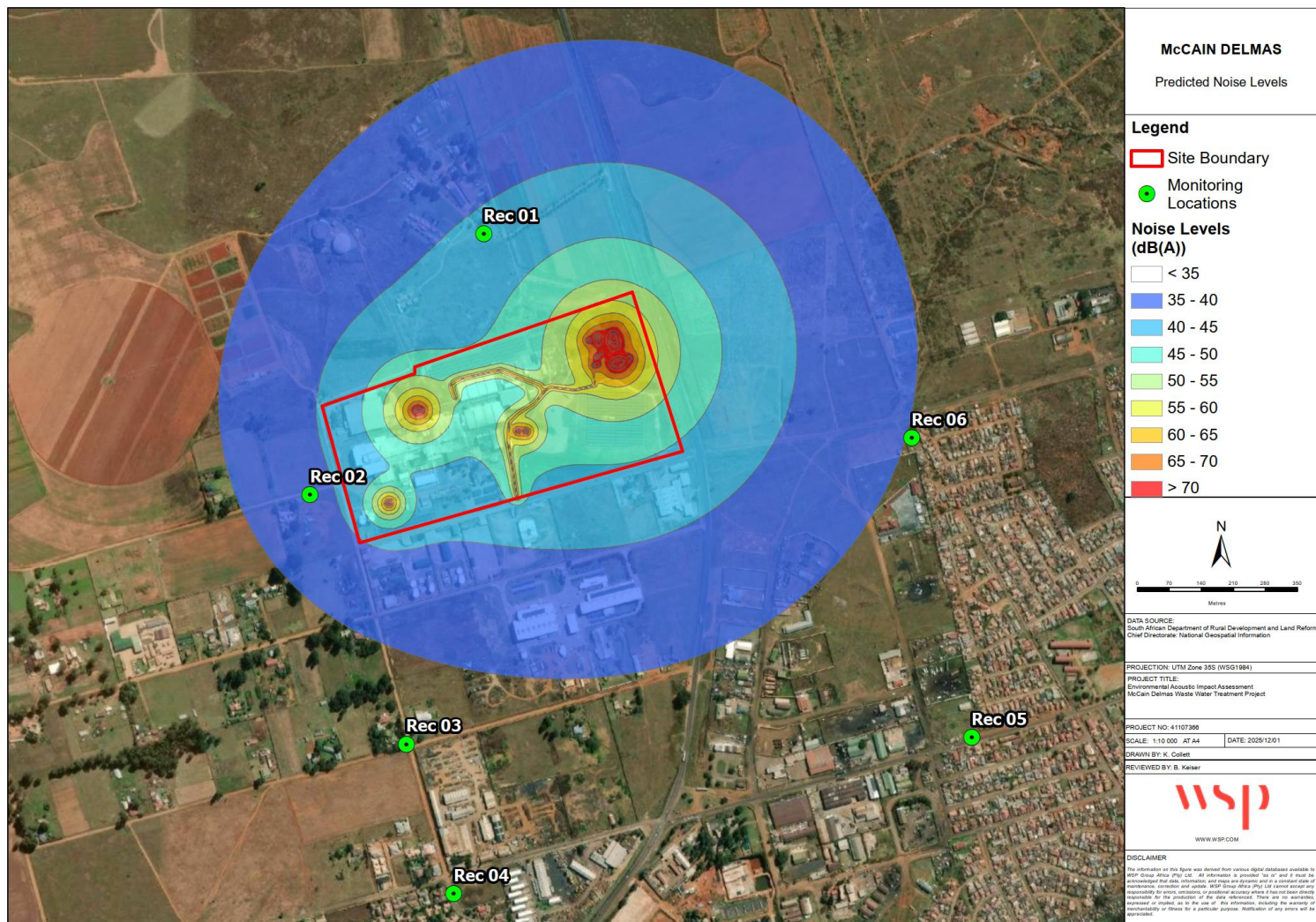


Figure 8: Predicted noise levels during the operational phase of the Project

8. ASSESSMENT OF IMPACTS

The purpose of this Environmental Acoustic Impact Assessment is to identify the potential impacts and associated risks posed by the operation of the proposed Project on the noise climate of the area. The outcomes of the impact assessment will provide a basis to identify the key risk drivers and make informed decisions on the way forward in order to ensure that these risks do not result in unacceptable social or environmental risk.

All impacts of the operation of the proposed Project were evaluated using a risk matrix, which is a semi-quantitative risk assessment methodology. This system derives an environmental impact level on the basis of the magnitude, duration, scale/extent, reversibility and probability of occurrence. The overall risk level is determined using professional judgement based on a clear understanding of the nature of the impact, potential mitigatory measures that can be implemented and changes in risk profile as a result of implementation of these mitigatory measures. A full description of the risk rating methodology is presented in **Appendix B**. Key localised acoustic impacts associated with the Project include:

- Construction phase impacts of noise on sensitive receptors.
- Operational phase impacts of noise on sensitive receptors.

Outcomes of the Environmental Acoustic Impact Assessment are contained within **Table 13** outlining the impact of each parameter and the resulting risk level.

Table 13: Impact assessment of risks associated with the operation of the Project

Aspect	Description	Stage	Character	Ease of Mitigation	Magnitude	Extent	Reversibility	Duration	Probability	Significance without Mitigation	Magnitude	Extent	Reversibility	Duration	Probability	Significance with Mitigation
Environmental Noise	Noise impact on surrounding sensitive receptors	Construction Phase	Negative	Moderate	2	3	1	1	3	21 (Low)	1	2	1	1	2	10 (Very Low)
Environmental Noise	Noise impact on surrounding sensitive receptors	Operational Phase	Negative	Moderate	2	3	1	4	3	30 (Low)	2	2	1	4	2	18 (Low)

9. PROJECT ALTERNATIVES

The EIA Regulations, 2014 (GNR 326) (as amended) require that the BA process must identify and describe alternatives to the proposed activity that were considered, or a motivation provided for not considering alternatives. Different types or categories of alternatives could be considered, including different site locations, technology types, and project layouts. It is not always possible to provide alternatives to various categories, as project designs and locations may already be located strategically or may be too costly for the Project to proceed.

9.1. SITE ALTERNATIVES

The proposed Project will be located within the current footprint of the McCain Delmas Plant facility. No site alternatives for the WWTP or the diesel storage expansion can be provided or considered, due to the following reasons:

- McCain Delmas is an existing facility.
- Limited available land provides no alternative for the location of the WWTP on the McCain Delmas property, and this infrastructure needs to be constructed within proximity to the existing McCain facility.
- Existing facility infrastructure will tie into the proposed expansion infrastructure, allowing for easy integration.

9.2. TECHNOLOGY ALTERNATIVES

Several technology alternatives for the WWTP were considered, as relevant to the various phases of the treatment process. The alternatives are presented in Table 14, including the key advantages and disadvantages as well as the motivation for selecting the preferred alternative.

The alternatives considered are:

- 1) Primary Treatment: Two technology options have been identified as either Covered Anaerobic Lagoons or UASB Reactors.
- 2) Phosphorous Removal: Two technology options for removal include use of iron/aluminium or use of specialised bacteria (biological).
- 3) Activated Sludge Process: Two technology options have been considered for the control of the mass of biomass in the treatment systems, namely gravity settling in a secondary clarifier and applying a Membrane Bioreactor.
- 4) Biogas Handling: Two options have been considered for the use of the biogas generated at the plant, namely, to generate power (in a gas engine at the WWTP) or displace coal in the McCain facility's existing boilers.

Table 14: WWTP technology alternatives

WWTP Component	Alternative Technologies	Advantage	Disadvantage	Preferred Option
1) Primary Anaerobic Treatment Alternatives	Covered Anaerobic Lagoons	<ul style="list-style-type: none"> Produces renewable energy (biogas). Reduces odour and greenhouse gas emissions. Lower operating cost compared to mechanical systems. Suitable for large volumes of high-strength wastewater. 	<ul style="list-style-type: none"> Requires large land area. Not suitable for low-strength or highly diluted wastewater. May need post-treatment for nutrient removal or pathogen control. Temperature-sensitive (microbial activity slows in cold climates unless heated). 	Either option is acceptable from a noise perspective.
	Upflow Anaerobic Sludge Blanket Reactors	<ul style="list-style-type: none"> Compact design – requires much less space than lagoons. Energy-efficient – no need for aeration. Produces biogas – can be captured and used. Low sludge production. Can handle high organic loads. 	<ul style="list-style-type: none"> Sensitive to temperature (less effective in cold climates). Needs skilled monitoring and maintenance. Start-up period can be slow (several weeks/months to develop good sludge granules). Does not remove nutrients or pathogens and often needs post-treatment. 	Either option is acceptable from a noise perspective.

WWTP Component	Alternative Technologies	Advantage	Disadvantage	Preferred Option
2) Phosphorus Removal	Iron or Aluminium	<ul style="list-style-type: none"> Aluminium is advantageous in low-alkalinity water because it raises alkalinity and requires lower dosages, producing less chemical sludge. Iron is cost effective and readily available. 	<ul style="list-style-type: none"> Sludge production that requires dewatering. Need for careful chemical dosing. 	Either option is acceptable from a noise perspective.
	Biological	<ul style="list-style-type: none"> Reduced chemical costs. Lower sludge production. 	<ul style="list-style-type: none"> Uses specialised bacteria. Risk of poor performance. 	Either option is acceptable from a noise perspective.
3) Activated Sludge Process	Gravity settling in a secondary clarifier	<ul style="list-style-type: none"> Lower initial capital costs. Lower energy consumption. 	<ul style="list-style-type: none"> Requires larger development footprint. Effluent quality may not meet environmental discharge or plant requirements and therefore may require additional treatment. Operates at lower mixed liquor suspended solids concentration. Performance can be impacted by variable flow rates or poor sludge settling characteristics. Produces great quantity of excess sludge. 	Preferred option: Requires less infrastructure and equipment, resulting in lower noise levels.

