




# SPECIALIST ASSESSMENT



NOISE BASELINE ASSESSMENT FOR PIONEER MINERALS (PTY) LTD  
FARM REMHOOGTE 152 PROSPECTING RIGHT - NORTHERN CAPE.



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## DECLARATION OF OBJECTIVENESS-

I, **Anton Botha**, in my capacity as a specialist consultant, hereby declare that I: -

- Act as an independent consultant;
- Do not have any financial interest in the undertaking of this project, other than remuneration for the work performed in terms of the National Environmental Management Act 107 of 1998;
- Have and will not have vested interest in the proposed and/or existing activity nor will I engage myself in any conflicting interest associated with this project;
- I undertake to disclose and provide to the competent authority any material or information at my disposal regarding this project as required in terms of National Environmental Management Act 107 of 1998;
- Based on the information provided to me by the client and in addition to information obtained during the course of this study, I have presented the results and conclusion with regard to this project to the best of my professional ability;
- I reserve the right to modify aspects pertaining to this study should additional information become available through ongoing research and further work on this field;
- I undertake to have my work peer reviewed on a regular basis by a competent specialist in the field of study;
- I am duly qualified and experienced to undertake the work at hand;




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Anton Botha (Environmental Consultant)

Environmental Consultant	Relevant expertise
Anton Botha	Has completed a B.Sc. in Environmental Sciences, followed by a B.Sc. (Hons) and M.Sc. specialising in Hydrogeology and Hydrology. Anton has comprehensive experience and knowledge on compliance monitoring, project management and specialist reporting. As an environmental consultant, Anton has provided several environmental monitoring assessments, specialist input services, mine closure quantum's and environmental audits.

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## EXECUTIVE SUMMARY

This document has been prepared by Environmental Assurance (Pty) Ltd [ENVASS] as an independent environmental consultancy firm as appointed by Pioneer Minerals (Pty) Ltd. to undertake a noise baseline assessment for the proposed prospecting right on Farm 152 Remhoogte, Northern Cape Province.

Pioneer Minerals (Pty) Ltd is in the process of applying for a prospecting right including bulk sampling by means of opencast pitting and trenching methods using heavy earthmoving machinery. Currently mining is present at the centre of the farm, while the prospecting right application includes the remaining northern and southern extent portions. The prospecting evaluation activities is planned for five years where a total of 250 000 m<sup>3</sup> (trenching) and 1 350 m<sup>3</sup> (pitting) of ore will be processed. The proposed northern and southern prospecting areas, consisting of the remaining Remhoogte Farm 152 extent (2512.2808 hectares) will constitute as the study area for the baseline assessment.

The South African National Standard, SANS 10103:2008, describes nuisance sound (annoyance by generated noise) as: “the general negative reaction of the community or person to a condition creating displeasure or interference with specific activities. Additionally, the nuisance of noise can be described as sound which is perceived as very loud, disturbing or negatively affecting hearing.” A noise nuisance, however, does not equal noise pollution (as mentioned). Noise pollution is when normal anthropogenic and ecological functions (reproduction of birds or frogs), human health and/or wellbeing and any other normal function of the environment, present during baseline conditions in most natural to semi-natural areas, are inhibited or affected by newly generated noise.

ENVASS responded by conducting a thorough baseline environmental noise assessment, in line with the requirements of the South African National Standard 10103 (“The measurement and rating of environmental noise with respect to annoyance and to speech communication”). The prospecting right application includes the remaining portion of the Farm 152 Remhoogte extent. The land use for the sites is characterised by mining and is surrounded by rural areas and directly bounded to surrounding farmland.

The field survey relevant to this noise baseline assessment report was conducted on the 4<sup>th</sup> and 5<sup>th</sup> of June 2019. This report and the accompanying data will be used to provide input into the current ambient conditions and relevant impacts relating to the proposed prospecting activity.

### Results and Impact Statement

By measuring the noise levels at twelve (12) boundary localities, the baseline conditions could be determined before the prospecting commences. In the vicinity of Remhoogte, the closest sensitive receptors identified in the area are the local farms and a local school regarding the rural area around the proposed prospecting area. Direct measurements during the day-time and night-time was recorded, where several exceedances were noted in terms of the rural district limits. Only two

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points – NM03 and NM11 recorded compliant to the day-time limits, while all night-time assessment readings were above the SANS10103:2008 stipulated thresholds. It should be noted that the strictest limit was used and several areas where only ambient environmental sounds were present already exceeded the day and night-time limits.

### **Specialist's Recommendation**

Prospecting of the mine unto the proposed areas will generate noise and could result in increased exceedances if not correctly mitigated, this could in turn lead to *sporadic complaints*, while in very rare cases, to *threats of the community or possible group action*. As various activities could contribute to noise generation, it is important to determine the extent of noise generated by specified activities. This can in turn lead to the management and mitigation of noise generating activities by means of implementing different measures with the aim of preventing the noise generated from becoming noise pollution. Due to current mining being active at the centre of the farming area, the sound levels should not pose a threat to the surrounding land users.

