



Transnet National Ports Authority

ENVIRONMENTAL ACOUSTIC IMPACT ASSESSMENT

Scoping and Environmental Impact Reporting
Process for the Development of New Berth 605
and Associated Infrastructure to Support the
Container Handling Facility, Port of Richards Bay,
Kwazulu-Natal



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of Richards Bay, Kwazulu-Natal

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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 in to 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

AIA	Acoustic Impact Assessment
CD	Chart Datum
CHF	Container Handling Facility
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
kV	Kilovolt
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 day-time
L _{Req,n}	Equivalent continuous rating level for night-time
L _{Req,T}	Typical noise rating levels
m	Metre
m/s	Metres per second
mamsl	Metres above mean sea level
NEMA	National Environmental Management Act 107 of 1998
NEM:AQA	National Environmental Management: Air Quality Act 39 of 2004
OECD	Organisation for Economic Co-operation and Development
PoRB	Port of Richards Bay
PWL	Sound power level
SACNASP	South African Council for Natural Scientific Professions
SANS	South African National Standards
TEU	Twenty Foot Equivalent Unit
TNPA	Transnet National Ports Authority
WHO	World Health Organisation
WSP	WSP Group Africa (Pty) Ltd

EXECUTIVE SUMMARY

Transnet National Ports Authority (TNPA) is proposing the development of a new berth (Berth 605) at the Port of Richards Bay (PoRB) (hereafter referred to as the Project). The overarching objective of the Project is to have a dedicated berth for the Container Handling Facility (CHF) at the PoRB.

Environmental Authorisation (EA) for the proposed Project is required, in the form of a Scoping and Environmental Impact Reporting (S&EIR) process. As part of the Environmental Impact Assessment (EIA) phase, an Environmental Acoustic Impact Assessment (AIA) is also required to evaluate any acoustic impacts of the Project on the surrounding environment. This report details the findings of the Environmental AIA undertaken to investigate noise associated with the Project.

To assess the existing noise climate in the area surrounding the Project site, ambient noise monitoring was conducted at four on-site locations (including the Richards Bay Seafarers Club, which borders the Project to the west) and at the nearest off-site sensitive receptor location (Arboretum residential). 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 attenuation-over-distance acoustic calculations. It is noted, that 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 port operations, a quantitative assessment of construction phase acoustic impacts was not undertaken, but rather a qualitative discussion thereof.

Baseline monitoring indicated current day-time noise levels were below the respective South African National Standards (SANS) guideline rating level at all of the monitoring locations. At night, average noise levels at two of the five monitoring locations (Pt 02 (onsite south) and Pt 05 (Arboretum residential)) exceeded the respective guideline rating level. From the day-time and night-time monitoring campaigns, it is evident that the current noise climate surrounding the Project site is predominantly anthropogenic in nature (traffic and port-related), with influences from natural sources like birds and insects.

During the operational phase of the Project, day-time noise levels at the onsite monitoring locations (including Rec 01 (Richards Bay Seafarers Club)) are anticipated to increase by between 0.6 and 11.8 dB(A). Cumulative noise levels at all these locations remain below the industrial guideline rating level (70 dB(A)). Night-time noise levels at the onsite monitoring locations (including Rec 01 (Richards Bay Seafarers Club)) are anticipated to increase by between 0.8 and 12.6 dB(A) with the operation of the Project. The larger increase at night-time is attributed to the lower baseline noise levels at this time. Cumulative night-time noise levels at all these locations are predicted to exceed the industrial guideline rating level (60 dB(A)). It must be noted that these locations are all onsite, within the site boundary and not on the fenceline, where compliance applies. Furthermore, there are no sensitive receptors within the immediate vicinity of the site. The nearest sensitive receptor is approximately 3,1 km from the Project site in a north-easterly direction.

As a receptor location with regular occupants, the Richards Bay Seafarers Club (Rec 01) will experience the largest increase in noise levels (+11.8 dB(A) during the day and +10.5 dB(A) at night). Such a change is above the 7 dB(A) threshold for annoyance as per the Noise Control Regulations, resulting in medium to strong community response, with complaints anticipated. It is noted, however,

that although the Richards Bay Seafarers Club is not considered an industrial activity itself, it is located in an area zoned for industrial and port activities, so the occupants would essentially be accustomed to industrial type ambient noise levels. As such, this location is not classified as a “sensitive receptor”.

Predicted day and night-time noise levels at the only sensitive receptor (Rec 05 – Arboretum) located ~ 3,110 m from the Project site, are well below the respective urban guideline rating levels. With the operation of the Project, noise levels are predicted to increase by between 0.2 and 0.9 dB(A), resulting in “little” community/group response. It is noted that such increases are well below the 7 dB(A) threshold for annoyance as per the Noise Control Regulations. Such increases are also well below the International Finance Corporation (IFC) more stringent threshold for annoyance of 3 dB(A). As such, these increases are likely to go unnoticed.

Based on both the day and night-time results presented here within, acoustic impacts on sensitive receptors due to the operation of the proposed Project are not predicted and noise-related complaints from receptors are not anticipated. As such, it is recommended that the Project be authorised with no special acoustic-related conditions applicable.

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IMPACT ASSESSMENT METHODOLOGY

1. INTRODUCTION

Transnet National Ports Authority (TNPA) is proposing the development of a new berth (Berth 605) at the Port of Richards Bay (PoRB) (hereafter referred to as the Project). The overarching objective of the Project is to have a dedicated berth for the Container Handling Facility (CHF) at the PoRB.

The New Berth 605 will ensure that Berths 606 to 609 are utilised for the Multi-Purpose Terminal (MPT) only and not for handling of containers. This will result in the improved operational efficiency of the MPT. Furthermore, the dedicated berths within the CHF will ensure high operational efficiencies of the facility.

Environmental Authorisation (EA) for the proposed Project is required, in the form of a Scoping and Environmental Impact Reporting (S&EIR) process. As part of the Environmental Impact Assessment (EIA) phase, an Environmental Acoustic Impact Assessment (AIA) is also required to evaluate any acoustic impacts of the Project on the surrounding environment. This report details the findings of the Environmental AIA undertaken to investigate noise associated with the Berth 605 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 associated with the operational phase of the Project.
- A screening-level investigation to determine the impact of the noise associated with the operational phase of the proposed Project.
- Submission of an Environmental AIA report (this report), detailing all findings from the baseline assessment, acoustic inventory and screening assessment.
- Provision of 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 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 by WSP and has worked on environmental acoustic impact assessments, monitoring and modelling for a variety of clients over the past twelve 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 (NEMA) (Act 107 of 1998): Environmental Impact Assessment Regulations of 2014, as amended 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:

2. BACKGROUND

2.1. LOCALITY

Berth 605 is located within the PoRB , within the uMhlathuze Local Municipality of the King Cetshwayo District Municipality in the KwaZulu-Natal Province. The site is bounded by the railway line to the north, Berth 606 and 607 to the east, the Seafarers Club to the west and the basin for the 600 Series berths to the south (**Figure 1**).

2.2. EXISTING NOISE CLIMATE

2.2.1. SITE SENSITIVITY VERIFICATION

The existing noise climate surrounding the Berth 605 site is predominantly influenced by anthropogenic sources including shipping and port activities, industries and vehicles as confirmed during the site verification conducted in November 2024. With scattered natural surrounding land, influences from natural sources like birds and insects are minor. A baseline monitoring campaign was conducted for the Project, with the methodology and results presented in **Section 6.1** and **8.1**, respectively.