WWTP Component	Alternative Technologies	Advantage	Disadvantage	Preferred Option
	Membrane bioreactor system	<ul style="list-style-type: none"> Provides a positive barrier to solids, eliminating the possibility of upset conditions due to variable flow or changes in bacteria growth in the activated sludge system. Allows for a significantly higher influent mixed liquor suspended solids concentration, reducing the required size of the activated sludge system. Effluent quality would allow for environmental discharge or direct feed into a water recycle system with no modifications. 	<ul style="list-style-type: none"> More operationally complex and requires additional infrastructure, such as backpulse pumps and air scour blowers. Relies on vendor-supplied membranes, which will need to be periodically maintained and replaced. Cannot operate in low- or no-power conditions; untreated effluent from the activated sludge system would discharge by gravity to a containment tank. 	-
4) Biogas Handling	Power generation	<ul style="list-style-type: none"> Reduced electricity consumption for the plant. 	<ul style="list-style-type: none"> Gas engine will generate noise. Higher operational costs. 	-
	Replacement fuel for on-site boilers	<ul style="list-style-type: none"> Limited additional infrastructure required. Reduced dependence on coal. Replacement of coal as a fuel source for the boilers will reduce greenhouse gas emissions and air pollution. Lower operational costs. 	<ul style="list-style-type: none"> May lead to corrosion of boilers, if H₂S scrubber system for desulfurization is not optimally operating 	Preferred option: Boilers are a current noise source on site, so are already part of the noise climate. Gas engines will produce additional noise.

9.2.1. NO-GO ALTERNATIVE

The “do-nothing” alternative will be the status quo. The Project activities, i.e. the expansion of the fuel storage tank and the WWTP will not occur, should the No-Go alternative be implemented, and no potential negative or positive impacts from such proposed activities will arise. The fuel storage expansion is an operational requirement to allow for sustainable business continuation and will negatively impact the McCain Delmas operation if it does not proceed.

As per the Need and Desirability, benefit will arise from the WWTP as aligned with and contributing to McCain’s Sustainability Pillars of resource efficient operations. This includes treatment of wastewater to a standard suitable for plant use or discharge, and generation of biogas (a renewable energy source to be used within the McCain Delmas plant operation) through conversion of high COD waste material.

From a noise perspective, should the proposed Project not go ahead, the status quo will remain the same.

10. CONCLUSIONS

This Environmental Acoustic Impact Assessment investigated noise associated with the operation of the proposed WWTP and additional diesel storage at the McCain Delmas facility. To assess the existing noise climate in the area surrounding the proposed Project, ambient noise monitoring was conducted at six of the closest off-site sensitive receptor locations surrounding the McCain facility. An acoustic inventory was developed to identify all potential sources of noise associated with the proposed Project. The acoustic impacts of the operation of the proposed Project were then assessed using the CadnaA acoustic model. Due to the erratic and transient nature of the construction phase, as well as the fact that construction noise will be masked by the existing operations, a quantitative assessment of construction phase acoustic impacts was not undertaken, but rather a qualitative discussion thereof.

Baseline monitoring indicated that current daytime noise levels were below the South African National Standards (SANS) urban daytime guideline rating level at all receptor monitoring locations, except for Rec 05 (Delpark Residential 01). At night, average noise levels at all monitoring locations exceeded the respective guideline rating level. From the daytime and night-time monitoring campaigns, it is evident that the current noise climate surrounding the Project site is predominantly traffic-related, with influences from industrial activities at the McCain site as well as neighbouring industries. Natural sources like birds and insects were also evident.

For the acoustic modelling, one scenario was considered, namely the operational phase of the Project. Comparisons of the existing (monitored) and proposed (modelled) noise levels at each specified receptor enabled an assessment of changes in noise levels at these locations as a result of the operation of the proposed Project.

Daytime noise levels at all receptor locations are predicted to increase by between 0.0 and 0.7 dB(A) with the operation of the Project, resulting in “little” community/group response. Night-time noise levels at all the receptor locations are predicted to increase by between 0.0 and 0.3 dB(A), also resulting in “little” community/group response. It is noted that such increases at these locations (during both day and night) are well below the 5 dB(A) threshold for annoyance as per the Nkangala District Municipality Air Quality Management By-Law and as such, these increases are likely to go unnoticed. Based on both the day and night-time results presented here, acoustic impacts of the operation of the proposed Project are negligible and noise-related complaints from receptors are not anticipated.

Highest noise levels are predicted around the WWTP and Hammermill area, as these areas contain the noisiest sources. It is understood that in reality, some of these sources may be contained within acoustic enclosures, however, these model results represent a worst-case scenario, without sources being contained/enclosed. Noise levels decrease as distance from the sources increase, with levels dropping below the industrial guideline level (70 dB(A) (day) and 60 dB(A) (night)) onsite. Noise levels at all receptor locations are below the respective urban guideline levels (55 dB(A) (day) and 45 dB(A) (night)).



All impacts of the operation of the proposed Project were evaluated using a risk matrix, which is a semi-quantitative risk assessment methodology. This system derives an environmental impact level on the basis of the magnitude, extent, duration and probability of occurrence. Based on the results of this Environmental Acoustic Impact Assessment, the significance of noise-related impacts is rated as “low” for both the construction and operational phases of the Project.

The Project will generate noise, however, sensitive receptors are located at sufficient distances from the site to perceive minimal noise impacts. As such, it is envisaged that the Project can be authorised with no special conditions, compulsory mitigation requirements or monitoring requirements in place. It is noted that noise levels onsite as a result of the proposed Project will increase and occupational health and safety measures for workers onsite must remain in place.

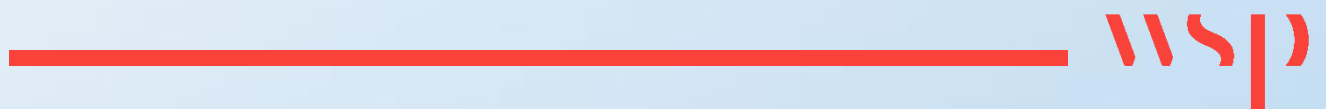
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Appendix A

CURRICULUM VITAE





Kirsten Collett

Earth & Environment, Air Quality & Acoustics – Environment & Energy,
Associate

CAREER SUMMARY

Kirsten is an Associate Air Quality and Acoustic Consultant with a Master of Science (Atmospheric Sciences) degree obtained from the University of the Witwatersrand. She is currently employed at the Johannesburg branch of WSP and has worked on various air quality and acoustic impact assessments; air quality management plans; air quality and acoustic monitoring projects; and air quality and acoustic modelling projects for a variety of clients over the past thirteen years. She has provided consulting support to various client industries including petrochemical, mining, metallurgical, manufacturing and local government bodies, among others. She is also a registered Professional Natural Scientist (Pr.Nat.Sci.) with the South African Council for Natural Scientific Professions (SACNASP).

Countries of work experience gained include South Africa, Botswana, Mozambique, Madagascar, Somalia, Ethiopia, Serbia, Qatar and Kuwait.

13 years with WSP

15 years of experience

Area of Expertise

Air Quality Impact Assessments
Environmental Acoustic Impact Assessments
Air Quality Management
Ambient Air Quality and Acoustic Monitoring

Language

English – Fluent

EDUCATION

Master of Science, Atmospheric Sciences, University of Witwatersrand, Johannesburg, South Africa	2009
Bachelor of Science (Honours) Geography and Environmental Studies, University of the Witwatersrand, Johannesburg, South Africa	2006
Bachelor of Science, Geography and Environmental Studies, University of Witwatersrand, Johannesburg, South Africa	2005

ADDITIONAL TRAINING

CadnaA - Acoustics Training	2022
Snake Awareness Training	2016
Business-focussed Project Management	2013

PROFESSIONAL REGISTRATIONS

SACNASP – South African Council for Natural Scientific Professions – Registration No. 115870	2016
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ORGANIZATION MEMBERSHIPS

SASAS – South African Society for Atmospheric Sciences	2022
NACA – National Association for Clean Air	2016

WSP



Kirsten Collett

Earth & Environment, Air Quality & Acoustics – Environment & Energy,
Associate

PROFESSIONAL HISTORY

WSP Group Africa (Pty) Ltd

September 2011 – present

Climatology Research Group (University of the Witwatersrand)

January 2009 – April 2011

PROFESSIONAL EXPERIENCE

Acoustics

**Tronox Mineral Sands (Pty) Ltd, Environmental Acoustic Impact Assessment for a Proposed Mine, Richards Bay, KwaZulu-Natal, South Africa
2023 – 2025**

Project Manager and Lead Consultant

WSP was appointed to undertake an environmental acoustic impact assessment for a proposed heavy mineral sands mine near Richards Bay. Kirsten was responsible for conducting the assessment which included a baseline assessment; development of a comprehensive acoustic inventory; and determination of the impact of the proposed project on the surrounding sensitive receptors using the Computer Aided Noise Abatement (CadnaA) acoustic modelling software.

**Seriti Green Developments South Africa (Pty) Ltd, Environmental Acoustic Impact Assessment for a Proposed Wind Energy Facility, Ermelo, Mpumalanga, South Africa.
2024**

Project Manager and Lead Consultant

WSP was appointed to undertake an environmental acoustic screening assessment for a proposed wind energy facility near Ermelo in Mpumalanga. Kirsten was responsible for conducting the assessment which determined the potential acoustic impacts of the proposed project based on the methodology prescribed by the International Finance Corporation Environmental Health and Safety (IFC EHS) Guidelines.