Considering the project as a whole, it is the specialist's opinion that the proposed development continues, provided that the mitigation measures presented within this report and the approved site EMPr be strictly implemented and subsequently monitored. Additionally, a complaints register is recommended to be kept on site at all times.

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## GLOSSARY

A list of commonly used acronyms, terms, measurement units and definitions are included below for the purpose of ensuring uniformity in the interpretation of this report:

<b>ABBREVIATIONS</b>	
<b>ASTM</b>	American Society for Testing and Materials
<b>Average period</b>	Period of time over which the average value is determined.
<b>ENVASS</b>	Environmental Assurance (Pty) Ltd.
<b>Non-residential area</b>	Means any area not classified for residential use as per local town planning scheme.
<b>Residential area</b>	Means any area classified for residential use in terms of the local town planning scheme.
<b>SANS</b>	South African National Standards - Means the South African National Accreditation System establish by Section 3 of the Accreditation for Conformity Assessment Calibration and Good Laboratory Practices Act 19 of 2006.

<b>DEFINITIONS</b>	
Ambient Sound Level	<p>Consistent with the national Noise Regulations which was promulgated in terms of the Environment Conservation Act (ECA), ambient sound level means the reading on an integrating impulse sound level meter taken at a measuring point in the absence of any alleged disturbing noise at the end of a total period of at least 10 minutes, after such a meter has been put into operation.</p> <p>For the purposes of this study ambient noise will be defined as the total surrounding sound in a given position at a given time, and is usually composed of sound from a variety of emitting sources, both far (in which case it will be softer) and near.</p>
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') sound. 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.
dB or dBA	The Decibel, the dB (or dBA) is not the unit of sound. The human ear is a phenomenally sensitive instrument that can detect fluctuations in air pressure over an extremely wide range of amplitudes. This makes the handling of sound quantities in absolute terms, i.e. Pascal (Pa), very cumbersome. 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

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	sound measurement quantities. The attached 'A' indicates that the sound measurement has been A-weighted.
L <sub>Aeq</sub>	(The equivalent A-weighted sound pressure level). This is internationally the most often used parameter to measure noise in relation to human responses.
L <sub>Amax</sub>	The maximum sound pressure level of a noise event, normally measured on an A-weighted decibel scale.
L <sub>Leq</sub>	(The equivalent sound pressure level). This is in essence a time-averaged sound measurement. Sound continuously fluctuates as a function of time. In order to effectively assess the effect of sound or noise on human beings it is very often necessary to obtain a measure of the average exposure to the sound or noise.
Noise	Noise is generally defined as unwanted sound.
Noise nuisance	Noise nuisance means any sound which disturbs or impairs or may disturb or impair the convenience or peace of any person.
Nuisance	A legal definition of a noise that offends or upsets the receiver because it is occurring at the wrong time in the wrong place or is of a character that annoys due to excessive tonal components or impulses.
Quest Technologies SoundPro	Sound Level Meter used.
Sound	Sound is small fluctuations in air pressure (measured in N/m <sup>2</sup> , or Pascal) that are transmitted as vibrational energy via the medium (air) from the source to the receiver. The human ear is in essence a pressure transducer, which converts these small fluctuations in air pressure into electrical signals, which the brain then interprets as sound.
Sound or Noise Level	A sound or noise level is a sound measurement that is expressed in terms of dB or dBA.

# 1 INTRODUCTION AND BACKGROUND

## 1.1 INTRODUCTION

Environmental Assurance (Pty) Ltd (ENVASS), as independent environmental consultants, was appointed by Pioneer Minerals (Pty) Ltd. to assess the baseline noise quality for the proposed prospecting activity on the remaining extent of Farm Remhoogte 152 - Northern Cape Province (refer to Figure 1). This document reports on results and outlines findings and conclusions.

By measuring the noise levels at and surrounding the boundaries, the baseline conditions could be determined for the prospecting areas. The layout of the noise monitoring should provide a comparison between actual and expected residual noise emanating from the site or prospecting (a possible cause of annoyance or noise pollution) and serve as useful information to inform responsible environmental management decision making. The noise assessment is conducted in line with the requirements of the South African National Standard 10103 (“The measurement and rating of environmental noise with respect to annoyance and to speech communication”).

Processes associated with the prospecting of the mine complex and associated future expansion do produce noise. The main purpose of this baseline assessment is to determine the level of noise that is currently present at Remhoogte Farm 152 and how to manage it before it becomes either a nuisance or a source of noise pollution.

Generated noise can become a nuisance (or health risk) when it is not properly managed and mitigated. Noise can be a concern to the surrounding land users and receiving environment. It is important to determine the extent of noise generated by the activities which can in turn lead to the management and mitigation of noise generating activities by means of implementing different measures with the aim of preventing the noise generated from being perceived as a nuisance.