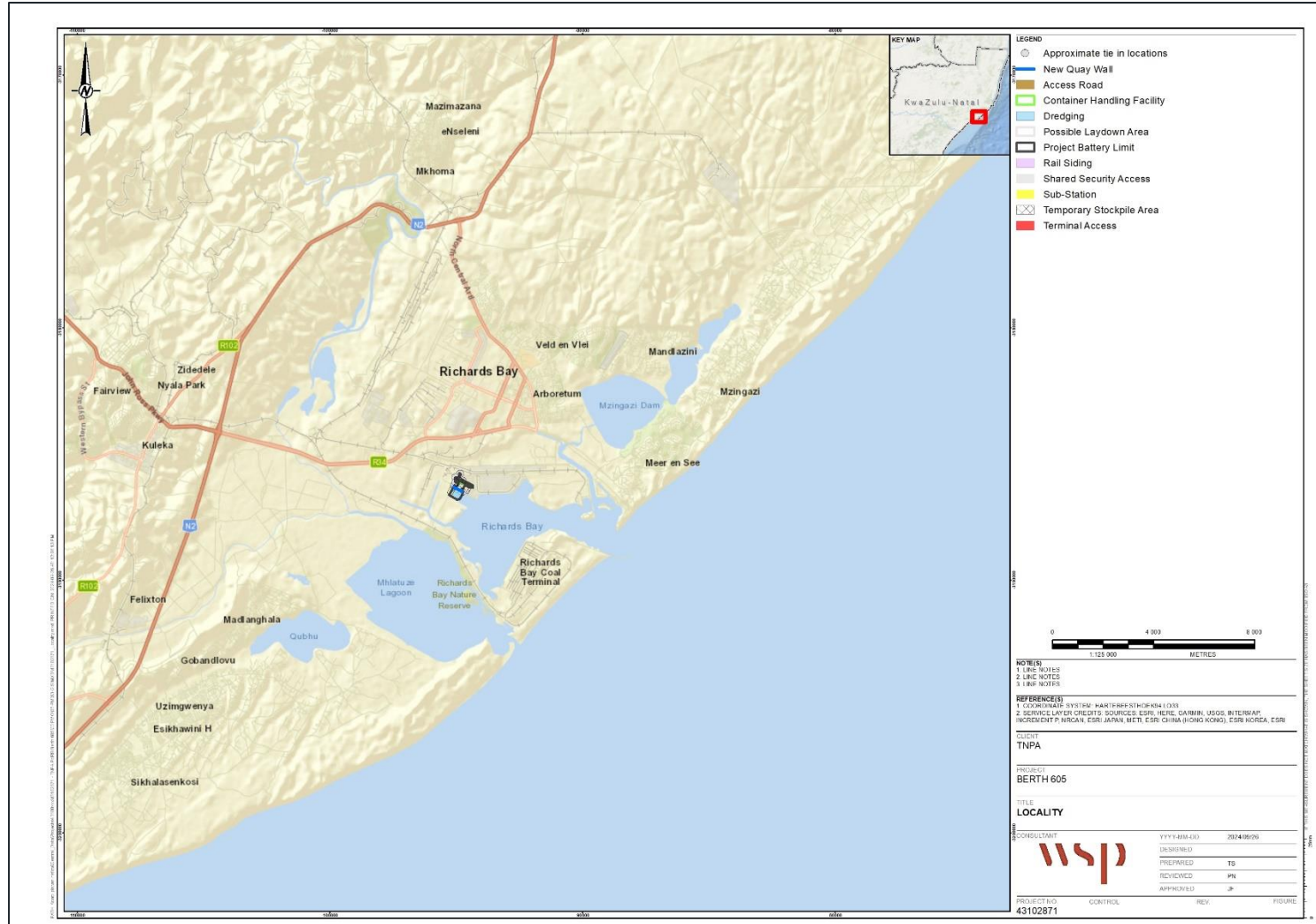


Figure 1: Location of the Project site

3. PROJECT DESCRIPTION

Various development opportunities were identified by TNPA across three precincts namely South Dunes, Newark and Bayvue and are reflected in the Port Development Framework Plan and the PoRB Master Plan 2021 – 2035. The Project area is located within the Bayvue Precinct. The Bayvue Precinct was identified as a strategic location for the handling and consolidation of general cargo (dry bulk, liquid bulk (phosphoric acid and liquid Pitch) and break bulk, including containers) in the PoRB. The precinct is situated on the northern side of the port, between Alusaf aluminium smelter in the west, Thulazihleka pan in the north and Tuzi-gazi in the east. Effectively the precinct accommodates dry bulk, break bulk and liquid bulk terminals which include significant road, rail, building and services infrastructure.

The following structures and infrastructure are deemed necessary to achieve the overall objective of the Project:

- **New Berth Pocket and Quay Wall** – A new berth pocket and quay wall is proposed. The new proposed Berth 605 quay wall will extend from the existing Berth 606 quay wall maintaining the same cope line alignment (cope level is the top of the quay wall). On the other end of Berth 605, the quay wall will stop short of Urania Road. The quay is a mass gravity structure with a concrete foundation and walls with soil backfill internally which provides a wider footprint, but a lower density will result in a stable foundation, this is aligned to the existing Berth 606 quay wall and is considered as an economical design that has been used at the PoRB and Port of Coega. The quay wall is expected to be 366 m in length. The new quay wall is designed for a future depth of -19 m Port Chart Datum (PCD). This will ensure that the berth can be lengthened and deepened without the need for additional quay wall deepening costs.
- **End of Berth Basin Slopes** – The Berth 605 must fit within the space between the end of the existing Berth 606 and the South Dunes Road. The location of the end of Berth 606 berth pocket is defined as the end of the existing berth which is the lower retained earth wall. With a slope of 1V:3H from -14.5 m PCD to the existing ground level is 60 m long, this provides a total berth length of 338.5 m from the toe of the embankment to the start of Berth 606. This will support a vessel of 315 m Length Overall (LOA). A basin width of 305 m is applied to the bottom of the basin where a proclaimed depth of at least -14.5 m PCD is to be maintained.
- **Dredging** – The new Berth 605 quay wall will be constructed to -19m PCD to allow for further Port expansion at a point in the future. For this project, the berth will be dredged such that a proclaimed depth of -14.5 m PCD is achieved, however the design dredging depth also considers sedimentation and sounding accuracy i.e. 0.6 m below -14.5 m PCD providing a design depth of -15.1 m PCD. This dredge depth is consistent with the PoRB depths and the requirements of the design vessel. This approach limits the volume of dredge material requiring disposal.
- **Dredge Disposal** – An estimated 2.8 million cubic metres of dredged material will be disposed of at an existing authorised offshore disposal site. However, it is estimated that a

bulk volume of approximately 3.6 million cubic metres will be disposed of at the offshore dump site.

- **Scour Protection** - The concept design evaluated the necessary scour protection to prevent excessive erosion, which will compromise the structural integrity of nearby infrastructure, such as Urania Road, or cause excessive sediment movement within the berth pocket. The movement of material within the berth is also of significant concern. The depth of the berth pocket is impacted when material erodes from one area and is deposited elsewhere in the berth pocket. Consequently, maintenance dredging will be required to maintain the required berth pocket minimum navigation depth. A revetment (sloped embankment) will be constructed on the seaward side of the Urania Road. This slope must be protected against wave and propeller action to maintain the structural integrity of the Urania Road. A riprap scour protection system has been considered.
- **New Rail Siding** – Based on the design throughput and the current requirement of a 50-wagon container train and 2 locomotives, it is proposed that the rail siding will consist of two rail lines that are 370m each in length, each servicing 25 rakes. The existing Mhlathuze Yard will be used for shunting and staging purposes to service the new proposed rail siding.
- **New Access Road** – a new shared access road and vehicle access control point to the PoRB, the CHF) and the adjacent vacant land surrounding the CHF is proposed. The new road will be an estimated 735 m length with a lane width of 3.7 m and a reserve width of 30 m. It will consist of two (2) lanes each direction and three (3) intersections; at Urania Road, at Ventura Road and one to the CHF. The shared access road will also have a security control facility as the road is accessible from outside of the Port's security perimeter. Street lighting will be provided for as part of the new road network extension. It must be noted that the road itself and the berth will not be traffic generating, the traffic that will be generated is associated with the operation of the CHF.
- **Footprint of the CHF and Apron Area** – The CHF will be built and operated by the operator therefore this S&EIR process only considers the disturbance footprint of the CHF and not the associated permits that it will require when operational. The total area considered is 6.75 Ha for the CHF with estimated dimensions of 270 m x 250 m. The apron area is an operational area located behind the quay wall and is used for the movement of trucks. The apron area is an estimated 33 m wide and 400 m in length.
- **Provision of Electrical Supply to Feed the Facility Operations and Equipment** – The preferred alternative is applicable where the required electrical demand is within the available capacity of the current existing 11 kV network. A new feed will be taken from the existing 11 kV network to provide electrical power to the new CHF and quay wall. However, while there is existing capacity on the current 11 kV network, this is limited and may not be able to provide for the full electrical demands in the future. To protect against restricting future electrical supply constraints, a new 11 kV Switching Station fed from the existing Primary Substation is proposed.
- **Water** – The concept design allows for water to be sourced from the municipal supply. There are three municipal feeds into the port, supplied by two separate municipal reservoirs. This provides adequate supply contingency, and therefore, no additional storage has been included in the system. The existing 225mm diameter water main will be

extended along with the new quay wall to supply ship water along the new quay. At the end of the new quay wall extension the water main will follow Urania Road to tie into the existing 150mm diameter pipe in the vicinity of the existing gate house. Connections to new buildings will be off takes from either the existing network directly, or via extensions to the existing network brought to the boundary of the proposed CHF. A tie in point will be provided. Connections to new buildings will be off takes from either the existing network directly, or via extensions to the existing network brought to the boundary of the proposed CHF. A tie in point will be provided which will consist of approximately 500 m of pipework with a diameter of 150 mm. Inside the quay wall, water will be provided to landing valves for ships and firefighting.