**Safripol (Pty) Ltd, Environmental Acoustic Impact Assessment for a Polyethylene Terephthalate (PET) Resin Manufacturing Facility, Durban, KwaZulu-Natal, South Africa.
2024**

Project Manager and Lead Consultant

WSP was appointed to undertake an environmental acoustic impact assessment for the proposed Microgrid Project (Phase 1) at the facility. Kirsten was responsible for conducting the assessment which included a baseline assessment; development of a comprehensive acoustic inventory; and determination of the impact of the proposed project on the surrounding sensitive receptors using the Computer Aided Noise Abatement (CadnaA) acoustic modelling software.

**National Petroleum Refiners of South Africa (Pty) Ltd, Environmental Acoustic Impact Assessment for the Hybrid Clean Fuels II Project, Sasolburg, Free State, South Africa
2023**

Project Manager and Lead Consultant

WSP was appointed to undertake an environmental acoustic impact assessment for the proposed Hybrid CFII upgrade project at the refinery. Kirsten was responsible for conducting the assessment which included a baseline assessment; development of a comprehensive acoustic inventory; and determination of the impact of the proposed project on the surrounding sensitive receptors using the Computer Aided Noise Abatement (CadnaA) acoustic modelling software.



Kirsten Collett

Earth & Environment, Air Quality & Acoustics – Environment & Energy,
Associate

**Tronox Mineral Sands (Pty) Ltd, Environmental Acoustic Compliance Statement for a Mining Expansion, Mtunzini, KwaZulu-Natal, South Africa
2023**

Project Manager and Lead Consultant

WSP was appointed to undertake a desktop review of a proposed expansion to an existing mineral sands mining operation and provide a noise compliance statement in order to confirm that noise from the proposed expansion was a non-issue. Kirsten was responsible for conducting the assessment and compiling the noise compliance statement.

**Red Rocket South Africa, Environmental Acoustic Compliance Statement for two Solar PV Facilities, Thuthukani, Mpumalanga, South Africa
2023**

Project Manager and Lead Consultant

WSP was appointed to undertake a desktop review of two proposed solar PV facilities and provide a noise compliance statement in order to confirm that noise from the facilities was a non-issue. Kirsten was responsible for conducting the assessments and compiling the noise compliance statements.

**ENERTRAG South Africa, Environmental Acoustic Screening Assessment for two Proposed Wind Energy Facilities, Belfast, Mpumalanga, South Africa
2022 – 2023**

Project Manager and Lead Consultant

WSP was appointed to undertake an environmental acoustic screening assessment for two proposed wind energy facilities near Belfast in Mpumalanga. Kirsten was responsible for conducting the assessments which determined the potential acoustic impacts of the proposed projects based on the methodology prescribed by the International Finance Corporation Environmental Health and Safety (IFC EHS) Guidelines.

**ENERTRAG South Africa, Environmental Acoustic Screening Assessment for two Proposed Wind Energy Facilities, Camden, Mpumalanga, South Africa
2021 – 2022**

Project Manager and Lead Consultant

WSP was appointed to undertake an environmental acoustic screening assessment for two proposed wind energy facilities near Camden in Mpumalanga. Kirsten was responsible for conducting the assessments which determined the potential acoustic impacts of the proposed projects based on the methodology prescribed by the International Finance Corporation Environmental Health and Safety (IFC EHS) Guidelines.

**ENERTRAG South Africa, Environmental Acoustic Impact Assessment for a Proposed Green Hydrogen and Ammonia Facility, Camden, Mpumalanga, South Africa
2021 – 2022**

Project Manager and Lead Consultant

WSP was appointed to undertake an environmental acoustic Impact assessment for the proposed Camden I Green Hydrogen and Ammonia Facility. Kirsten was responsible for conducting the assessment which included a baseline assessment; development of a comprehensive acoustic inventory; and determination of the impact of the proposed project on the surrounding sensitive receptors using attenuation-over-distance acoustic calculations.

**Crossboundary Energy, Environmental Acoustic Screening Assessment for a Proposed Wind Energy Facility, Port Dauphine, Madagascar
2021 – 2022**

Project Manager and Lead Consultant

WSP was appointed to undertake an environmental acoustic screening assessment for a proposed wind energy facility in Madagascar. Kirsten was responsible for conducting the assessment which determined the potential acoustic impacts of the proposed project based on the methodology prescribed by the International Finance Corporation Environmental Health and Safety (IFC EHS) Guidelines.



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**DP World, Environmental Acoustic Impact Assessment for the Port of Berbera Phase 2 Expansion, Somaliland, Somalia
2021 – 2022**

Project Manager and Lead Consultant

WSP was appointed to undertake an environmental acoustic impact assessment for the proposed Phase 2 expansion to the Port of Berbera. An acoustic inventory was developed to identify all potential sources of noise associated with the construction and operational phases of the Phase 2 expansion project. The construction phase impacts were assessed through attenuation-over-distance acoustic calculations, whilst acoustic impacts of the proposed port operations were assessed using the Computer Aided Noise Abatement (CadnaA) acoustic model.

**Loci Environmental, Environmental Acoustic Impact Assessment for a Proposed Manganese Mine, Kanye, Botswana
2021 – 2022**

Project Manager and Lead Consultant

WSP was appointed to undertake an environmental acoustic impact assessment for a proposed manganese mine in Botswana. Kirsten was responsible for conducting the assessment which included a baseline assessment; development of a comprehensive acoustic inventory; and determination of the impact of the proposed project on the surrounding sensitive receptors using the Computer Aided Noise Abatement (CadnaA) acoustic modelling software.

**Die Oesterreichische Entwicklungsbank Ag And Metito Utilities Ltd, Environmental Acoustic Impact Assessment for a Proposed Wastewater Treatment Plant, Zrenjanin, Serbia
2021**

Project Manager and Lead Consultant

WSP was appointed to undertake an environmental acoustic impact assessment for the development of a proposed wastewater treatment plant (WWTP). To assess the existing noise climate in the area surrounding the proposed site, ambient noise monitoring was conducted at four receptor locations. An acoustic inventory was developed to identify all potential sources of noise associated with the construction and operational phases of the WWTP. The acoustic impacts of the operation of the proposed WWTP were then assessed using the Computer Aided Noise Abatement (CadnaA) acoustic model, while construction phase impacts were assessed through attenuation-over-distance acoustic calculations.

**DNG Energy Ltd, Environmental Acoustic Impact Assessment for a Proposed Gas to Power Project, Komatipoort, Mpumalanga, South Africa
2021**

Project Manager and Lead Consultant

WSP was appointed to undertake an environmental acoustic impact assessment for the development of the proposed Khensani Gas to Power Project. To assess the existing noise climate in the area surrounding the proposed site, ambient noise monitoring was conducted at five receptor locations. An acoustic inventory was developed to identify all potential sources of noise associated with the operational phase of the project. The acoustic impacts of the operation of the proposed facility during both an unmitigated and mitigated scenario were then assessed using the Computer Aided Noise Abatement (CadnaA) acoustic model.

**Platinum Cement Industries, Environmental Acoustic Impact Assessment for a Proposed Cement Grinding Processing Facility, Umbogintwini, KwaZulu-Natal, South Africa
2020 – 2021**

Project Manager and Lead Consultant

WSP was appointed to conduct a screening-level environmental acoustic impact assessment for a proposed cement grinding processing facility. Kirsten was responsible for conducting the assessment which included a baseline assessment; development of a comprehensive acoustic inventory; and determination of the impact of the proposed project on the surrounding sensitive receptors using attenuation-over-distance acoustic calculations.



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Associate

**AngloGold Ashanti, Environmental Acoustic Impact Assessment for the Expansion to a Tailings Storage Facility, Northwest, South Africa
2017 – 2020**

Project Manager and Lead Consultant

WSP was appointed to undertake an environmental acoustic impact assessment for the proposed extension of the Kareerand Tailings Storage Facility. Kirsten was responsible for conducting the assessment which included baseline acoustic monitoring; development of a comprehensive acoustic inventory for both the construction and operational phases of the project; and determination of the impact of the proposed project on the surrounding sensitive receptors using the Computer Aided Noise Abatement (CadnaA) acoustic modelling software.

**BioTherm Energy, Environmental Acoustic Impact Assessment for three Wind Energy Facilities, Northern and Western Cape, South Africa
2016 – 2019 and 2021 – 2022**

Project Manager and Lead Consultant

WSP was appointed to undertake an environmental acoustic impact assessment for three proposed wind energy facilities located between Sutherland and Matjiesfontein in the Northern and Western Cape provinces. Kirsten was responsible for conducting the assessments which included baseline acoustic monitoring; development of a comprehensive acoustic inventory for both the construction and operational phases of the project; and determination of the impact of the proposed wind energy facilities on the surrounding sensitive receptors (farmhouses) using the Computer Aided Noise Abatement (CadnaA) acoustic modelling software. Various updates and expansions to the above-mentioned projects were then further assessed during 2021/2022.

**Sappi Southern Africa Limited, Environmental Acoustic Impact Assessment for the proposed Expansion to a Paper Mill, KwaZulu-Natal, South Africa
2018**

Project Manager and Lead Consultant

WSP was appointed to undertake an environmental acoustic impact assessment for the proposed expansion to the Sappi Saiccor Mill, near Umkomaas. Kirsten was responsible for conducting the assessment which included baseline acoustic monitoring; development of a comprehensive acoustic inventory for the proposed expansion activities; and determination of the impact of the proposed expansion on the surrounding sensitive receptors through the use of attenuation-over-distance acoustic calculations.