## 1.2 DESCRIPTION OF STUDY AREA

The Remhoogte project is situated approximately 85km southwest of Douglas which, in turn, is situated 110km southwest of Kimberley, the administrative capital of the Northern Cape Province and the historic centre of the South African diamond mining industry. The Remhoogte project is located on the south bank of the Orange River in the Prieska district of the Northern Cape Province.

Pioneer Minerals (Pty) Ltd is in the process of applying for a prospecting right with bulk Sampling, for the prospecting of alluvial diamonds, diamonds in general and Kimberlite diamonds on the listed properties next to the Middle Orange River. The prospecting operation is based on alluvial diamondiferous gravels that will be sampled by means of opencast pitting and trenching methods using heavy earthmoving machinery. Vegetated soil is stripped where required and the underlying gravels are excavated, screened and treated through a Pan Plant. No ore processing reagents are required or used in the treatment of the ore. The rough diamond product is then removed from site for further beneficiation. Currently mining is

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present at the centre of the farm, while the prospecting right application includes the remaining northern and southern extent portions. The total duration of the prospecting and evaluation activities is planned for five years, during which a total of 250 000 m<sup>3</sup> (trenching) and 1 350 m<sup>3</sup> (pitting) of ore will be processed from the prospecting areas.

Communities and villages in the area include:

- Surrounding agricultural farming areas;
- Prieska ±28 km southwest of the Remhoogte prospecting area.