- **Building water** - A new 75mm diameter pipe will branch off from the 150mm diameter water pipe to supply a metered connection for the handling facility. Any connections to new buildings will be made from the metered supply point, located on the western side of the site, just south of the Seafarers club. The Container Handling Facility operator will be responsible for the water network within the facility.
- **Ship water** - The proposed new water main line will tie into the existing 225mm diameter asbestos cement water pipe, that is in the existing quay of berth 606, located on the eastern side of the new berth 605. The new pipe will be 200 mm diameter, within the new quay wall, with 75 mm off takes to the landing valves. The 200mm diameter pipe reduce in size to a 160 mm diameter, where the pipe exits the new quay wall and is parallel to Urania Road and will tie into the existing 150mm diameter asbestos cement pipe north of the existing security access to complete the ring.
- **Fire water** - The fire water in the PoRB is off the water reticulation network. Allowance for fire-hydrants will be made where there isn't a dedicated firefighting system. This allowance is for normal hydrants outside the container handling facility boundary along the lengths of pipelines that will be installed to service the new quay wall extension.
- **Sewerage** – The existing sewer network has been evaluated to identify areas that require upgrades to accommodate the extension of the sewer network for the new proposed CHF. The sewerage system will allow for wastewater from new toilets, basins, baths and showers. The proposed sewer will be designed to tie into the closest existing pipe network or an existing pump station closest to the proposed CHF. Sewerage inside the CHF will be designed to accommodate for approximately 160 people. The new sewerage pipeline will have a connection point at the northwestern boundary of the CHF. It will be approximately 100 m in length and 160 mm pipe diameter. The preferred alternative involves designing a sump to accommodate the facility's sewer through gravity flow, with pumping from the sump to the existing pumpstation PS20, located north of the facility. The final sewer pipe route will be determined during the design phase.
- **Stormwater** – With the hydrological analysis complete and design flows computed, the stormwater pipes were sized. The minimum size of stormwater pipelines is 600mm diameter, which considers effective maintenance of the stormwater network. With the hydrological analysis complete and design flows computed, the stormwater pipe system

has been designed to accommodate a 1 in 5-year storm. The proposed handling facility, as well as any future development adjacent to berth 605 will require major floods to flow overland into the bay. The area will therefore have to be designed and shaped to accommodate overland flow during a major storm, to prevent water ponding and to control flood damage to any infrastructure. The minimum size of stormwater pipelines is 450mm diameter, which considers effective maintenance of the stormwater network. Conventional catchpits, at 50m to 80m spacing, have been shown along the proposed access road. The access road stormwater is then routed in a pipe system to the bay at a slope of 0.5%. The pipeline will be approximately 360 m along the quay line and 400 m on the other side with a 900mm pipe diameter. It will have a velocity of 0.6 m/s for self-cleaning, to prevent sand settling inside the pipe and blocking. There will also be cross drainage at the new rail siding which will be 400 m in length and 600 mm diameter. The existing network discharges into the bay through the existing quay wall.

- **Provision for Temporary Laydown and Stockpile Areas** – Areas for temporary stockpiles and laydown areas have been designated and will be further assessed as part of the project. An approximate area of 4.2 Ha, 220 m in length and 170 m wide to be used as a potential lay down area for the project. In addition, two temporary stockpile areas are proposed. The first image is an area of approximately 2.4 Ha, 250 m in length and 100 m wide. The area is located SE of the CHF. The second area is split into two areas across the Harbour Arterial Road. These areas cover an area of approximately 6 Ha. The infilling of approximately 6 Ha of the basin is also being considered for stockpiling (this infilled area also forms part of the basin to be dredged).

A site layout is provided in **Figure 2**.

3.1. CONSTRUCTION PHASE

The proposed construction sequence for the construction of the new Berth 605 quay wall will include:

- The site is to be cleaned and cleared to facilitate the excavation and dewatering for the construction of the quay wall.
- Excavation to start at the end adjacent to the existing Berth 606.
- Excavate and shore the excavation sides through the loose sands, silts and clay material. Dewatering will be required. The excavation will be done based on the completion of a 20 m long section of the quay wall before progressing on to the next 20 m long section. This is to reduce the dewatering effort and to maintain a manageable site. The contractor can propose longer excavation sections for review and approval of the Supervisor.
- As the excavation progresses to the foundation of Berth 606, the contractor must proceed with an underpinning of the exposed edge of Berth 606 in a hit and miss construction. That is that in a preplanned and agreed sequence of construction a block no wider the 2 m will be excavated from under the existing berth 606 foundation and backfilled with mass concrete. The next section will be excavated (not adjacent to the previous) and the process repeated until the excavation has progressed to the final berth 605 foundation depth with the existing berth 606 now supported on the exposed edge by the underpinning.

- Clean and prepare the rock for the foundation. Place blinding concrete.
- Cast the reinforced concrete base for the new B605 quay wall.
- Cast the first 2 m high wall sections of the quay wall and back fill with suitable graded fill material to achieve the specified bulk density.
- Repeat the process of casting 2 m high walls then back fill until the top of the gravity structure is reached. Prepare shutters for the cope beam and fix reinforcement and formwork for the services tunnels and access ducts. Cast the cope beam.
- Repeat for the next 20 m long quay wall section. After the next quay wall section is complete, instal a filter sock (A6 BIDIM tube filled with gravel) to seal between adjacent quay walls (to prevent fine material passing through the quay wall).
- Backfill behind the quay wall (landside) with graded core rock backfill to specification.
- Backfill in front of the quay wall (seaside) with selected rock to the underside of the future scour rock protection.
- Compete the quay wall.
- Install bollards water pipes to landing valves and other service ducts etc.
- Install fenders after dredging.

3.2. OPERATIONAL PHASE

Typical operations at Berth 605 will include:

- **Vessel Approach:** Container vessels will enter the PoRB and travel to the turning basin located between the dry bulk berths and the sand spit while reducing speed. Tugboats will engage with the vessels to support turning of the vessels inside the turning basin and manoeuvring to Berth 605 for berthing and mooring. Upon departure, vessel unberthing operations and travel towards the entrance channels will be tug-assisted. Once the vessels have passed the B800-Jetty, the tugs will disengage. Different container vessel sizes are envisaged to call at Berth 605, however, the largest vessel envisaged is a Post Panamax I Max, with an overall length of 315 m, beam of 42.8 m and maximum draft of 13 m.
- **Quay Side Operations:** Containers are envisaged to be handled between the quay and vessel with three mobile harbour cranes, having a sufficient outreach to lift a container across the beam of the design vessel.
- **Stacking Operations:** The throughput capacity of the facility is constrained by the yard, implying that the storage area available restricts the throughput potential of the facility and not the berth length. Containers are conservatively envisaged to be stacked with six rubber-tyred gantry cranes. Most likely container stacking will be done with reach stackers, however, to increase the throughput capacity of the facility, within the identified boundaries, the operator may opt to use rubber-tyred gantry cranes.
- **Horizontal Container Transfer Operations:** Containers are envisaged to be moved between the quay and container stacks by means of terminal tractor-trailer units. Containers are collected by road trucks for transport by road.
- **Vehicle Access Control Operations:** Road trucks are envisaged to enter the Port through a new shared access road and security control facility to be developed near the Project

site. From here, trucks and light vehicles (staff, contractors, etc.) will enter the dedicated security access control facility of the CHF to collect or deliver containers. Heavy vehicles for container transport may be required to stage before entering the Port and CHF at a dedicated truck staging area of the PoRB.