**Sappi Southern Africa Limited, Environmental Acoustic Impact Assessment for a Proposed Timber Handling Facility, Umkomaas, KwaZulu-Natal, South Africa
2017**

Project Manager and Lead Consultant

WSP was appointed to undertake an environmental acoustic impact assessment for a proposed timber handling facility near Umkomaas. Kirsten was responsible for conducting the assessment which included baseline acoustic monitoring; development of a comprehensive acoustic inventory; and determination of the impact of the proposed facility on the surrounding sensitive receptors (specifically, a newly proposed retirement village) using the Computer Aided Noise Abatement (CadnaA) acoustic modelling software.

**Loci Environmental, Environmental Acoustic Impact Assessment for the Proposed Rehabilitation of the Sekoma-Morwamosu Road Section, Botswana
2017**

Project Manager and Lead Consultant

WSP was appointed to undertake an environmental acoustic impact assessment for the proposed rehabilitation of a section of road within the southern part of Botswana. Kirsten was responsible for conducting the assessment. Current operational noise levels in the vicinity of the road section were determined using an acoustic modelling platform, with current (2017) traffic count data as input. The acoustic impacts of the proposed rehabilitation were determined using attenuation-over-distance calculations (construction phase) and



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acoustic modelling (operational phase). Changes in noise levels at specific receptor locations were then assessed for each phase and the resultant community responses were evaluated.

**City of Cape Town, Environmental Acoustic Impact Assessment for the Redevelopment of the Athlone Power Station, Cape Town, Western Cape, South Africa
2016 – 2017**

Lead Consultant

WSP was contracted to undertake an environmental acoustic impact assessment for redevelopment of the Athlone Power Station site to determine the noise impacts of a) the surrounding activities on the redevelopment site; and b) the proposed site activities on the surrounding communities. Kirsten was responsible for conducting the assessment which included baseline acoustic monitoring; development of a comprehensive noise source inventory; and determination of the impact of the current noise climate on the Athlone site as well as the impact of the proposed redevelopment activities on the surrounding communities.

**Central Termica Da Ressano Garcia, Environmental Acoustic Monitoring for a Gas Engine Power Plant, Ressano Garcia, Mozambique
2016**

Project Manager

WSP was commissioned to undertake acoustic monitoring at the Central Termica De Ressano Garcia gas engine power plant site in order to assess the noise associated with the operation of the plant. Kirsten was responsible for project management, technical input and reporting for this project.

**Anglo American Coal SA, Community Environmental Acoustic Monitoring Survey, Vereeniging, Gauteng, South Africa
2016**

Project Manager

WSP was appointed to conduct community-based noise monitoring in a region adjacent to the New Vaal Colliery in order to assess the acoustic impacts of the colliery on the surrounding communities. Kirsten was responsible for project management, data analysis and reporting for the project.

**Anglo American Platinum Limited, Screening Level Environmental Acoustic Impact Assessment for a New Ventilation Shaft, Rustenburg, Northwest, South Africa
2016**

Lead Consultant

WSP was appointed to investigate the acoustic impacts associated with the construction and operation of an additional ventilation shaft at the Siphumelele 1 Mine near Rustenburg. Kirsten was responsible for conducting the assessment through baseline acoustic monitoring and acoustic propagation calculations.

**Industrial Development Corporation of SA (Pty) Ltd, Environmental Acoustic Impact Assessment for a Proposed Paper Mill, Frankfort, Free State, South Africa
2013 – 2015**

Lead Consultant

WSP was contracted to undertake an environmental acoustic impact assessment for a proposed paper mill in Frankfort in the Free State Province. Kirsten was responsible for conducting the assessment which included baseline acoustic monitoring; development of a comprehensive noise source inventory; and determination of the impact of the proposed project on the surrounding communities using the Computer Aided Noise Abatement (CadnaA) acoustic model.

**South32 Aluminium SA Limited, Environmental Acoustic Impact Assessment for the Decommissioning of a Smelter, Richards Bay, KwaZulu-Natal, South Africa
2014 – 2015**

Lead Consultant

WSP was contracted to undertake a screening-level environmental acoustic impact assessment for the decommissioning of the Bayside Aluminium Smelter in Richards Bay. Kirsten was responsible for conducting the assessment which included the development of a comprehensive noise source inventory; and



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determination of the impact of the proposed project on the surrounding communities using noise propagation calculations.

**Sasol New Energy Holding (Pty) Ltd, Environmental Acoustic Monitoring for a Gas Engine Power Plant, Ressano Garcia, Mozambique, Africa
2014 – 2015**

Project Manager and Lead Consultant

WSP was commissioned by Sasol New Energy Holding (Pty) Ltd to undertake acoustic monitoring at the Central Termica De Ressano Garcia gas engine power plant site in order to assess the noise associated with the construction and operational phases of the plant. Kirsten was responsible for technical input, acoustic data analysis and reporting for this project.

**Sonae Novobord (Pty) Ltd, Environmental Noise Survey for a Wood Producer, White River, Mpumalanga, South Africa
2012 – 2015**

Consultant

WSP has been conducting environmental noise monitoring at the Sonae Novobord White River plant since 2009. The project includes day and night-time monitoring in accordance with the SANS 10103:2008 methodology, data analysis, compliance assessment and reporting. Kirsten was involved in the data analysis, interpretation and reporting for the project.

**Atha-Africa Ventures (Pty) Ltd, Environmental Acoustic Impact Assessment for a Proposed Mine, Wakkerstroom, Mpumalanga, South Africa
2012 – 2014**

Lead Consultant

WSP Environmental was commissioned to undertake an environmental acoustic impact assessment for a proposed underground coal mine near Wakkerstroom, Mpumalanga as part of a comprehensive environmental and social impact assessment for the mine. Kirsten was responsible for conducting the environmental acoustic assessment. The assessment comprised on-site environmental noise monitoring in order to obtain a baseline noise climate for the region as well as acoustic modelling to determine the predicted impacts that the proposed mine will have on the existing noise climate. An inventory of all noise sources during the construction and operational phases was compiled with associated sound power levels for each source. These sources were then input into the Computer Aided Noise Abatement (CadnaA) acoustic model. Results were compared with the monitored (existing) noise levels as well as the SANS day and night-time guidelines to assess compliance.

**Sonae Novobord (Pty) Ltd, Environmental Noise Survey for a Wood Producer, Panbult, Mpumalanga, South Africa
2013**

Project Manager

WSP was commissioned to do a once-off environmental acoustic compliance monitoring survey at the Sonae Novobord Panbult site in Mpumalanga. Kirsten was responsible for project management and reporting for the project.

**Rustenburg Platinum Mines Limited, Environmental Noise Impact Assessment for the Amandelbult Mine, Limpopo, South Africa
2013**

Lead Consultant

As part of an environmental impact assessment, WSP was commissioned to conduct an environmental noise assessment for the sinking of a new shaft at the Tumela mine in the Limpopo Province. Kirsten conducted this environmental noise impact assessment through a baseline review of the site; compilation of a detailed site-specific noise inventory; determination of the impact of the proposed project on the surrounding communities using the CadnaA acoustic model; interpretation of modelled results; compliance assessment; and reporting.



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Shell and BP South Africa Petroleum Refineries (SAPREF), Environmental Noise Impact Assessment for SAPREF Cleaner Fuels Phase Two, Durban, KwaZulu-Natal, South Africa 2013

Lead Consultant

WSP was contracted to perform the environmental noise impact assessment of the Cleaner Fuels Phase Two Project for the SAPREF Refinery in South Durban. The project investigated the noise associated with undertaking the required modifications to the refinery in order to meet the pending fuel specifications published by the South African Department of Energy. Kirsten was responsible for analysis and interpretation of on-site acoustic monitoring; compilation of a detailed site-specific noise inventory; determination of the impact of the proposed project on the surrounding communities through the use of the CadnaA acoustic model; interpretation of modelled results; compliance assessment; and reporting.

Assmang Black Rock Mine Operations, Environmental Monitoring Assessment for a Manganese Mine, Hotazel, Northern Cape, South Africa 2012 – 2013

Consultant

WSP was commissioned to conduct environmental monitoring for their underground manganese mining venture at Black Rock in the Northern Cape Province. The environmental monitoring consisted of both environmental noise monitoring and particulate monitoring. Vehicle noise and emissions testing was also performed on various Assmang owned vehicles onsite. Kirsten was responsible for analysis of all monitored data, interpretation, compliance assessment and reporting.

AngloGold Ashanti (Pty) Ltd, Environmental Noise Surveys, Vaal River and West Wits Operations, Northwest, South Africa 2012

Consultant

WSP was commissioned by Anglo Gold Ashanti to perform environmental noise surveys of their Vaal River and West Wits mining operations in the Northwest Province, as part of their commitment to minimise negative impacts on the environment. The project included day and night-time monitoring in accordance with the SANS 10103:2008 methodology, data analysis, compliance assessment and reporting. Kirsten was responsible for assisting with data analysis, interpretation and reporting.

Sasol New Energy Holding (Pty) Ltd, Environmental Acoustic Impact Assessment for a proposed Power Plant, Ressano Garcia, Mozambique 2011

Field Consultant

WSP was commissioned by Sasol New Energy Holding (Pty) Ltd to undertake an integrated environmental and social impact assessment (ESIA) and bankable environmental, social and health impact assessment (ESHIA) for the proposed gas engine power plant that is to be constructed in Ressano Garcia, Mozambique. As part of this assessment, a specialist environmental acoustic study was conducted to assess what impacts the proposed plant may have on the noise climate of the region. Kirsten was responsible in assisting with on-site acoustic monitoring for the project.