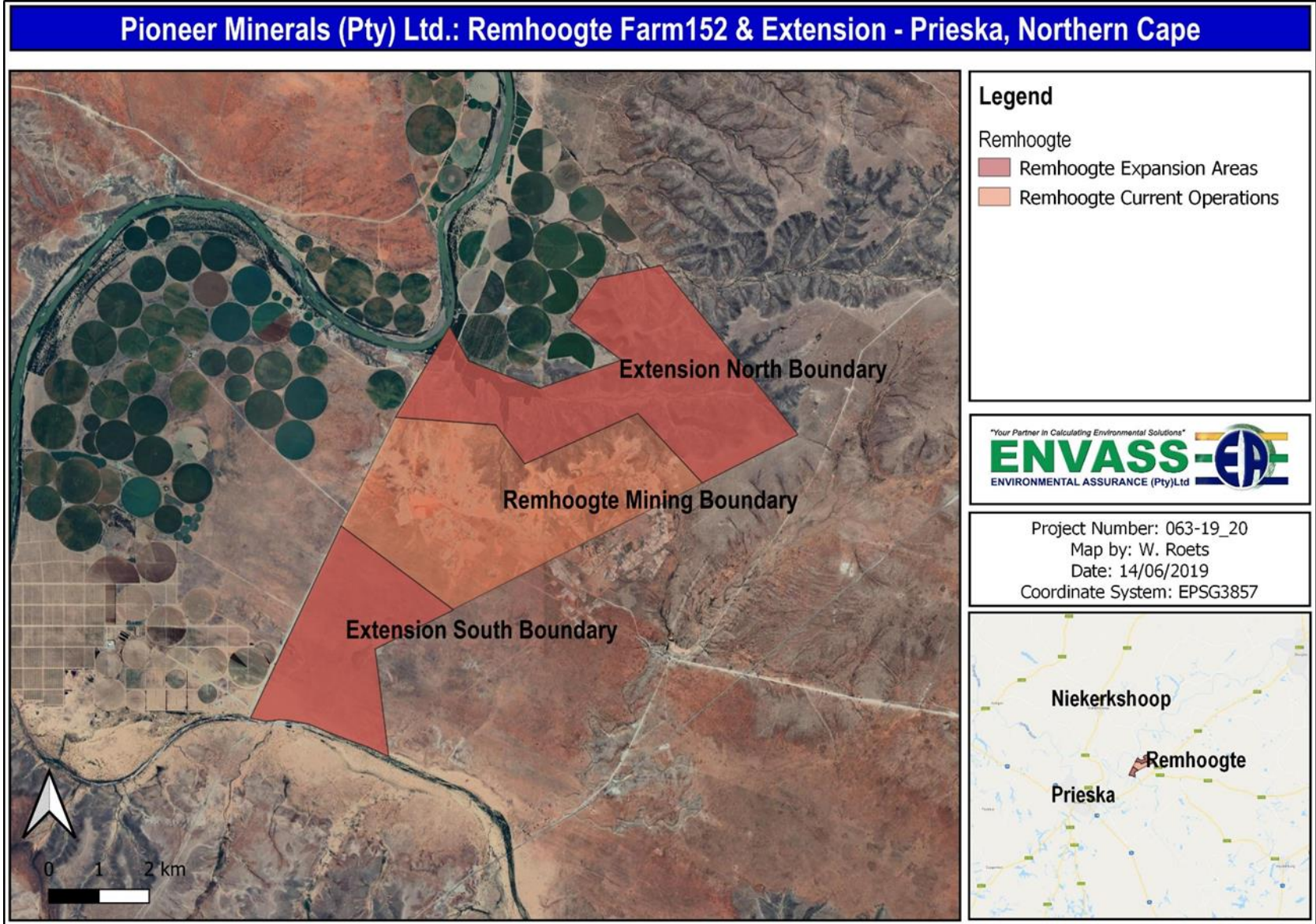
### 1.2.1 DEMOGRAPHY

According to the Municipal Capacity Assessment from the Siyathemba Local Municipality (2018) the Siyathemba Local Municipality has a population of 21 562 in 5 800 households', with the majority of the population being high density. The district has an unemployment rate of 24.3% and a rising dependency ratio of 58%. Overall formal housing dominates the sector (88.4%), while informal settlements calculate to 10.6% of the population.

Various actions and activities add to noise levels measured in the vicinity of the prospecting area and can be classified as noise generators. These include, but are not limited to:

- The main gravel roads;
- Surface mobile equipment (Excavators, reverse hooters etc.); and
- Ambient noise from the physical environment (wind, birds, insects etc.)

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**Figure 1: Remhoogte Farm 152 Current Mining and Prospecting Boundaries (Northern and Southern) Map**

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## 1.3 LEGISLATIVE CONTEXT

### 1.3.1 National Environmental Management Act

Section 28(1) of the National Environmental Management Act 107 of 1998 (NEMA) places a general duty of care on any person who causes pollution, to take reasonable measures to prevent such pollution from occurring. Noise monitoring is considered to be a measure to exercise this duty of care, as the study undertaken will provide the current conditions of noise on the site, which can then be used to determine the possible impact of the activity and thereby provide possible mitigation measures to prevent noise pollution.

### 1.3.2 The National Environmental Management: Air Quality Act

The National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) Section 34 requires:

Control of noise

- (1) The Minister may prescribe essential national standards-
  - (a) for the control of noise, either in general or by specified machinery or activities or in specific 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.

### 1.3.3 South African National Standards (SANS 10103)

From the 1960's the SABS Code of Practice 10103 for The Measurement and Assessment of Environmental Noise with Respect to Annoyance and Speech Communication provided guidance in defining noise impact criteria limits and standards and was also used by local authorities in the control of environmental noise.

This standard has now been updated by the South African National Standard (SANS) 10103, the latest edition of which is SANS 10103:2008 - The Measurement and Rating of Environmental Noise with Respect to Annoyance and to Speech Communication.

The tables below are adapted from those contained within the abovementioned code of practice, and describe typical noise rating levels for various land-use types (Table 1) and expected community response that may be elicited should these levels be exceeded (Table 2).

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Table 1: Typical Rating Levels for Noise in Different Land Use Zones.

Type of District	Equivalent Continuous Rating Level for Noise ( $L_{Req,T}$ ) (dBA)					
	Outdoors			Indoors (with windows open)		
	DayNight ( $L_{R,dn}$ )	Daytime ( $L_{req,d}$ )	Nighttime ( $L_{req,n}$ )	DayNight ( $L_{R,dn}$ )	Daytime ( $L_{req,d}$ )	Nighttime ( $L_{req,n}$ )
a) Rural	45	45	35	35	35	25
b) Suburban (with little road traffic)	50	50	40	40	40	30
c) Urban	55	55	45	45	45	35
d) Urban (with one or more of the following: workshops; business premises; and main roads)	60	60	50	50	50	40
e) Central Business Districts	65	65	55	55	55	45
f) Industrial Districts	70	70	60	60	60	50

Table 2: Expected community response that may be elicited from certain noise levels

Excess dBA (Above 75 dBA)	Estimated Community/ Group Response	
	Category	Description
0 - 10	Little	Sporadic Complaints
5 – 15	Medium	Widespread Complaints
10 – 20	Strong	Threats of community or group action
>15	Very Strong	Vigorous community or group action

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

**a.)  $L_{Req,T}$  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.**

## **1.4 NOISE IN THE ENVIRONMENT**

### **1.4.1 BACKGROUND VIEWS ON NOISE**

Sound may be 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 have a health impact and can negatively affect the quality of life of people. The annoyance due to a given noise source is perceived very differently 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 and his or her opinion of the source.

Noise impact may be understood to mean one or a combination of negative physical, physiological or psychological responses experienced by individuals, whether consciously or unconsciously as caused by exposure to sound. The result of increased exposure to noise on individuals can have negative effects, both physiological (influence on communication and, productivity and even impaired hearing) and psychological effects (stress, frustration and disturbed sleep).

Hearing impairment is typically defined as an increase in the threshold of hearing. 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 – 6000 Hz, with the largest effect at 4 000 Hz. But with increasing LAeq, 8h 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 8-hour exposure times of 75 dBA or below, even for prolonged occupational noise exposure.