- **Rail Operations:** Trains are envisaged to be shunted from and staged at the Mhlatuze rail yard to the west of the project site. Trains will be loaded at a new rail siding in the vicinity of the proposed CHF. The siding will consist of two rail lines, each accommodating a 50-wagon container train and locomotive. For the design throughput, loading is envisaged to be done with two reach stackers. Terminal tractor-trailer units will be used to transfer the containers from the storage yard to the rail siding.

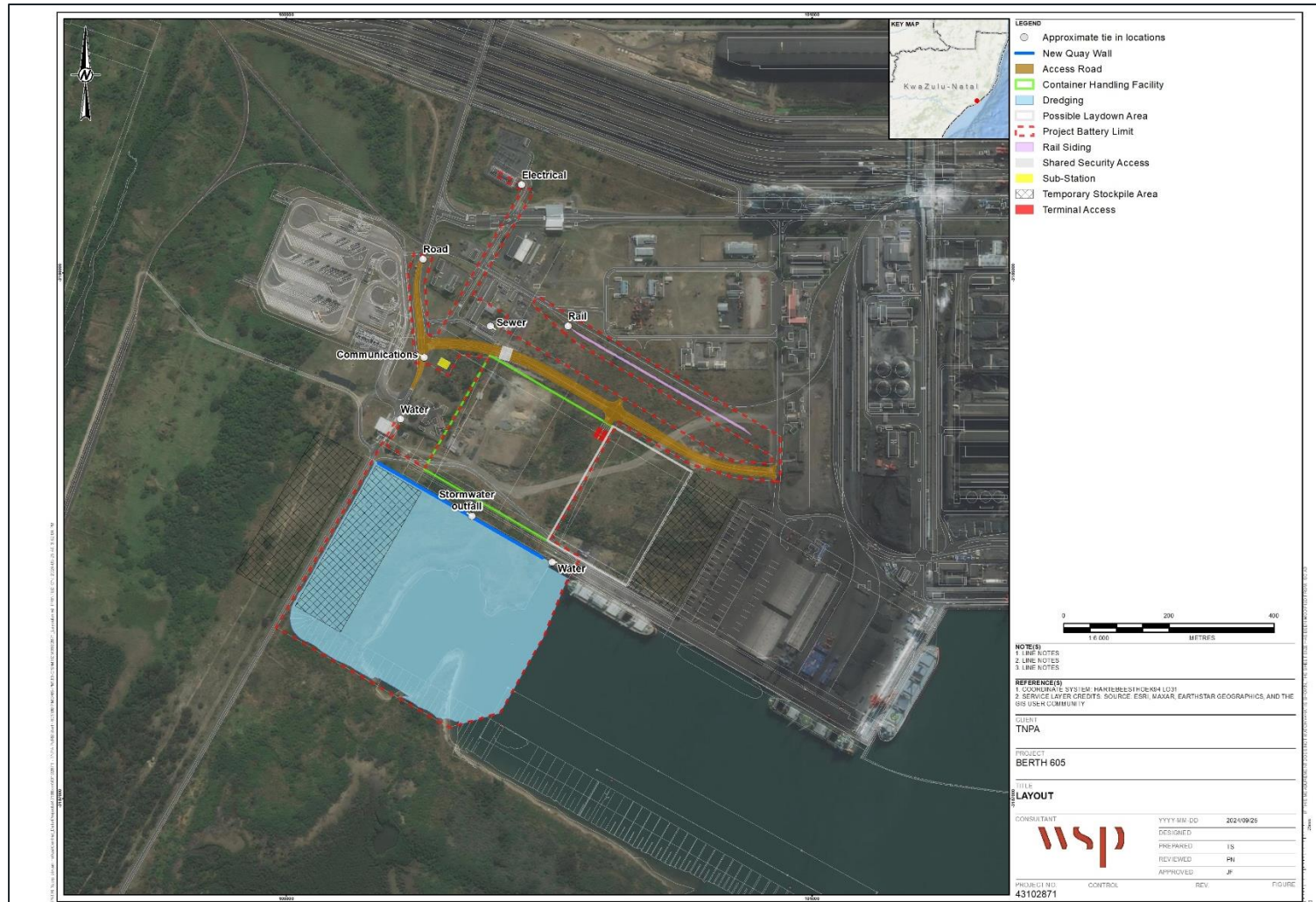


Figure 2: Proposed Project layout

4. ACOUSTIC FUNDAMENTALS

4.1. 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) (**Table 1**). 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

4.2. 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.

4.3. 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 3**). 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 3: Weighting curves

5. LEGISLATIVE FRAMEWORK

5.1. SOUTH AFRICAN LEGISLATION

5.1.1. 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 NEMA, as amended. The National Environmental Management: Air Quality Act 39 of 2004 (NEM:AQA) 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 NEM:AQA, 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, NEM:AQA 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.

5.1.2. 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 the EIA phase. 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.

5.2. 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 day-time 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.

5.3. 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, 2007). 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.

6. METHODOLOGY

To assess the environmental acoustic impacts of the operation of the proposed Project, both baseline (monitored) and proposed (calculated) noise levels were assessed. Comparisons of the existing and proposed noise levels at 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**) to determine the anticipated impacts/responses as a result of such increases.

It is noted that due to the erratic and transient nature of the construction phase, as well as the fact that 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.

6.1. ACOUSTIC MONITORING

Ambient sound level measurements were undertaken on 19 - 21 November 2024 at four on-site locations (including the Richards Bay Seafarers Club, which borders the Project to the west) and at the nearest off-site sensitive receptor location (Arboretum) (**Table 6** and **Figure 4**). It is noted, that although the Richards Bay Seafarers Club is not considered an industrial activity itself, it is located in an area zoned for industrial activities. As such, this receptor is classified as an “industrial” location as per the SANS 10103 rating levels and is assessed against the industrial guideline rating levels.

All sound 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 the SANS 10103:2008. This guides the selection of monitoring locations, microphone positioning and equipment specifications. Sound 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**.

Day-time and night-time measurements were conducted for fifteen minutes each, allowing monitoring to be adequately representative. The monitoring was conducted during the relevant timeframes 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.

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 Battery Limit Boundary (m)	Direction from Battery Limit Boundary	SANS Classification *
Pt 01	Richards Bay Seafarers Club	28.788775	32.027277	Onsite	-	Industrial F
Pt 02	Onsite (south)	28.790786	32.029722	Onsite	-	Industrial F
Pt 03	Onsite (east)	28.787647	32.031817	Onsite	-	Industrial F
Pt 04	Onsite (north)	28.785706	32.029226	Onsite	-	Industrial F
Pt 05	Arboretum Residential	28.764397	32.050931	3,110	Northeast	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 4: Noise monitoring locations surrounding the site

6.2. ACOUSTIC INVENTORY

The sources of noise identified during the operational phase of the proposed Project are presented in **Table 8**. These sources and sound power level (PWL) specifications (Bernardini *et al.*, 2024; GH Cranes, 2024; Liebherr, 2024; SANY, 2024; Kone Cranes, 2017; Muller-BBM, 2014; Khoo and Nguyen, 2011; Witte, 2009) were used as input into the acoustic calculations.

Table 8: Noise sources and sound power levels associated with the Project

Source	Location	Quantity	Specification/Type	PWL (dB(A))	SPL (dB(A)) at 1m
Mobile Harbour Cranes	Quay	3	LHM 420	110.0	102.0
Rubber-tyred Gantry Crane	Quay	6	-	94.0	86.0
Empty Container Handler	Quay	2	-	85.0	77.0
Terminal Tractor Trailer Units	Quay	15	-	90.0	82.0
Shipping Vessels	Berth 605	1 at a given time	Post Panamax I Max (6600 TEU, 315 m length)	92.4*	84.4
Trucks	New access road	1 at a given time	Interlink trucks or single trailer trucks	104.0	96.0
Trains	Rail siding	2 at a given time	43D, 15 km/h, 14 m wagons (x 50)	109.2**	101.2
Reach Stackers	Rail siding	2	-	107.0	99.0

PWL = Sound Power Level
SPL = Sound Pressure Level

* Includes noise from the ship engine itself and not the other auxiliary, intermittent sources associated with the vessel (fans, pumps, horns, sirens, public address systems etc).