Air Quality Impact Assessments (AQIAs)

Strandfoam (Pty) Ltd, AQIA for an Existing Polyurethane Foam Production Facility, City of Tshwane, Gauteng, South Africa. 2023 – 2025

Project Manager

WSP was contracted to undertake an air quality impact assessment in the form of an atmospheric impact report (AIR) for the Strandfoam Rosslyn facility. The Client did not hold a valid atmospheric emission licence (AEL) for the facility and as such a Section 22A rectification process was triggered. As part of the Section 22A process, an AIR was specifically requested by the authorities. The project included a baseline assessment, compilation of a comprehensive emissions inventory and dispersion modelling using the AERMOD dispersion



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model to assess the impacts of emissions on the surrounding communities. The project also included the AEL component, with authority liaison, advertisement placement and submission of the manual AEL application form.

Bidvest Tank Terminals (BTT), AQIA for a Bulk Liquid Handling Storage Terminal, Durban, KwaZulu-Natal, South Africa.

2024

Project Manager

WSP was appointed to conduct an AQIA in the form of an Atmospheric Impact Report to assess the impact of the BTT Bay 1 storage facility on the ambient air quality in the area. The assessment consisted of the compilation of a comprehensive emissions inventory to account for emissions from the facility as well as dispersion modelling using the AERMOD dispersion model to assess the impacts of emissions on any surrounding receptors.

Strandfoam (Pty) Ltd, AQIA for an Existing Polyurethane Foam Production Facility, Strand, Western Cape, South Africa.

2020 – 2024

Project Manager

WSP was contracted to undertake an air quality impact assessment in the form of an atmospheric impact report (AIR) for the Strandfoam Strand facility. The Client did not hold a valid atmospheric emission licence (AEL) for the facility and as such a Section 22A rectification process was triggered. As part of the Section 22A process, an AIR was specifically requested by the authorities. The project included a baseline assessment, compilation of a comprehensive emissions inventory and dispersion modelling using the AERMOD dispersion model to assess the impacts of emissions on the surrounding communities. The project also included the AEL component, with authority liaison, advertisement placement and submission of the manual AEL application form.

Transnet Port Terminals - Saldanha, AQIA for a Proposed Expansion to an Iron Ore Loading Terminal, Saldanha, Western Cape, South Africa

2020 – 2022

Project Manager and Lead Consultant

WSP was contracted to undertake an air quality impact assessment in the form of an atmospheric impact report (AIR) to determine the impacts of a proposed increase in iron ore storage and handling capacity at the Saldanha Port. The project was part of an Atmospheric Emission Licence (AEL) variation application, with an AIR specifically requested by the authorities. The project included a baseline assessment, compilation of a comprehensive emissions inventory and dispersion modelling using the CALPUFF dispersion model to assess the impacts of emissions on the surrounding communities. The project also included the AEL component, with authority liaison, advertisement placement and submission of the AEL variation application on the South African Atmospheric Emission Licencing and Inventory Portal (SAAELIP).

Cast Products South Africa, AQIA for a Section 22A AEL Renewal for a Foundry, Boksburg, Gauteng, South Africa

2022

Project Manager and Lead Consultant

WSP was contracted to undertake an air quality impact assessment in the form of an atmospheric impact report (AIR) for the Boksburg Foundry. The Client failed to renew their current AEL timeously and as such a Section 22A rectification process was triggered. As part of the Section 22A process, an AIR was specifically requested by the authorities. The project included a baseline assessment, compilation of a comprehensive emissions inventory and dispersion modelling using the AERMOD dispersion model to assess the impacts of emissions on the surrounding communities. The project also included the AEL component, with authority liaison, advertisement placement and submission of the AEL renewal application on the South African Atmospheric Emission Licencing and Inventory Portal (SAAELIP).



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**Orion Engineered Carbons, AQIA for a Bulk Liquid Cargo Facility, Port of Gqeberha, Eastern Cape, South Africa
2020 – 2021**

Project Manager and Lead Consultant

WSP was appointed to conduct an AQIA in the form of an Atmospheric Impact Report as part of the licencing of the operational tanks at the port. This formed part of a Noxious Use Permit application, as per the Port Elizabeth Zoning Scheme. The assessment consisted of quantification of emissions from the tanks using the US EPA's Tanks 4.0.9 model as well as dispersion modelling using the AERMOD dispersion model to assess the impacts of emissions on any surrounding receptors.

**Platinum Cement Industries, AQIA for a Proposed Cement Grinding Processing Facility, Umbogintwini, KwaZulu-Natal, South Africa
2020 – 2021**

Project Manager and Lead Consultant

WSP was appointed to conduct an AQIA in the form of an Atmospheric Impact Report as part of an Atmospheric Emission Licence (AEL) application for a proposed cement grinding processing facility. The assessment consisted of the compilation of a comprehensive emissions inventory to account for emissions from the facility as well as dispersion modelling using the AERMOD dispersion model to assess the impacts of emissions on any surrounding receptors.

**Protea Chemicals, AQIA for a Revised Production Rate for a Chemical Producer, Cape Town, Western Cape, South Africa
2020**

Project Manager and Lead Consultant

WSP was appointed to conduct an AQIA in the form of an Atmospheric Impact Report as part of an Atmospheric Emission Licence (AEL) amendment application for a production rate change at the facility. The assessment consisted of the compilation of a comprehensive emissions inventory to account for emissions from the facility as well as dispersion modelling using the AERMOD dispersion model to assess the impacts of emissions on any surrounding receptors.

**WSP Middle East, AQIA for a Proposed Independent Power Project, Qatar
2020**

Project Manager and Lead Consultant

WSP was contracted to undertake a screening-level air quality impact assessment to determine the suitability of the proposed stack heights in dispersing emission away from sensitive receptors. The project included a baseline assessment, emissions inventory, dispersion modelling using SCREEN3 and comparison of the predicted concentrations against the Qatar ambient air quality standards.

**Transnet Port Terminals - Saldanha, AQIA for a Proposed Expansion to an Iron Ore Loading Port, Saldanha, Western Cape, South Africa
2019**

Project Manager and Lead Consultant

WSP was contracted to undertake an air quality impact assessment to determine the impacts of a proposed increase in iron ore storage and handling capacity at the Saldanha Port. The project included a baseline assessment, compilation of a comprehensive emissions inventory and dispersion modelling using the CALPUFF dispersion model to assess the impacts of emissions on the surrounding communities.

**Anglo American Coal SA, AQIA for a proposed coal stockpile at an underground mine, Ogies, Mpumalanga, South Africa
2018**

Project Manager and Lead Consultant

WSP was appointed to conduct an Air Pollution Assessment in the form of an Atmospheric Impact Report for a proposed coal stockpile at the underground section of the Zibulo Colliery. The assessment consisted of the compilation of a comprehensive emissions inventory to account for emissions from the proposed stockpile as



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well as dispersion modelling using the AERMOD dispersion model to assess the impacts of emissions on any surrounding receptors.

WSP Middle East, AQIA for a Proposed Waste to Energy Facility, Kuwait 2017 – 2018

Project Manager and Lead Consultant

WSP was contracted to undertake an air quality impact assessment to determine the impacts of a proposed waste to energy facility in Kuwait. The project included assessment of baseline monitoring data (conducted by a local partner), a baseline assessment, emissions inventory, dispersion modelling using CALPUFF and comparison of the predicted concentrations against the Kuwait and International ambient air quality guidelines/standards. A preliminary screening assessment was undertaken using SCREEN3 to determine the monitoring locations for the baseline monitoring campaign.

The Dow Chemical Company (Rohm and Haas) - Advanced Materials, AQIA for a Chemical Manufacturer, New Germany, KwaZulu-Natal, South Africa 2015

Project Manager and Lead Consultant

WSP was appointed to conduct an Air Pollution Assessment in the form of an Atmospheric Impact Report for the proposed Polyol Blending Plant at the Dow Advanced Materials site in New Germany. The assessment consisted of the compilation of a comprehensive emissions inventory to account for emissions from both the existing and proposed operations as well as dispersion modelling using the AERMOD dispersion model to assess the impacts of emissions on the surrounding communities.

South32 Aluminium SA Limited, AQIA for Remediation of a Smelter, Richards Bay, KwaZulu-Natal, South Africa 2015 – 2016

Lead Consultant

WSP was contracted to undertake an air quality impact assessment to determine the impacts of remediating the legacy landfill sites at the Bayside Aluminium Smelter in Richards Bay. Kirsten was responsible for the development of a comprehensive emissions inventory; and determination of the impact of the proposed project on the surrounding communities using the AERMOD dispersion modelling software.

South32 Aluminium SA Limited, AQIA for a Smelter Decommissioning, Richards Bay, KwaZulu-Natal, South Africa 2014 – 2015

Lead Consultant

WSP was contracted to undertake a screening-level air quality impact assessment for the decommissioning of the Bayside Aluminium Smelter in Richards Bay. Kirsten was responsible for the development of a comprehensive emissions inventory; and determination of the impact of the proposed project on the surrounding communities using the AERSCREEN Tier 1 dispersion modelling software.

First in Spec Biofuels Ltd, AQIA for a Biodiesel Plant, Coega IDZ, Eastern Cape, South Africa 2011 – 2015

Lead Consultant

As part of a larger Environmental Impact Assessment for a proposed biodiesel production plant in Coega, WSP was commissioned to conduct a specialist air quality impact assessment for the facility. Kirsten was responsible for compiling the air quality impact assessment which was initially a screening-level assessment and later upgraded to a Tier 2 full air quality impact assessment. The project involved a baseline review of the area; baseline meteorological and pollutant data analysis; emission inventory compilation; dispersion modelling; reporting; and atmospheric emission licence (AEL) compilation.