The capacity of a noise to induce annoyance depends upon its physical characteristics, including the sound pressure level, spectral characteristics and variations of these properties with time. During daytime, few people are highly annoyed at LAeq

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levels below 55 dBA, and few are moderately annoyed at LAeq levels below 50 dBA. Sound levels during the evening and night should be 5–10 dB lower than during the day.

Speech intelligibility is adversely affected by noise. Most of the acoustical energy of speech is in the frequency range of 100–6 000 Hz, with the most important cue-bearing energy being between 300–3 000 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, fire alarms and other warning signals, and music.

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: difficulty in falling asleep; 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.

#### **1.4.2 NOISE GENERATION, TRANSMISSION AND REDUCTION**

Sound is a pressure wave that decreases over distance from the source. Noise attenuation is typically described as a set reduction in decibel level per doubling of distance from the source. Depending on the nature of the noise source, sound propagates at different rates. The two most common categories of noise are point sources and line sources. A review of international scientific literature shows that distance from a noise source is a mitigating factor. The most important factors affecting noise propagation are:

- The type of source (point or diffuse);
- Distance from source;
- Atmospheric absorption;
- Wind;
- Temperature and temperature gradient;
- Obstacles such as barriers and buildings;
- Ground absorption;
- Reflections;
- Humidity; and
- Precipitation.

Research has shown that a doubling in 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. With an obstacle in the sound path, part of the sound will be reflected; part

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absorbed and the remainder will be transmitted through the object. How much sound is reflected, absorbed or transmitted depends on the properties of the object, its size and the wavelength of the sound.

Noise mitigation can also result from the topography or shielding from trees or structures. When locations are not in the line of sight of the noise source, there is generally a 10+ dBA attenuation for broadband noise, with a further 10 dBA attenuation on the inside of an average residence, when the windows are open. The influences of vegetation, topography, and atmospheric conditions as noise reduction factors can vary greatly and are often impossible to quantify.

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 over distance of 1.5 dB per doubling of distance. Added to the standard reduction rate for soft site conditions, point source noise attenuates at a rate of 7.5 dB per doubling of distance.

Where a hard site exists 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 does not provide any attenuation. The standard attenuation rate for hard site conditions is 6 dB per doubling of distance for point source. A break in the line of sight between the noise source and the receptor can result in a 5-dB reduction. Dense vegetation can reduce noise levels by 5 dB for every 30m of vegetation, up to a maximum reduction of 10 dB.

Physics determines that propagation of sound waves is faster in hot air and slower in cold air. In the day-time, the air near the earth surface is hotter than the air above and therefore sound waves will be refracted to the sky. On the other side, during the night-time, the air near the surface of the earth is cooler and sound waves are refracted to the earth surface. This results in sound travelling further in the night.

Therefore, the night-time limit is lower and some exceedances can occur should activities that occur in the day-time also occur in the night-time. Due to the site being classified as Industrial, the limit of 70 dB applies for day-time and 60 dB for night-time.

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## 1.5 SCOPE OF WORK

Noise assessments are conducted to determine the current conditions of noise in order to identify possible impacts and to provide mitigation measures should it be found that an impact can occur due to the activity. The purpose of this study is to assess the baseline noise before the commencement of the proposed prospecting at the site for future studies. It is crucial to understand the current noise environment of the study to be able to define the impact of the activity on both sounds generated during the day and during the night.

The scope of this assessment is to:

- Determine the residual noise that may affect sensitive receptors in the area;
- Determine the current noise generating activities in the area;
- Determine the current noise levels of the activities;
- Determine the possible noise impact of the activities; and
- Provide mitigation measures for the activities.

Noise measurements were determined at twelve (12) measurement locations around the perimeter and in the vicinity of the study area itself (see Figure 2). Table 3 provides a description of each measured location.