** Includes noise from the converter motor, air compressor and exhaust valve. Noise from shunting will create an impulse noise level of ~78 dB(A) (CTA, 2011), which is not included here.

6.3. ACOUSTIC CALCULATIONS

This assessment represents a worst-case scenario, where it has been assumed that all equipment at each operational area (quay (including the Berth), road and rail siding) will be operational simultaneously at a location in closest proximity to the nearest receptor (i.e. the Richards Bay Seafarers Club). The sum (logarithmic) of the PWLs from all noise sources per location area listed above was utilised to calculate resultant noise levels at specified distances

from the Project site. Such resultant receptor noise levels were calculated using attenuation-over-distance acoustic calculations.

6.4. 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, residential areas and in more remote locations, individual farmhouses or farmsteads. The specific receptors considered in this study are the same as those locations selected in the monitoring campaign as presented in **Table 6** and **Figure 4**. It is noted, however, that only one of these receptors (Arboretum) is considered “sensitive”, but it is located ~3,110 m away from the Project site in a north-easterly direction. Although the Richards Bay Seafarers Club is not considered an industrial activity itself, it is located in an area zoned for industrial activities. As such, this receptor is not classified as a “sensitive” receptor.

7. ASSUMPTIONS AND LIMITATIONS

In this Environmental AIA, 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 and transient nature of the construction phase, as well as the fact that construction noise will be masked by the existing port operations, a quantitative assessment of construction phase acoustic impacts was not undertaken, but rather a qualitative discussion thereof.
- This assessment represents a worst-case scenario, where it has been assumed that all equipment at each operational area (quay, road and rail siding) will be operational simultaneously at a location in closest proximity to the nearest receptor (i.e. the Richards Bay Seafarers Club).
- The acoustic calculations do not take terrain or vegetation into account, thus representing an absolute worst-case.
- It was assumed that all cranes, handlers, tractor-trailer units and reach stackers (at rail siding) will be operational at the same time.
- It was assumed that one shipping vessel will be berthed at any given time.
- Noise from the shipping vessels only accounted for the ship engine noise itself and not the other auxiliary, intermittent sources associated with the vessel (fans, pumps, horns, sirens, public address systems etc).
- It was assumed, as a worst-case, that there will be two trains at the rail siding at a given time, since there will be two rail lines at the siding.
- For the train sources, noise from the converter motor, air compressor and exhaust valve were included. Noise from shunting will create an impulse noise level of ~78 dB(A) (CTA, 2011), which is not included in this assessment.
- It was assumed that one truck will be operational on the new access road at any given time (a location closest to the nearest receptor (Richards Bay Seafarers Club) was utilised in the calculations).

8. RESULTS

8.1. 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.

8.1.1. DAYTIME

The results from the daytime noise monitoring campaign conducted on 19 November 2024 are presented in **Table 9** and **Figure 5**. Conditions during the campaign were hot and clear with intermittent winds (up to 3.4 m/s). Noise levels at all on-site locations (including the Richards Bay Seafarers Club) were compared to the typical daytime rating level for noise in industrial (Class F) areas (70 dB(A)), while noise levels at the off-site residential location (Arboretum) were compared to the typical daytime rating level for noise in urban (Class C) areas (55 dB(A)).

Noise levels (L_{Aeq}) at all five monitoring locations were below the respective guideline rating levels. The main sources of noise identified at each location included:

- Pt 01 (Richards Bay Seafarers Club): Truck movement on a nearby gravel road, trucks idling and birds.
- Pt 02 (Onsite (south)): Port operations, truck movements, trucks idling and activities of workers.
- Pt 03 (Onsite (east)): Traffic at the port in the distance, birds and insects.
- Pt 04 (Onsite (north)): Traffic on port roads and at the entrance gate, vehicles idling and a reverse hooter.
- Pt 05 (Arboretum Residential): Vehicles on nearby roads, dogs and birds. Port activities were not audible.

From the daytime monitoring campaign, it is evident that the current noise climate surrounding the Project site is predominantly traffic and port-related, with smaller influences from natural sources like birds and insects. As one moves further from the site towards the residential area of Arboretum, the noise climate is dominated by traffic, dogs and birds, with port activities not being audible.

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
Pt 01	11:55	68.7	40.0	54.0	45.0	70	Yes
Pt 02	13:35	78.6	61.8	68.8	65.0	70	Yes
Pt 03	13:00	65.5	49.3	54.1	52.0	70	Yes
Pt 04	12:32	85.0	49.8	58.5	52.0	70	Yes
Pt 05	14:17	70.7	43.7	51.9	46.0	55	Yes

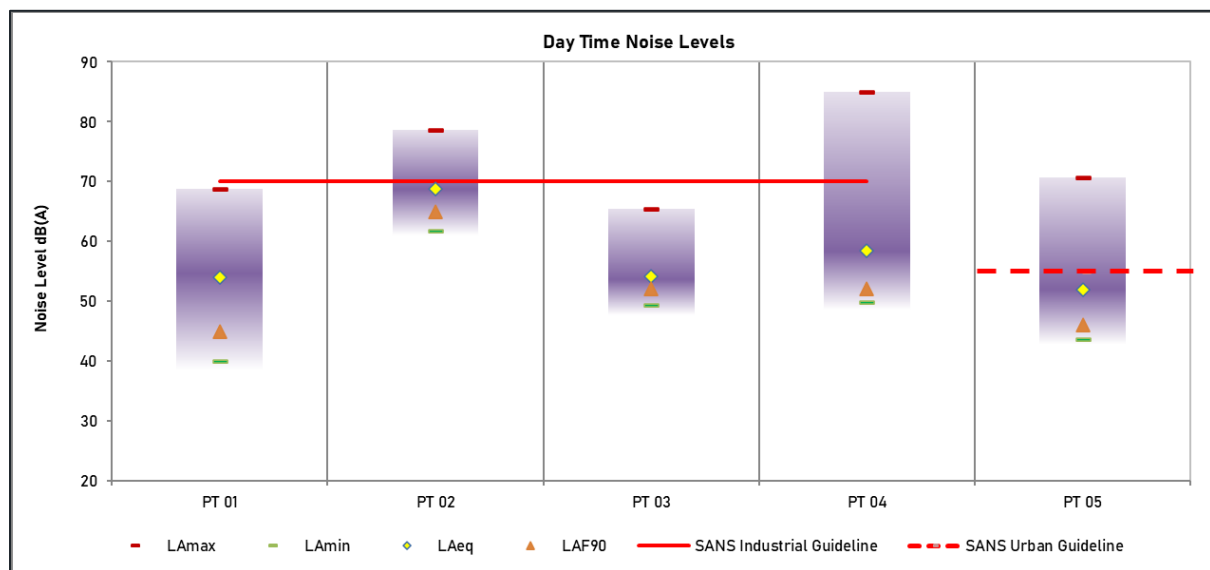


Figure 5: Daytime monitored noise levels. L_{Aeq} (yellow diamond) is compared with the SANS guideline.

8.1.2. NIGHT-TIME

The results from the night-time noise monitoring campaign conducted on 19 to 21 November 2024 are presented in **Table 10** and **Figure 6**. Conditions during the campaign were warm and clear, with generally calm conditions on both nights. Noise levels at all on-site locations (including the Richards Bay Seafarers Club) were compared to the typical night-time rating level for noise in industrial (Class F) areas (60 dB(A)), while noise levels at the off-site residential location (Arboretum) 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 two (Pt 02 and Pt 05) of the five monitoring locations exceeded the guideline level. The main sources of noise identified at each location include:

- Pt 01 (Richards Bay Seafarers Club): Truck movement on a nearby gravel road, trucks idling and insects.
- Pt 02 (Onsite (south)): Port operations including constant fan noise from nearby ships, truck movements, trucks idling, people talking and insects.
- Pt 03 (Onsite (east)): Distant vehicle movement and insects. Port activities were not audible.
- Pt 04 (Onsite (north)): Vehicle movement at port entrance, trucks idling and insects.
- Pt 05 (Arboretum Residential): Vehicles on nearby roads, dogs and insects. Port activities were not audible.