**Atha-Africa Ventures (Pty) Ltd, AQIA for a Proposed Mine, Wakkerstroom, Mpumalanga, South Africa
2012 – 2014**

Lead Consultant

WSP was commissioned to undertake an air quality impact assessment for a proposed underground coal mine near Wakkerstroom, Mpumalanga as part of a comprehensive environmental and social impact assessment for the mine. Kirsten was responsible for conducting the air quality assessment. The assessment comprised on-site ambient air quality monitoring in order to assess the existing air quality in the region as well as dispersion modelling (using the ADMS (v5) software) to determine the predicted impacts that the proposed mine will have on the existing air quality.

**Apollo Tyres South Africa (Pty) Ltd, AQIA for a Tyre Manufacturer, Durban, KwaZulu-Natal, South Africa
2012 – 2013**

Consultant

WSP was commissioned to perform an air quality impact assessment for a tyre manufacturer to determine the changes in emissions should they replace their existing heavy fuel oil fired boiler with two coal fired boiler equipped with bag filters. Kirsten was responsible for conducting this screening-level air quality assessment through a baseline review of the site; emissions inventory compilation; and determination of the impact of the boiler emissions on the surrounding communities using the SCREEN3 screening-level dispersion modelling software.

**Ferrochrome Furnaces (Pty) Ltd, AQIA for Ferrochrome Production Facility, Rustenburg, North West, South Africa
2012**

Lead Consultant

WSP was commissioned to perform an air quality impact assessment of a proposed ferrochrome production facility in Zinziaville, Rustenburg as part of a larger environmental impact assessment. Kirsten was responsible for conducting the air quality assessment through a baseline review of the site; compilation of a detailed site-specific emissions inventory; determination of the impact of the proposed facility on the surrounding communities using the ADMS dispersion modelling software; and compilation of the atmospheric emission licence (AEL) application.

**SIVEST SA (Pty) Ltd, AQIA for a Fuel Depot Recommissioning, Western Cape, South Africa
2012**

Consultant

WSP was commissioned as part of a broader environmental impact assessment, to conduct an air quality impact assessment of the recommissioning of the Total Paarden Island fuel storage and distribution terminal near Cape Town. The air quality impact assessment investigated emissions generated as a result of both the construction phase and operational phase of the facility. Kirsten was responsible for the assessment which comprised a baseline review of the site; compilation of a detailed site-specific emissions inventory; estimation of emissions generated from each of the onsite storage tanks through the use of the TANKS 4.0.9 model; and determination of the impact of the proposed facility on the surrounding communities using the SCREEN3 dispersion modelling software.

**Noble Resources Ltd, AQIA for a Proposed Oilseeds Processing Plant, Standerton, Mpumalanga, South Africa
2011-2012**

Consultant

Noble Resources proposed to construct an oilseeds processing plant in Standerton and required an air quality assessment to determine what impacts the activity would have in the region. Kirsten performed this assessment through a baseline assessment of the site; development of a comprehensive emissions inventory; and determination of the proposed impacts through the use of a Tier 2 atmospheric dispersion model (ADMS)

**City of Johannesburg, Ambient Air Quality Assessment during Car Free Day, Johannesburg, South Africa
2007 – 2008**

Consultant

This project monitored vehicular emissions from a mobile monitoring station placed alongside the M1 highway in Johannesburg. This was done to evaluate the effectiveness of car free day and to assess whether there was a reduction in emissions on the day. Kirsten was involved in the assessment, analysis and reporting in this specific project.



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Air Quality Management

Foskor (Pty) Ltd, Air Quality Management Plan for the Foskor Richards Bay Facility, Richards Bay, KwaZulu-Natal, South Africa

Project Manager

Foskor requested the compilation of an Air Quality Management Plan (AQMP) for their Richards Bay processing facility. The AQMP was aimed at improving air quality at the facility through the identification of main sources of emissions and recommendations to reduce emissions from these sources. The AQMP consisted of a baseline assessment; identification of key emission sources; compilation of a detailed site specific emissions inventory; determination of the impact of emissions from the facility on surrounding communities using the CALPUFF dispersion modelling software; review of current management and mitigation techniques at the facility; and development of strategies to minimise any impacts of emissions from the facility going forward.

Strandfoam Group (Pty) Ltd, NAEIS submission for a Polyurethane Foam Manufacturer, Strand, Western Cape

2023, 2024, 2025

Project Manager

WSP was appointed to undertake the required National Atmospheric Emissions Inventory System (NAEIS) reporting for the facility. This included the compilation of an emissions inventory for the facility and uploading the necessary information to the NAEIS (electronic (pre-2024) and manual (post-2024)).

Weir Minerals, Atmospheric Emission Licence (AEL) Audit, Annual Reporting and NAEIS submission for a Foundry, Isando, Gauteng **2021**

Project Manager and Lead Consultant

WSP was appointed to undertake an audit of the facility's current AEL to assess the accuracy of what was represented in the AEL as well as to evaluate compliance with the conditions stipulated in the AEL. Additionally, the scope of work included compilation of their Annual Report as well as reporting of emissions onto the National Atmospheric Emissions Inventory System (NAEIS). Kirsten was responsible for conducting the audit, compiling the audit report and annual report and submitting all information onto NAEIS.

Sasol Satellite Operations Ekandustria, Atmospheric Emission Licence (AEL) Audit for an Explosives Manufacturer, Ekandustria, Mpumalanga, South Africa **2020**

Project Manager and Lead Consultant

WSP was appointed to undertake an audit of the facility's current AEL to assess the accuracy of what was represented in the AEL as well as to evaluate compliance with the conditions stipulated in the AEL. Kirsten was responsible for conducting the audit and compiling the audit report.

Anglo American Coal SA, Isibonelo Colliery Air Quality Management Plan, Mpumalanga, South Africa **2019 – 2020**

Project Manager and Lead Consultant

Anglo American Coal SA requested the compilation of an Air Quality Management Plan (AQMP) for the Isibonelo Colliery in the Mpumalanga province. The AQMP was aimed at improving air quality at the colliery through the identification of main sources of emissions and recommendations to reduce emissions from these sources. Kirsten was responsible for the compilation of the AQMP which was performed through a baseline assessment of activities at the colliery; identification of key emission sources; compilation of a detailed site specific emissions inventory; determination of the impact of emissions from the colliery on surrounding communities using the AERMOD dispersion modelling software; review of current management and mitigation techniques at the colliery; and development of strategies to minimise any impacts of emissions from the colliery going forward.



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**Transnet Port Terminals Saldanha Bay, Atmospheric Emission Licence (AEL) Audit for a Manganese Multipurpose Terminal, Saldanha, Western Cape, South Africa
2019**

Lead Consultant

WSP was contracted to undertake an audit of the current provisional AEL (PAEL) for the terminal and assist with conversion of the PAEL to a final AEL. The project included a site visit and audit, Client and Authority liaison and assistance with submission of the AEL on the South African Atmospheric Emission Licencing and Inventory Portal (SAAELIP).

**Anglo American Coal SA, Mafube Colliery Integrated Air Quality Management Plan, Mpumalanga, South Africa
2015 – 2016**

Project Manager and Lead Consultant

WSP was appointed for the compilation of an integrated Air Quality Management Plan (AQMP) for the Mafube Colliery in the Mpumalanga province. The AQMP was aimed at improving air quality at the colliery through the identification of main sources of emissions and recommendations to reduce emissions from these sources. Kirsten was responsible for the compilation of the AQMP which was performed through a baseline assessment of activities at the colliery; identification of key emission sources; compilation of a detailed site specific emissions inventory; determination of the impact of emissions from the colliery on surrounding communities using the AERMOD dispersion modelling software; review of current management and mitigation techniques at the colliery; and development of strategies to minimise any impacts of emissions from the colliery going forward.

**Sonae Novobord (Pty) Ltd, Air Quality Management Reports, White River, Mpumalanga, South Africa
2011 – 2015**

Consultant

WSP has been continuously monitoring formaldehyde, suspended particulate matter (PM₁₀) and dust deposition (fallout) concentrations in and around the Sonae Novobord White River plant since 2008. Kirsten was responsible for analysing and assessing the ambient monitoring data and drafting the air quality management reports.

**Anglo American Coal SA, Combined Integrated Air Quality Management Plan for the Greenside, Kleinkoppje and Landau Collieries, Mpumalanga, South Africa
2013 – 2014**

Lead Consultant

Anglo American Coal SA requested the compilation of a combined integrated Air Quality Management Plan (AQMP) for the Greenside, Kleinkoppje and Landau Collieries in the Mpumalanga province. The AQMP was aimed at becoming a management tool for the collieries going forward Kirsten was responsible for the compilation of the combined AQMP which was performed through a baseline assessment of activities at each colliery; identification of key emission sources; compilation of a detailed site specific emissions inventory for each colliery; determination of the impact of emissions from each colliery (as well as the combined impact) on surrounding communities using the CALPUFF dispersion modelling software; review of current management and mitigation techniques at each colliery; and development of strategies to minimise any impacts of emissions going forward.

**Columbus Stainless (Pty) Ltd, Fugitive Dust Suppression Plan for a Steel Producer, Middelburg, Mpumalanga, South Africa
2013**

Lead Consultant

WSP was commissioned to compile a fugitive dust suppression plan in order to assess the fugitive dust emanating from a stainless-steel plant in Middelburg. Kirsten was responsible for compiling the fugitive dust suppression plan through on-site dust fallout monitoring; analysis of all historical particulate matter, dust fallout



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and meteorological data for the site; identification of key emission sources; and provision of mitigation and management measures to limit the impact of fugitive dust going forward.