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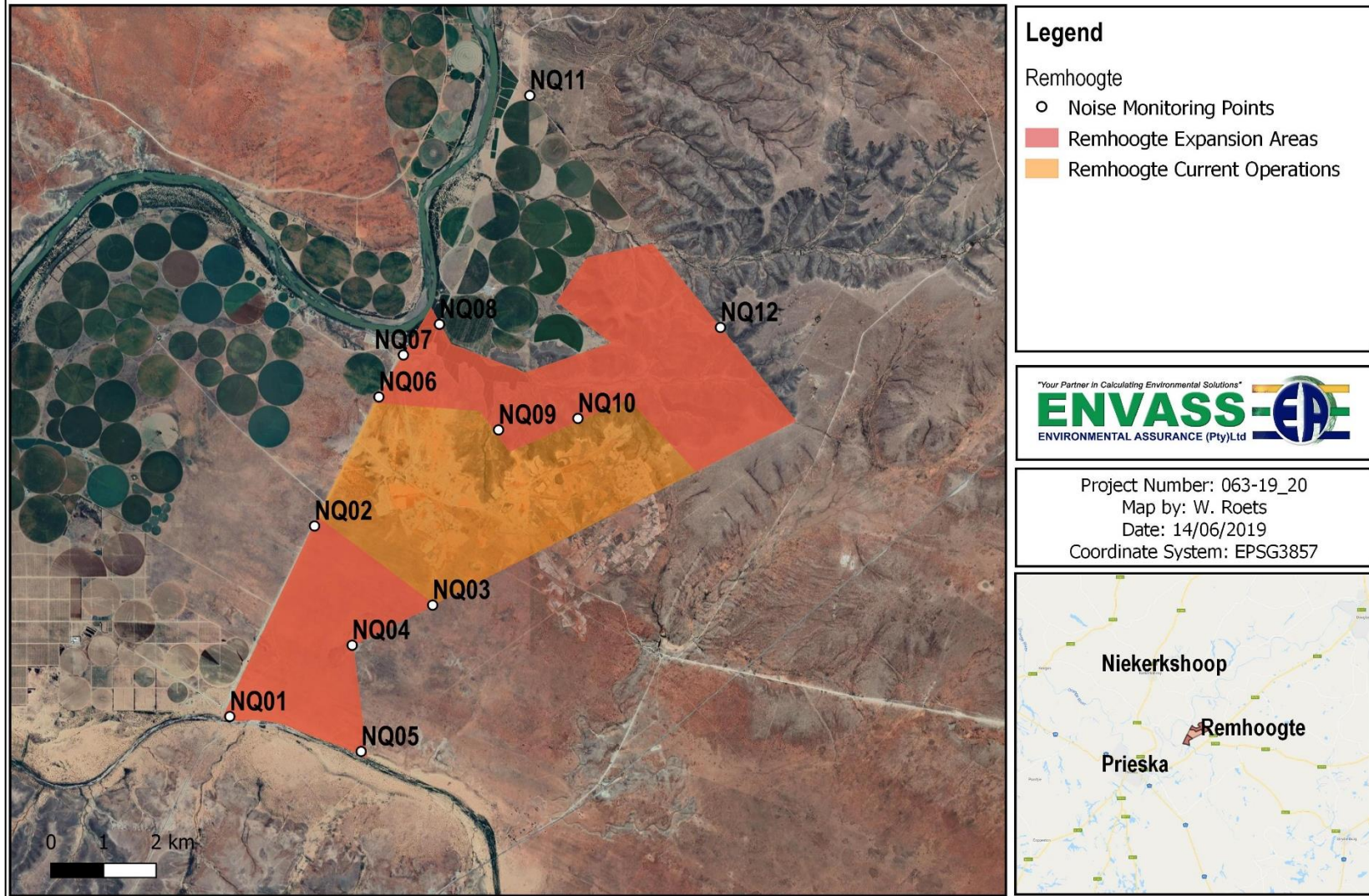


Figure 2: Remhoogte Farm 152 Prospecting Areas Monitoring Localities

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Table 3: Noise Measurement Location Descriptions

Measurement Location	Notes	Description
<p><b>NM01</b></p>	<p>During the night-time assessment vehicles were not noted to pass by this location. A continuous buzzing sound was noted from the electricity wires originating from the poles next to the road. Ambient sound from crickets were observed during the night-time assessment.</p> <p>During the day similar conditions were observed, however the presence winds, vehicles passing on the gravel road and birds were noted.</p>	<p><b>Classification:</b> Rural</p> <p><b>Coordinates:</b> S29.598332 E22.964930</p> <p><b>Date of Assessment:</b> Day-time: 04-06-2019 Night-time: 05-06-2019</p> <p><b>Impact:</b> Medium (sensitive receptors 3km northwest of the vicinity – farm house)</p>
<p><b>NM02</b></p>	<p>During the night-time assessment a humming sound and sounds from the mining machinery was noted, along with ambient sounds from crickets and birds.</p> <p>During the day sounds from similar conditions were observed, however the presence vehicles and truck passing on the gravel road and birds were noted.</p>	<p><b>Classification:</b> Rural</p> <p><b>Coordinates:</b> S29.565785 E22.981566</p> <p><b>Date of Assessment:</b> Day-time: 04-06-2019 Night-time: 05-06-2019</p> <p><b>Impact:</b> Minimal to none (no sensitive receptors in vicinity)</p>
<p><b>NM03</b></p>	<p>During the night-time assessment sounds from heavy machinery, reverse hooters and a humming sound from the mine was noted.</p> <p>During the day sounds from heavy machinery and a humming from the mine was noted. Additionally, strong winds and bird sounds were also present during the day-time assessment</p>	<p><b>Classification:</b> Rural</p> <p><b>Coordinates:</b> S29.579302 E23.004764</p> <p><b>Date of Assessment:</b> Day-time: 04-06-2019 Night-time: 05-06-2019</p> <p><b>Impact:</b> Minimal to none (no sensitive receptors in vicinity)</p>
<p><b>NM04</b></p>	<p>The night-time assessment was dominated by ambient animal sounds. Additional anthropogenic sounds were not present at the monitoring point.</p> <p>During the day-time assessment strong winds and bird sounds were noted, while anthropogenic sounds were not recorded at the monitoring point.</p>	<p><b>Classification:</b> Rural</p> <p><b>Coordinates:</b> S29.586156 E22.988962</p> <p><b>Date of Assessment:</b> Day-time: 04-06-2019 Night-time: 05-06-2019</p>