From the night-time monitoring campaign, it is evident that the current noise climate surrounding the Project site is predominantly traffic and port-related, with smaller influences from natural sources like insects. As one moves further from the site towards the residential area of Arboretum, the noise climate is dominated by traffic, dogs and insects, with port activities not being audible.

Table 10: Night-time 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
19 November 2024 (late night)							
Pt 01	22:00	68.4	47.1	55.3	48.5	60	Yes
Pt 02	23:55	78.1	64.0	66.9	66.0	60	No
Pt 03	23:26	57.1	45.1	48.4	47.0	60	Yes
Pt 04	23:06	84.1	51.7	61.5	55.0	60	No
Pt 05	22:35	67.0	35.4	45.4	37.0	45	No
20 November 2024 (early morning)							
Pt 01	01:45	74.7	48.2	55.1	50.0	60	Yes
Pt 02	01:11	77.6	64.1	66.6	65.5	60	No
Pt 03	00:44	61.6	47.2	50.7	49.0	60	Yes
Pt 04	00:24	78.2	47.6	60.0	51.5	60	Yes
Pt 05	02:16	56.3	33.6	36.6	34.5	45	Yes
20 November 2024 (late night)							
Pt 01	22:50	69.2	47.8	54.7	50.5	60	Yes
Pt 02	00:05	78.7	64.7	68.2	66.5	60	No
Pt 03	23:38	63.7	44.6	47.0	46.0	60	Yes
Pt 04	23:18	75.1	45.8	55.8	48.0	60	Yes
Pt 05	22:08	66.6	36.0	47.6	39.0	45	No
21 November 2024 (early morning)							
Pt 01	01:58	70.7	47.3	56.3	49.0	60	Yes
Pt 02	01:20	76.0	65.1	67.9	66.5	60	No
Pt 03	00:55	59.2	46.1	49.6	47.5	60	Yes
Pt 04	00:34	72.1	44.6	55.5	48.0	60	Yes
Pt 05	02:30	72.7	31.1	46.9	34.0	45	No
Logarithmic Averages							
Pt 01		71.5	47.6	55.4	49.6	60	Yes
Pt 02		77.7	64.5	67.5	66.1	60	No
Pt 03		61.1	45.9	49.1	47.5	60	Yes
Pt 04		79.7	48.3	59.0	51.6	60	Yes
Pt 05		68.5	34.4	45.6	36.6	45	No

Note: Exceedances of the SANS guideline are highlighted in red

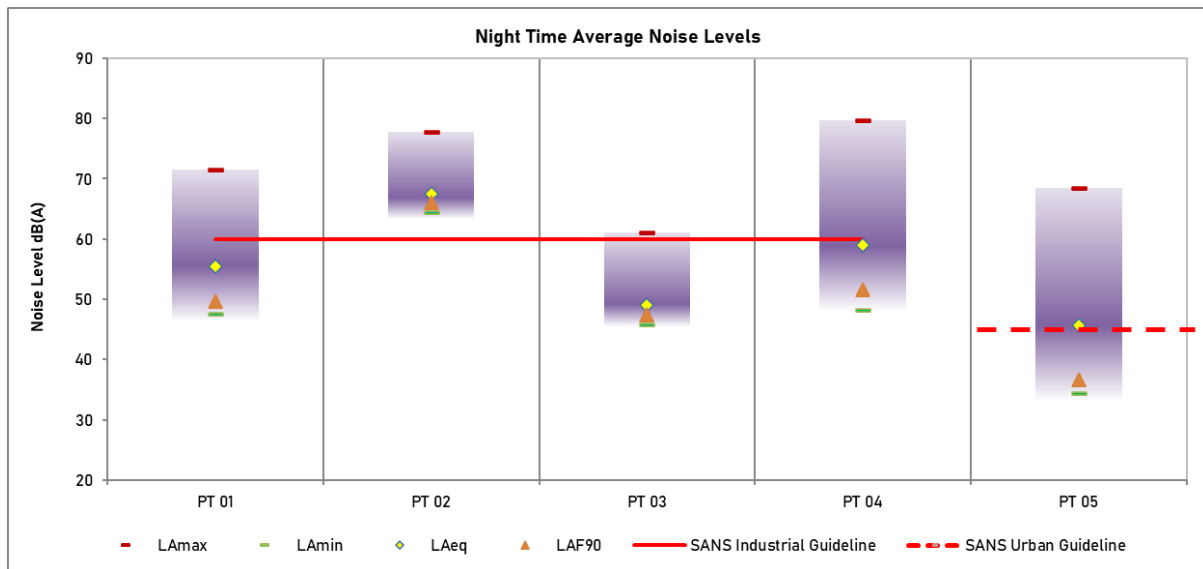


Figure 6: Night-time average (logarithmic) monitored noise levels. L_{Aeq} (yellow diamond) is compared with the SANS guideline.

8.2. PREDICTED NOISE CLIMATE

8.2.1. CONSTRUCTION PHASE

Unlike general industry, construction activities are not always stationary and in one location. Construction activities at the site will include excavation works, dredging/dumping, civil works (including surveying), reinforced concrete works, masonry works, façade works, floor works, carpentry works as well as mechanical, plumbing/sewerage and electrical installation works. Due to the erratic and transient nature of such construction activities, noise impacts from the construction phase of the Berth 605 Project could not be quantified.

It is understood that the quay excavation will be through rock in the lower portions, which being weak is expected to be excavated via mechanical means. The new quay wall will be cast with in-situ concrete with a soil back fill. After construction of the quay wall the ground behind the wall will be backfilled with granular material. The basin will then be dredged using a cutter suction dredger to the required dredged depth to match the existing basin.

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

8.2.1.1. Mitigation Recommendations

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

- 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.
- Using noise control devices, such as temporary noise barriers and deflectors for high impact activities, and exhaust muffling devices for combustion engines.
- Selecting equipment with the lowest possible sound power levels.
- Ensuring equipment is well-maintained to avoid additional noise generation.
- Installing acoustic enclosures for equipment causing radiating noise.
- Reducing any project traffic through community areas where possible.

- Developing a mechanism to record and respond to complaints.
- Ensuring all onsite personnel are equipped with the correct personal protective equipment (PPE) including noise control hearing devices.

8.2.2. OPERATIONAL PHASE

Since the operational phase activities will occur in three different locations (the quay area, the road and the rail siding), calculations of noise levels at the receptors (monitoring locations) were calculated for noise emanating from each of these locations. A cumulative noise level calculation was then applied to determine the overall noise level at each receptor location.

The predicted day-time and night-time noise levels at the specified receptor locations associated with the noise sources at the quay area are presented in **Table 11** and **Table 12**, respectively. The predicted day-time and night-time noise levels at the specified receptor locations associated with the noise sources at the rail siding are presented in **Table 13** and **Table 14**, respectively. The predicted day-time and night-time noise levels at the specified receptor locations associated with trucks operating on the new access road are presented in **Table 15** and **Table 16**, respectively. The predicted cumulative day-time and night-time noise levels at the specified receptor locations associated with all activities are presented in **Table 17** and **Table 18**, 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.

Day-time noise levels at the onsite monitoring locations (including Rec 01 (Richards Bay Seafarers Club)) are anticipated to increase by between 0.6 and 11.8 dB(A) with the operation of the Project. Cumulative noise levels at all these locations remain below the industrial guideline rating level (70 dB(A)). Night-time noise levels at the onsite monitoring locations (including Rec 01 (Richards Bay Seafarers Club)) are anticipated to increase by between 0.8 and 12.6 dB(A) with the operation of the Project. The larger increase at night-time is attributed to the lower baseline noise levels at this time. Cumulative night-time noise levels at all these locations are predicted to exceed the industrial guideline rating level (60 dB(A)). It must be noted that these locations are all onsite, within the site boundary and not on the fenceline, where compliance applies. Furthermore, there are no sensitive receptors within the immediate vicinity of the site.

As a receptor location with regular occupants, the Richards Bay Seafarers Club (Rec 01) will experience the largest increase in noise levels (+11.8 dB(A) during the day and +10.5 dB(A) at night). Such a change is above the 7 dB(A) threshold for annoyance as per the Noise Control Regulations, resulting in medium to strong community response, with complaints anticipated. It is noted, however, that although the Richards Bay Seafarers Club is not considered an industrial activity itself, it is located in an area zoned for industrial activities, so the occupants would essentially be accustomed to industrial type ambient noise levels. As such, this location is not classified as a “sensitive receptor”.