**Anglo American Coal SA, Greenside Colliery Integrated Air Quality Management Plan, Mpumalanga, South Africa
2012 – 2013**

Lead Consultant

Anglo American Coal SA requested the compilation of an integrated Air Quality Management Plan (AQMP) for the Greenside Colliery in the Mpumalanga province. The AQMP was aimed at improving air quality at the colliery through the identification of main sources of emissions and recommendations to reduce emissions from these sources. Kirsten was responsible for the compilation of the AQMP which was performed through a baseline assessment of activities at the colliery; identification of key emission sources; compilation of a detailed site specific emissions inventory; determination of the impact of emissions from the colliery on surrounding communities using the ADMS dispersion modelling software; review of current management and mitigation techniques at the colliery; and development of strategies to minimise any impacts of emissions from the colliery going forward.

**Anglo American Coal SA, Landau Colliery Integrated Air Quality Management Plan, Mpumalanga, South Africa
2012**

Lead Consultant

Anglo American Coal SA requested the compilation of an integrated Air Quality Management Plan (AQMP) for the Landau Colliery in the Mpumalanga province. The AQMP was aimed at improving air quality at the colliery through the identification of main sources of emissions and recommendations to reduce emissions from these sources. Kirsten was responsible for the compilation of the AQMP which was performed through a baseline assessment of activities at the colliery; identification of key emission sources; compilation of a detailed site specific emissions inventory; determination of the impact of emissions from the colliery on surrounding communities using the ADMS dispersion modelling software; review of current management and mitigation techniques at the colliery; and development of strategies to minimise any impacts of emissions from the colliery going forward.

**Sonae Novobord (Pty) Ltd, Strategic Overview of Air Quality Conditions at the Sonae Novobord Plant, White River, Mpumalanga, South Africa
2008 – 2011**

Consultant

WSP has been monitoring various air quality aspects in and around the Sonae Novobord White River plant since 2008. Concentrations of formaldehyde, suspended particulate matter (PM₁₀) and dust deposition (fallout) have been continually monitored in terms of the requirements of the NEMA Section 24G Environmental Management Plan. Kirsten was involved in performing a strategic assessment of conditions at the plant, to ascertain whether the air quality has improved over time and whether the conditions set out in the Record of Decision and the Air Quality Management Plan are being met.

Ambient Monitoring

**Anglo American Coal SA, Dust Fallout and Particulate Matter Monitoring for nine Collieries, Mpumalanga, South Africa
2016 – 2022**

Project Manager

WSP was appointed to manage Anglo American Coal SA's air quality monitoring requirements at nine of their collieries. The contract includes dust fallout monitoring at all nine collieries, while continuous particulate matter (PM₁₀ and PM_{2.5}) monitoring is conducted at seven collieries using mobile custom-designed solar system trailers. Kirsten was responsible for project management and quality control for the project.



**Foskor (Pty) Ltd, Dust Fallout and Particulate Matter Monitoring for a Phosphate Mine, Phalaborwa, Limpopo, South Africa
2016 – 2019**

Project Manager

WSP was commissioned to manage and maintain a dust monitoring network for Foskor Phalaborwa's phosphate rock operations in the Limpopo Province. The monitoring network comprises 37 dust fallout samplers, and a real-time particulate matter (PM₁₀) monitor. Kirsten was responsible for project management and quality control for the project.

**Total South Africa (Pty) Ltd, Leak Detection and Repair Programs for Ten Fuel Depots, South Africa
2016 – 2017**

Project Manager

WSP was appointed to conduct leak detection and repair programs at ten of Total South Africa's bulk fuel storage depots as part of their atmospheric emission licence conditions. Kirsten was responsible for project management, data analysis and reporting for the project.

**Eskom Holdings SOC Limited, Dust Fallout Monitoring for Kendal Power Station, Kendal, Mpumalanga, South Africa
2016**

Project Manager

WSP was commissioned to monitor dust fallout at the Kendal Power Station in Mpumalanga for a six month period. Kirsten was responsible for project management, data analysis and reporting for the project.

**Evraz Highveld Steel and Vanadium Corporation Ltd, Dust Fallout Monitoring for a Steel Facility, Mpumalanga, South Africa
2012 – 2015**

Project Manager

As part of Evraz Highveld Steel's on-going monitoring program for the assessment of dust generated by the steelworks and associated activities, WSP was commissioned to conduct dust fallout monitoring both on and off site. Monitoring has been performed over time at the site on a monthly basis in accordance with the ASTM D1739 reference method. Kirsten was responsible for data analysis, interpretation and reporting during the 2012 monitoring period. Most recently, Kirsten was responsible for project management during the 2014 and 2015 campaign.

**Evraz Highveld Steel & Vanadium Corporation Ltd, Particulate Matter Monitoring for a Steel Facility, Mpumalanga, South Africa
2014 – 2015**

Project Manager

WSP was commissioned to monitor particulate matter concentrations at three locations in and around the Evraz Highveld Steel facility using E-sampler monitoring equipment. Kirsten was responsible for project management and reporting for the project.

**Eskom Holdings SOC Limited, Dust Fallout Monitoring for Majuba Power Station, Volksrust, Mpumalanga, South Africa
2013 – 2015**

Project Manager

WSP was commissioned to monitor dust fallout at the Majuba Power Station in Mpumalanga for a two-year period. Kirsten was responsible for project management, data analysis and reporting for the project.

**Tubular Holdings (Pty) Ltd, Dust Fallout Monitoring, Kendal, Mpumalanga, South Africa
2013 – 2014**

Project Manager

WSP was commissioned to monitor dust fallout and meteorological conditions at the Tubular Holdings workers' living quarters near Kendal, Mpumalanga. The project was initiated to determine the source of dust at this location. Kirsten was responsible for project management; data analysis; and reporting for the project.

**Atlantis Foundries (Pty) Ltd, Dust Monitoring Program for a Foundry, Atlantis, Western Cape, South Africa
2011**

Data Analyst

WSP was commissioned to provide specialist air quality support and monitoring services to Atlantis Foundries (Pty) Ltd, situated within Atlantis near Cape Town. The project included: dust deposition monitoring, the



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compilation of an Atmospheric Emission Licence (AEL) for the facility and the development of site-specific dust mitigation and management strategies. Kirsten was involved in assisting with data analysis and interpretation of the results obtained from the monthly monitoring campaigns at the site.

Sasol New Energy Holding (Pty) Ltd, Air Quality Monitoring for a Proposed Power Plant, Ressano Garcia, Mozambique 2011

Field Consultant

WSP was commissioned by Sasol New Energy Holding (Pty) Ltd to undertake an integrated environmental and social impact assessment (ESIA) and bankable environmental, social and health impact assessment (ESHIA) for the proposed gas engine power plant that is to be constructed in Ressano Garcia, Mozambique. As part of this assessment, a specialist air quality study was conducted to assess what impacts the proposed plant may have on air quality in the region. Kirsten was responsible in assisting with the set-up of passive monitoring equipment, dust buckets and a meteorological station at the site.

Eskom Holdings SOC Limited, European Integrated Project on Aerosol, Cloud, Climate and Air Quality Interactions, Mpumalanga, South Africa 2007 – 2010

Technical Consultant

This was an international aerosol project focusing on four developing countries, namely South Africa, India, Brazil and China. It was initiated to provide a comparative set of aerosol emission data between the four countries. Kirsten was involved in the setup and maintenance of the monitoring instrumentation at the South African site. For this, Kirsten was also involved in an aerosol training course in Hyytiälä, Finland as well as technical training in Leipzig, Germany for the SMPS (Scanning Mobility Particle Sizer) instrument.

Eskom Holdings SOC Limited, Ambient Air Monitoring at the Point of Highest Impact Resulting from Kriel and Matla Power Stations, Mpumalanga, South Africa 2009

Consultant

This study was conducted on the Mpumalanga Highveld in order to increase our understanding of the sources and diurnal variations of various atmospheric species as well as the effects of local meteorology on the concentration of these species. The study included ambient monitoring using a mobile monitoring station. Kirsten was involved in the data analysis, statistical manipulation and reporting.

MSC Thesis

The Atmospheric Nitrogen Budget over the South African Highveld, Mpumalanga, South Africa 2007 – 2009

This project was Kirsten's MSc thesis and was performed in collaboration with Eskom. The project aimed to assess the atmospheric nitrogen cycle in the industrialised Highveld region. The project investigated the various atmospheric nitrogen compounds on the South African Highveld and looked at the dominant sources, the transport and conversion of the species in the atmosphere and in what form they are deposited to the ground. From this it was confirmed that the majority of emitted nitrogen remains in the atmosphere, confirming the trends depicted by satellite technology. Client: Eskom Holdings SOC Limited.

Honours Project

NO_x or Not: Nitrogen Oxide Levels over the South African Highveld, Mpumalanga, South Africa 2006

This was Kirsten's honours project and was performed in collaboration with Eskom. This project aimed to validate the nitrogen dioxide hotspot over the South African Highveld as identified by satellite technology. The prevalent sources of nitrogen dioxide were investigated as well as the diurnal and seasonal distributions. Client: Eskom Holdings SOC Limited.

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AWARDS

2009 - MSc Distinction

2008 - Best presentation for paper entitled “The Atmospheric Nitrogen Budget over the South African Highveld”.

National Association for Clean Air (NACA) conference

PUBLICATIONS AND PRESENTATIONS

Publications

Collett, K.S., Piketh, S.J. and Ross, K.E. “An assessment of the atmospheric nitrogen budget on the South African Highveld.” South African Journal of Science, 2010, pp. #106, 5/6, Article# 220.