Measurement Location	Notes	Description
		<b>Impact:</b> Minimal to none (no sensitive receptors in vicinity)
<b>NM05</b>	<p>The night-time assessment was dominated by ambient animal sounds. Additional anthropogenic sounds were not present at the monitoring point.</p> <p>During the day-time assessment strong winds and bird sounds were observed.</p>	<p><b>Classification:</b> Rural</p> <p><b>Coordinates:</b> S29.604302 E22.990726</p> <p><b>Date of Assessment:</b> Day-time: 04-06-2019 Night-time: 05-06-2019</p> <p><b>Impact:</b> Minimal to none (no sensitive receptors in vicinity)</p>
<b>NM06</b>	<p>During the night-time assessment sounds from the mining machinery and excavations were noted, a car horn was present along with ambient animal sounds (crickets etc.)</p> <p>During the day sounds from similar conditions were observed, however the presence vehicles and truck passing on the gravel road and strong winds were noted.</p>	<p><b>Classification:</b> Rural</p> <p><b>Coordinates:</b> S29.543739 E22.994206</p> <p><b>Date of Assessment:</b> Day-time: 04-06-2019 Night-time: 04-06-2019</p> <p><b>Impact:</b> Medium (the local school is situated <math>\pm</math>700 m north of the monitoring locality)</p>
<b>NM07</b>	<p>During the night-time assessment sounds were noted in terms of the mining activity (machinery and excavations), as well as the presence of animals sounds and slight wind conditions.</p> <p>The day-time assessment indicated similar conditions, in addition to reverse hooters and vehicles passing on the main gravel road.</p>	<p><b>Classification:</b> Rural</p> <p><b>Coordinates:</b> S29.536562 E22.999029</p> <p><b>Date of Assessment:</b> Day-time: 04-06-2019 Night-time: 04-06-2019</p> <p><b>Impact:</b> Medium to high (the local school is situated <math>\pm</math>200 m southwest of the monitoring locality, in addition to residential farm housing north)</p>
<b>NM08</b>	<p>The night-time assessment was dominated by ambient animal sounds (crickets and birds), while noise originating from a generator was also noted in the vicinity.</p> <p>During the day-time assessment sounds were noted in terms of the following:</p>	<p><b>Classification:</b> Industrial</p> <p><b>Coordinates:</b> S29.531322 E23.006102</p> <p><b>Date of Assessment:</b> Day-time: 04-06-2019 Night-time: 04-06-2019</p>

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Measurement Location	Notes	Description
	<ul style="list-style-type: none"> <li>Truck passing on the main gravel road;</li> <li>Earth diggings from the excavators;</li> <li>Wind blowing through the surrounding trees; and</li> <li>Birds chirping.</li> </ul>	<b>Impact:</b> Medium (the local school is situated $\pm 1.1$ km southwest of the monitoring locality, in addition to residential farm housing southwest and north)
<b>NM09</b>	<p>During the night-time assessment sounds were noted in terms of the mining activity (excavator machinery, reverse hooters and a humming), as well as the presence of animals sounds.</p> <p>The day-time assessment indicated similar conditions, in addition to slightly windy conditions and a squeaking sound from a local farm gate.</p>	<p><b>Classification:</b> Rural</p> <p><b>Coordinates:</b> S29.549365 E23.017707</p> <p><b>Date of Assessment:</b> Day-time: 04-06-2019 Night-time: 04-06-2019</p> <p><b>Impact:</b> Minimal to none (no sensitive receptors in vicinity, only the adjacent farm)</p>
<b>NM10</b>	<p>During the night-time assessment similar sound to NM09 was noted within the vicinity.</p> <p>The day-time assessment indicated similar conditions to the NM09 day-time assessment.</p>	<p><b>Classification:</b> Rural</p> <p><b>Coordinates:</b> S29.547408 E23.033298</p> <p><b>Date of Assessment:</b> Day-time: 04-06-2019 Night-time: 04-06-2019</p> <p><b>Impact:</b> Minimal to none (no sensitive receptors in vicinity)</p>
<b>NM11</b>	<p>The night-time assessment was dominated by ambient animal sounds and slight wind blowing through the surrounding corn field.</p> <p>During the day-time assessment birds chirping and winds blowing through the surrounding corn field was noted.</p>	<p><b>Classification:</b> Rural</p> <p><b>Coordinates:</b> S29.492216 E23.023846</p> <p><b>Date of Assessment:</b> Day-time: 04-06-2019 Night-time: 04-06-2019</p> <p><b>Impact:</b> Minimal to none (no sensitive receptors in vicinity, only the adjacent farm – this locality is situated far north outside of the northern prospecting boundary)</p>