Predicted day and night-time noise levels at the only sensitive receptor (Rec 05 – Arboretum) are well below the respective urban guideline rating levels. With the operation of the Project,

noise levels are predicted to increase by between 0.2 and 0.9 dB(A), resulting in “little” community/group response. It is noted that such increases are well below the 7 dB(A) threshold for annoyance as per the Noise Control Regulations. Such increases are also well below the IFC’s more stringent threshold for annoyance of 3 dB(A). As such, these increases are likely to go unnoticed.

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

Table 11: Predicted day-time noise levels at specified receptor locations associated with activities at the quay

Receptor	Current Noise Level (dB(A))	Predicted Noise Level (dB(A))	Cumulative Noise Level (dB(A))*	Change (dB(A))
Rec 01	54.0	64.6	65.0	+11.0
Rec 02	68.8	59.3	69.3	+0.5
Rec 03	54.1	53.1	56.6	+2.5
Rec 04	58.5	53.1	59.6	+1.1
Rec 05	51.9	36.0	52.0	+0.1

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

Table 12: Predicted night-time noise levels at specified receptor locations associated with activities at the quay

Receptor	Current Noise Level (dB(A))	Predicted Noise Level (dB(A))	Cumulative Noise Level (dB(A))*	Change (dB(A))
Rec 01	55.4	64.6	65.1	+9.7
Rec 02	67.5	59.3	68.1	+0.6
Rec 03	49.1	53.1	54.5	+5.4
Rec 04	59.0	53.1	60.0	+1.0
Rec 05	45.6	36.0	46.0	+0.4

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

Table 13: Predicted day-time noise levels at specified receptor locations associated with activities at the rail siding

Receptor	Current Noise Level (dB(A))	Predicted Noise Level (dB(A))	Cumulative Noise Level (dB(A))*	Change (dB(A))
Rec 01	54.0	56.8	58.6	+4.6
Rec 02	68.8	54.5	69.0	+0.2
Rec 03	54.1	60.7	61.6	+7.5
Rec 04	58.5	62.0	63.6	+5.1
Rec 05	51.9	36.1	52.0	+0.1

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

Table 14: Predicted night-time noise levels at specified receptor locations associated with activities at the rail siding

Receptor	Current Noise Level (dB(A))	Predicted Noise Level (dB(A))	Cumulative Noise Level (dB(A))*	Change (dB(A))
Rec 01	55.4	56.8	59.2	+3.8
Rec 02	67.5	54.5	67.7	+0.2
Rec 03	49.1	60.7	61.0	+11.9
Rec 04	59.0	62.0	63.7	+4.7
Rec 05	45.6	36.1	46.1	+0.5

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

Table 15: Predicted day-time noise levels at specified receptor locations associated with trucks on the new access road

Receptor	Current Noise Level (dB(A))	Predicted Noise Level (dB(A))	Cumulative Noise Level (dB(A))*	Change (dB(A))
Rec 01	54.0	52.5	56.3	+2.3
Rec 02	68.8	43.0	68.8	0.0
Rec 03	54.1	43.0	54.4	+0.3
Rec 04	58.5	47.2	58.8	+0.3
Rec 05	51.9	25.3	51.9	0.0

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

Table 16: Predicted night-time noise levels at specified receptor locations associated with trucks on the new access road

Receptor	Current Noise Level (dB(A))	Predicted Noise Level (dB(A))	Cumulative Noise Level (dB(A))*	Change (dB(A))
Rec 01	55.4	52.5	57.2	+1.8
Rec 02	67.5	43.0	67.5	0.0
Rec 03	49.1	43.0	50.0	+0.9
Rec 04	59.0	47.2	59.3	+0.3
Rec 05	45.6	25.3	45.6	0.0

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

Table 17: Predicted cumulative day-time noise levels at specified receptor locations from all operational sources

Receptor	Current Noise Level (dB(A))	Predicted Noise Level (dB(A))	Cumulative Noise Level (dB(A))*	Change (dB(A))	Estimated Community Response**
Rec 01	54.0	65.5	65.8	+11.8	Medium to strong
Rec 02	68.8	60.6	69.4	+0.6	-
Rec 03	54.1	61.5	62.2	+8.1	-
Rec 04	58.5	62.6	64.0	+5.5	-
Rec 05	51.9	39.2	52.1	+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)

Table 18: Predicted cumulative night-time noise levels at specified receptor locations from all operational sources

Receptor	Current Noise Level (dB(A))	Predicted Noise Level (dB(A))	Cumulative Noise Level (dB(A))*	Change (dB(A))	Estimated Community Response**
Rec 01	55.4	65.5	65.9	+10.5	Medium to strong
Rec 02	67.5	60.6	68.3	+0.8	-
Rec 03	49.1	61.5	61.7	+12.6	-
Rec 04	59.0	62.6	64.2	+5.2	-
Rec 05	45.6	39.2	46.5	+0.9	Little

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

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

8.2.2.1. Mitigation Recommendations

Given the minimal impact of the operation of the Project on surrounding receptors, additional mitigation interventions are not required. However, should TNPA want to improve the overall noise climate onsite or further ensure that noise does not become an issue offsite, the following mitigation options can be employed (IFC, 2007a):

- Ensuring equipment with the lowest sound power level specifications are selected for the Project.
- Installing suitable mufflers on engine exhausts.
- Installing acoustic enclosures for equipment causing radiating noise.
- Locating noise sources in less sensitive areas to take advantage of distance and shielding.
- Installing acoustic barriers without gaps and with a continuous minimum surface density of 10 kg/m² in order to minimize the transmission of sound through the barrier. Barriers should be located as close to the source or to the receptor location to be effective.
- Developing a mechanism to record and respond to complaints.

8.2.2.2. Cumulative Impacts

It is understood that numerous other projects are being proposed within the PoRB in the foreseeable future (**Figure 7**). As such, the cumulative impacts of this Project and these proposed initiatives need to be considered. Projects 1,2 and 15 are to be seen as short term i.e. within 5 years. Projects 1 and 15 will require dredging. There will also be refurbishing of the breakwater at the entrance of the Port between 2a and 14 (as indicated in **Figure 7**). Project 11, 9 and 13 to be considered for the medium term.

Based on distance from Berth 605, cumulative impacts are only considered with projects 6, 7, 8, 9 and 11. Noise sources and impacts from such projects are anticipated to be minimal. Additionally, based on the location of the Berth 605 Project away from sensitive receptors, the cumulative impacts of these new initiatives are anticipated to be low.

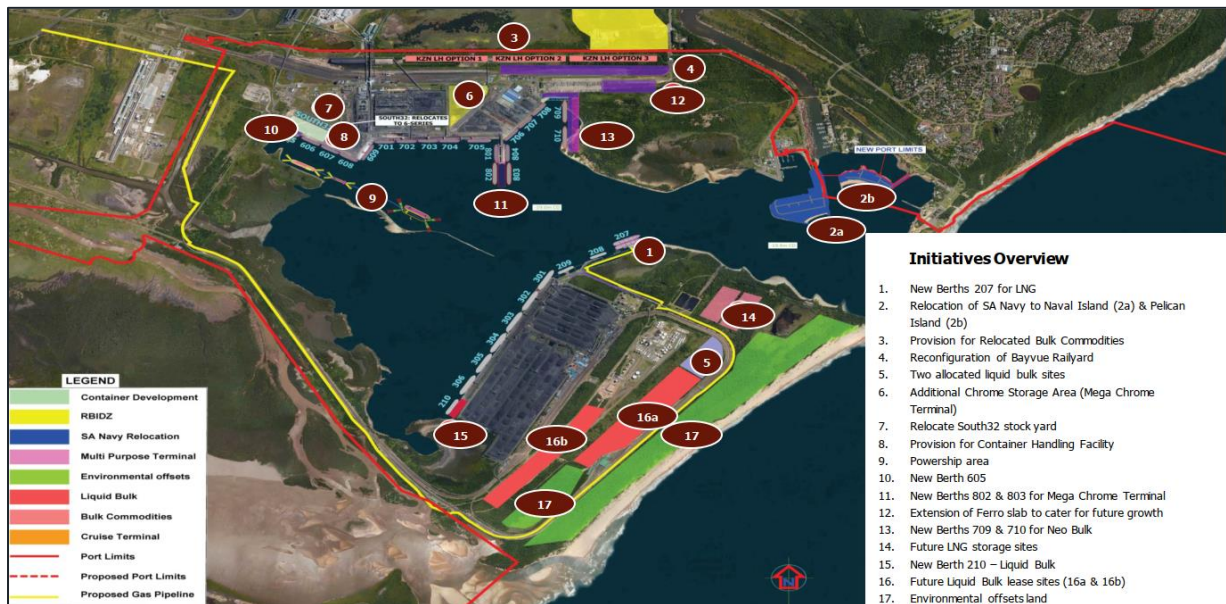


Figure 7: Proposed projects within the Port of Richards Bay

8.3. NO-GO OPTION

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

9. ASSESSMENT OF IMPACTS

The purpose of this Environmental AIA 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.
- Cumulative operational phase impacts of noise on sensitive receptors (including other proposed projects).