Laakso, L., Vakkari, V., Laakso, H., Virkkula, A., Kulmala, M., Beukes, J.P., van Zyl, P.G., Pienaar, J.J., Chiloane, K., Gilardoni, S., Vignati, E., Wiedensohler, A., Tuch, T., Birmili, W., Piketh, S., Collett, K., Fourie, G.D., Komppula, M., Lihavainen, H., de Leeuw, G. and Kerminen, V.-M. “South African EUCAARI – measurements: a site with high atmospheric variability,” Atmospheric Chemistry and Physics Discussion. Month 2010, 10, 30691 – 30729.

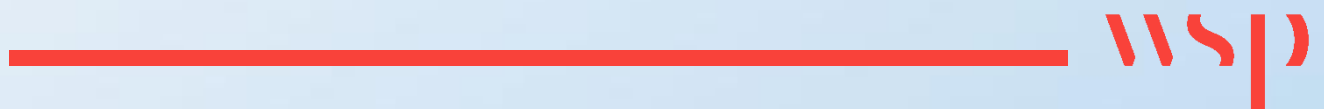
Ross, K., Broccardo, S., Heue, K-P., Collett (nee Ferguson), K. and Piketh, S. “Nitrogen oxides on the South African Highveld.” Clean Air Journal, Month 2007. 16, 2, 6 – 15.

Presentations

Collett, Kirsten. “The Atmospheric Nitrogen Budget over the South African Highveld.” National Association for Clean Air Conference, Nelspruit, Mpumalanga, 2009.

Appendix B

IMPACT ASSESSMENT METHODOLOGY



The assessment of impacts and mitigation evaluates the likely extent and significance of the potential impacts on identified receptors and resources against defined assessment criteria, to develop and describe measures that will be taken to avoid, minimise or compensate for any adverse environmental impacts, to enhance positive impacts, and to report the significance of residual impacts that occur following mitigation.

The key objectives of the risk assessment methodology are to identify any additional potential environmental issues and associated impacts likely to arise from the proposed Project, and to propose a significance ranking. Issues / aspects will be reviewed and ranked against a series of significance criteria to identify and record interactions between activities and aspects, and resources and receptors to provide a detailed discussion of impacts. The assessment considers direct¹, indirect², secondary³ as well as cumulative⁴ impacts.

A standard risk assessment methodology is used for the ranking of the identified environmental impacts pre-and post-mitigation (i.e. residual impact). The significance of environmental aspects is determined and ranked by considering the criteria⁵ presented in **Table B-1**.

Table B-1 - Impact Assessment Criteria and Scoring System

CRITERIA	SCORE 1	SCORE 2	SCORE 3	SCORE 4	SCORE 5
Impact Magnitude (M) The degree of alteration of the affected environmental receptor	Very low: No impact on processes	Low: Slight impact on processes	Medium: Processes continue but in a modified way	High: Processes temporarily cease	Very High: Permanent cessation of processes
Impact Extent (E) The geographical extent of the impact on a given environmental receptor	Site: Site only	Local: Inside activity area	Regional: Outside activity area	National: National scope or level	International: Across borders or boundaries
Impact Reversibility (R) The ability of the environmental receptor to rehabilitate or restore after the activity has caused environmental change	Reversible: Recovery without rehabilitation		Recoverable: Recovery with rehabilitation		Irreversible: Not possible despite action
Impact Duration (D) The length of permanence of the impact on the environmental receptor	Immediate: On impact	Short term: 0-5 years	Medium term: 5-15 years	Long term: Project life	Permanent: Indefinite

¹ Impacts that arise directly from activities that form an integral part of the Project.

² Impacts that arise indirectly from activities not explicitly forming part of the Project.

³ Secondary or induced impacts caused by a change in the Project environment.

⁴ Impacts are those impacts arising from the combination of multiple impacts from existing projects, the Project and/or future projects.

⁵ The definitions given are for guidance only, and not all the definitions will apply to all the environmental receptors and resources being assessed. Impact significance was assessed with and without mitigation measures in place.

CRITERIA	SCORE 1	SCORE 2	SCORE 3	SCORE 4	SCORE 5
Probability of Occurrence (P) The likelihood of an impact occurring in the absence of pertinent environmental management measures or mitigation	Improbable	Low Probability	Probable	Highly Probability	Definite
Significance (S) is determined by combining the above criteria in the following formula:	$[S = (E + D + R + M) \times P]$ $Significance = (Extent + Duration + Reversibility + Magnitude) \times Probability$				
IMPACT SIGNIFICANCE RATING					
Total Score	4 to 15	16 to 30	31 to 60	61 to 80	81 to 100
Environmental Significance Rating (Negative (-))	Very low	Low	Moderate	High	Very High
Environmental Significance Rating (Positive (+))	Very low	Low	Moderate	High	Very High

11.1.1. IMPACT MITIGATION

The impact significance without mitigation measures will be assessed with the design controls in place. Impacts without mitigation measures in place are not representative of the proposed development's actual extent of impact and are included to facilitate understanding of how and why mitigation measures were identified. The residual impact is what remains following the application of mitigation and management measures and is thus the final level of impact associated with the development. Residual impacts also serve as the focus of management and monitoring activities during Project implementation to verify that actual impacts are the same as those predicted in this report.

The mitigation measures chosen are based on the mitigation sequence/hierarchy which allows for consideration of five different levels, which include avoid/prevent, minimise, rehabilitate/restore, offset and no-go in that order. The idea is that when Project impacts are considered, the first option should be to avoid or prevent the impacts from occurring in the first place if possible, however, this is not always feasible. If this is not attainable, the impacts can be allowed, however they must be minimised as far as possible by considering reducing the footprint of the development for example so that little damage is encountered. If impacts are unavoidable, the next goal is to rehabilitate or restore the areas impacted back to their original form after Project completion. Offsets are then considered if all the other measures described above fail to remedy high/significant residual negative impacts. If no offsets can be achieved on a potential impact, which results in full destruction of any ecosystem for example, the no-go option is considered so that another activity or location is considered in place of the original plan.

The mitigation sequence/hierarchy is shown in **Figure B-1** below.

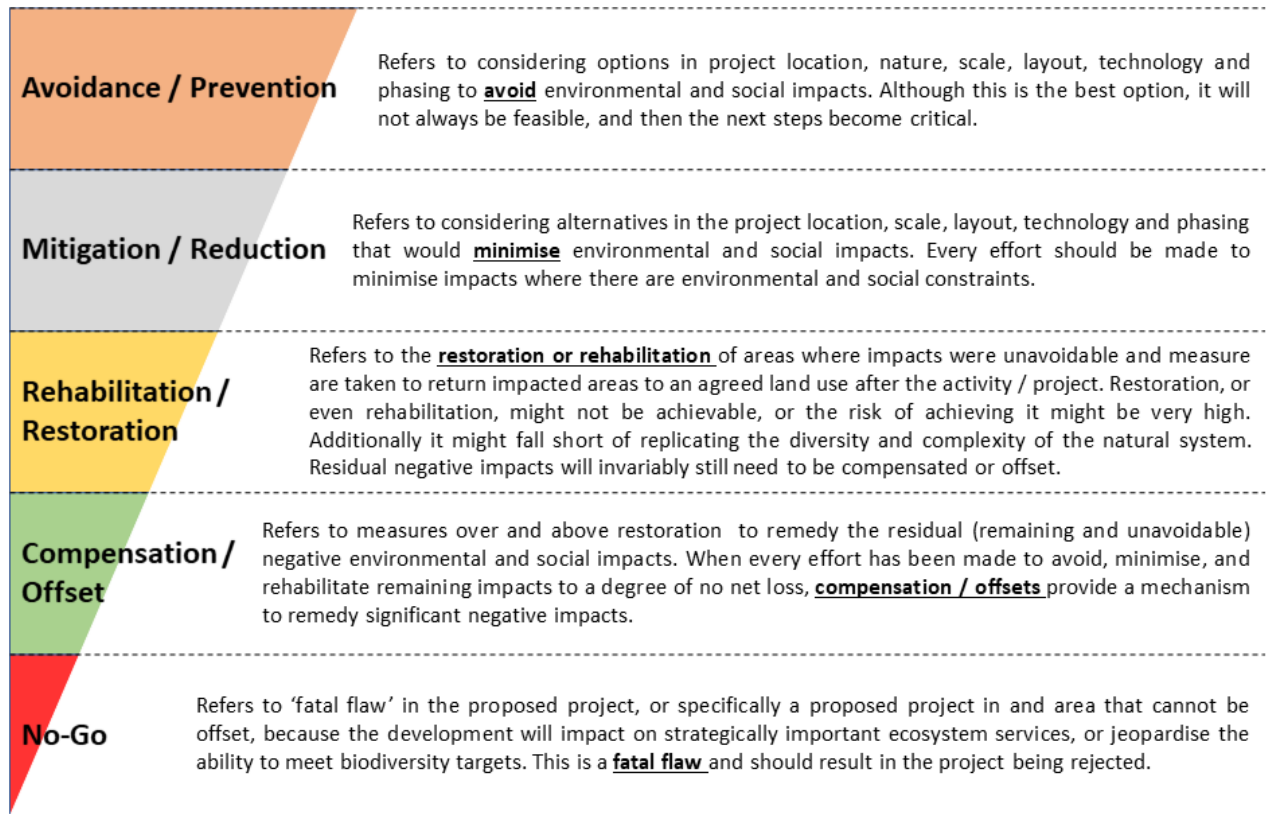


Figure B-1 - Mitigation Sequence/Hierarchy



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