Outcomes of the Environmental AIA are contained within **Table 19**, presenting the impact of each parameter and the resulting risk level.

Table 19: Impact assessment of risks associated with 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	3	3	1	1	2	16 (Low)	2	2	1	1	1	6 (Very Low)
Environmental Noise	Noise impact on surrounding sensitive receptors	Operational Phase	Negative	Moderate	3	1	1	4	2	18 (Low)	2	1	1	4	1	8 (Very Low)
Environmental Noise	Noise impact on surrounding sensitive receptors	Operational Phase (cumulative)	Negative	Moderate	3	3	1	4	2	22 (Low)	2	2	1	4	1	9 (Very Low)

10. CONCLUSIONS

This Environmental AIA investigated noise associated with the operation of the Berth 605 Project. To assess the existing noise climate in the area surrounding the Project site, ambient noise monitoring was conducted at four on-site locations (including the Richards Bay Seafarers Club, which borders the Project to the west) and at the nearest off-site sensitive receptor location (Arboretum residential). 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 attenuation-over-distance acoustic calculations. It is noted, that 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 port operations, a quantitative assessment of construction phase acoustic impacts was not undertaken, but rather a qualitative discussion thereof.

Baseline monitoring indicated current day-time noise levels were below the respective SANS guideline rating level at all of the monitoring locations. At night, average noise levels at two of the five monitoring locations (Pt 02 (onsite south) and Pt 05 (Arboretum residential)) exceeded the respective guideline rating level. From the day-time and night-time monitoring campaigns it is evident that the current noise climate surrounding the Project site is predominantly anthropogenic in nature (traffic and port-related), with influences from natural sources like birds and insects.

During the operational phase of the Project, day-time noise levels at the onsite monitoring locations (including Rec 01 (Richards Bay Seafarers Club)) are anticipated to increase by between 0.6 and 11.8 dB(A). Cumulative noise levels at all these locations remain below the industrial guideline rating level (70 dB(A)). Night-time noise levels at the onsite monitoring locations (including Rec 01 (Richards Bay Seafarers Club)) are anticipated to increase by between 0.8 and 12.6 dB(A) with the operation of the Project. The larger increase at night-time is attributed to the lower baseline noise levels at this time. Cumulative night-time noise levels at all these locations are predicted to exceed the industrial guideline rating level (60 dB(A)). It must be noted that these locations are all onsite, within the site boundary and not on the fenceline, where compliance applies. Furthermore, there are no sensitive receptors within the immediate vicinity of the site.

As a receptor location with regular occupants, the Richards Bay Seafarers Club (Rec 01) will experience the largest increase in noise levels (+11.8 dB(A) during the day and +10.5 dB(A) at night). Such a change is above the 7 dB(A) threshold for annoyance as per the Noise Control Regulations, resulting in medium to strong community response, with complaints anticipated. It is noted, however, that although the Richards Bay Seafarers Club is not considered an industrial activity itself, it is located in an area zoned for industrial activities, so the occupants would essentially be accustomed to industrial type ambient noise levels. As such, this location is not classified as a “sensitive receptor”.

Predicted day and night-time noise levels at the only sensitive receptor (Rec 05 – Arboretum) are well below the respective urban guideline rating levels. With the operation of the Project, noise levels are predicted to increase by between 0.2 and 0.9 dB(A), resulting in “little” community/group response. It is noted that such increases are well below the 7 dB(A) threshold for annoyance as per the Noise Control Regulations. Such increases are also well below the IFC’s more stringent threshold for annoyance of 3 dB(A). As such, these increases are likely to go unnoticed.

Based on both the day and night-time results presented here, acoustic impacts on sensitive receptors due to the operation of the proposed Project are not predicted and noise-related complaints from receptors are not anticipated. As such, it is recommended that the Project be authorised with no special acoustic-related conditions applicable.

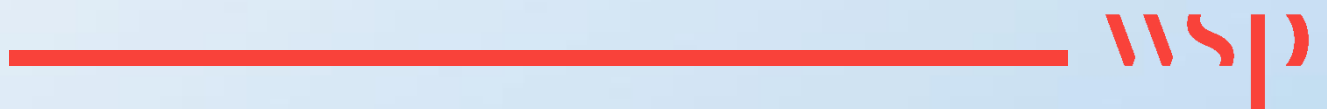
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Appendix A

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



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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.



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**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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**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 A**.

Table A: 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:	$[S = (E + D + R + M) \times P]$ <i>Significance = (Extent + Duration + Reversibility + Magnitude) × Probability</i>				
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

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 (5) 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** below.

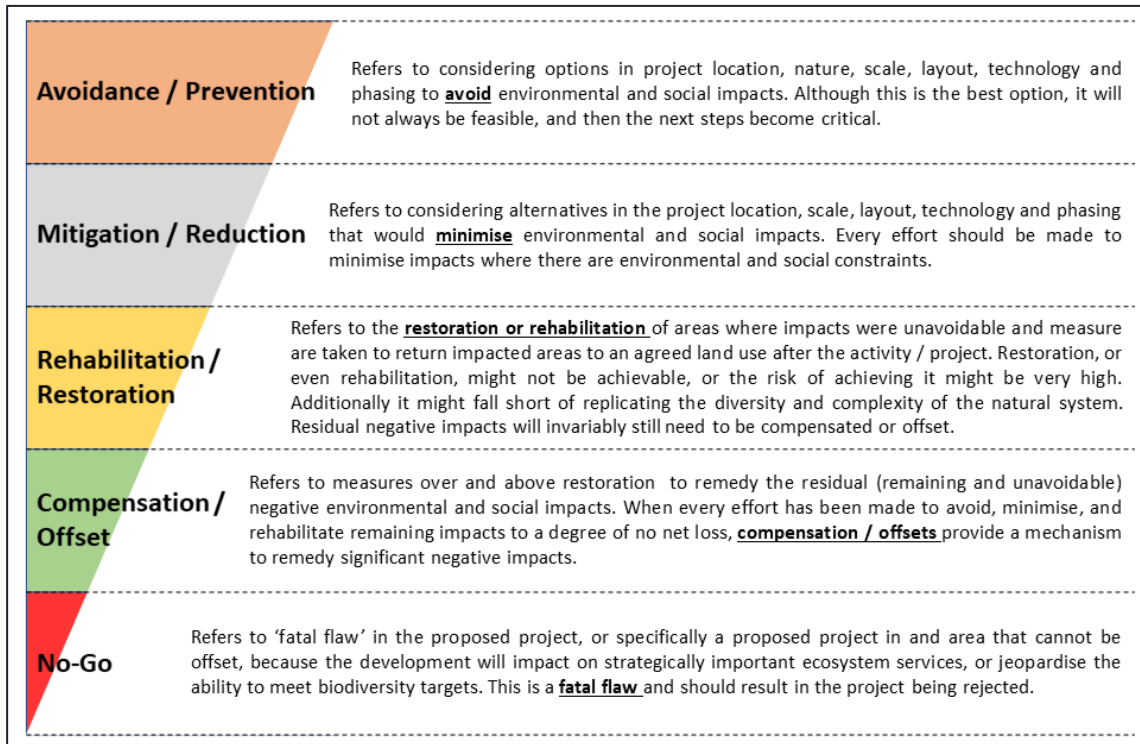


Figure A: Mitigation Sequence/Hierarchy



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