Measurement Location	Notes	Description
<p align="center"><b>NM12</b></p>	<p>During the night-time assessment sounds of vehicles were noted in a distance, while birds chirping and slight winds were also present.</p> <p>The day-time assessment indicated sounds relating to animals (birds), while slight windy conditions were also present.</p>	<p><b>Classification:</b> Rural</p> <p><b>Coordinates:</b> S29.531862 E23.061286</p> <p><b>Date of Assessment:</b> Day-time: 04-06-2019 Night-time: 04-06-2019</p> <p><b>Impact:</b> Minimal to none (no sensitive receptors in vicinity)</p>

## 2 METHODOLOGY

A certified and calibrated sound level meter was installed on a tripod at each of the monitoring locations and left to measure sound levels for at least 10 minutes – as stipulated by regulations. The model of the sound meter is the SoundPro Sound Level Meter from Quest Technologies (a 3M Company). This model comes with a wind shield. When winds were believed to influence the sound levels surrounding a particular site, the wind shield was installed before the measurement commenced. The sound level meter is calibrated annually to ensure that correct measurements are obtained.

The locality (coordinates), surrounding environmental conditions, weather conditions and any other site-specific observations were recorded and will aid to explain certain sound levels and/or conditions. The exposure time and time and date of study for each monitoring location was also recorded.

The noise assessment is compiled by studying and analysing the activities and by determining the possible noise impacts these activities will have on the surrounding land users. Various data source inputs are required which includes, but is not limited to the following:

- The site layout and geographical location;
- Sensitive receptors in the area;
- Noise generating activities in the area; and
- Actual measured noise data from the site.

The site layout and classification are compiled from background information and from data gathered on the site visit to the operational area. These assist in determining the correct zoning of the area and further to determine the sensitive receptors and noise generating activities in the area. In addition, during the site visit, appropriate locations are identified to measure the noise levels within the locality of the monitoring point.

During the site visit, the actual noise study was conducted and the conditions and characteristics of each monitoring point noted. The study is conducted in terms of the provisions of SANS 10103 of 2008, during a day and night-time period and will be the baseline noise levels for the current monitoring period.

From the abovementioned data, the areas or activities of the activities most prone to noise generation was determined and actual noise measurements obtained. A report is compiled with all available information and recommendations and mitigation measures are recommended to prevent noise from becoming pollution.

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### 3 LIMITATIONS AND ASSUMPTIONS

An environmental noise assessment was undertaken to provide Pioneer Minerals with baseline noise information for the Remhoogte prospecting area. It should be noted that the assessment was based on a two-day study of ambient activities. The data obtained during the site assessment is presented as average noise levels that are currently generated in the day to day continuance of activities in the area. This poses a limitation as the monitoring conducted is representative of conditions at the time. The ambient sound at the site could conceivably be higher than the limit and should be noted when considering the exceedances during the assessment especially during the night-time assessment since the lowest possible rural limit is presented for this study.

It is expected that the activities at Remhoogte will generate a certain amount of noise in the operation and prospecting. The land use for the site is characterised by mining activities and is surrounded by rural areas and farming activities. From the bounded farmlands surrounding the site, **the limits for rural districts therefore apply** according to SANS10103: 2008.

### 4 RESULTS

The environmental noise baseline assessment for Pioneer Minerals – Remhoogte Farm 152 required a site assessment (daytime and night-time at each point) in order to record baseline noise level results. This report responds to the following:

- Noise Assessment (Commenced June 2019):
  - The noise assessment was completed during the day and night-time hours of 04 June 2019 and 05 June 2019.

The results for the baseline assessment can be viewed in Table 4 below and visualisations are presented in Figures 3 and 4.

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Table 4: Baseline Environmental Noise Level Measurement Results

Measuring Locations	Remhoogte (Prospection) Environmental Noise Baseline Assessment Results	
	Day-time Measurements (Limit of 45 dBA <sub>Leq</sub> )	Night-time Measurements (Limit of 35 dBA <sub>Leq</sub> )
NM01	47.6	44.2
NM02	47.9	44.1
NM03	45.0	44.1
NM04	48.7	44.6
NM05	46.5	44.7
NM06	63.4	44.2
NM07	47.9	44.2
NM08	54.1	44.1
NM09	46.0	44.1
NM10	53.3	44.3
NM11	44.3	44.3
NM12	52.5	44.2

#### 4.1 NOISE RESULT GRAPHICAL REPRESENTATION

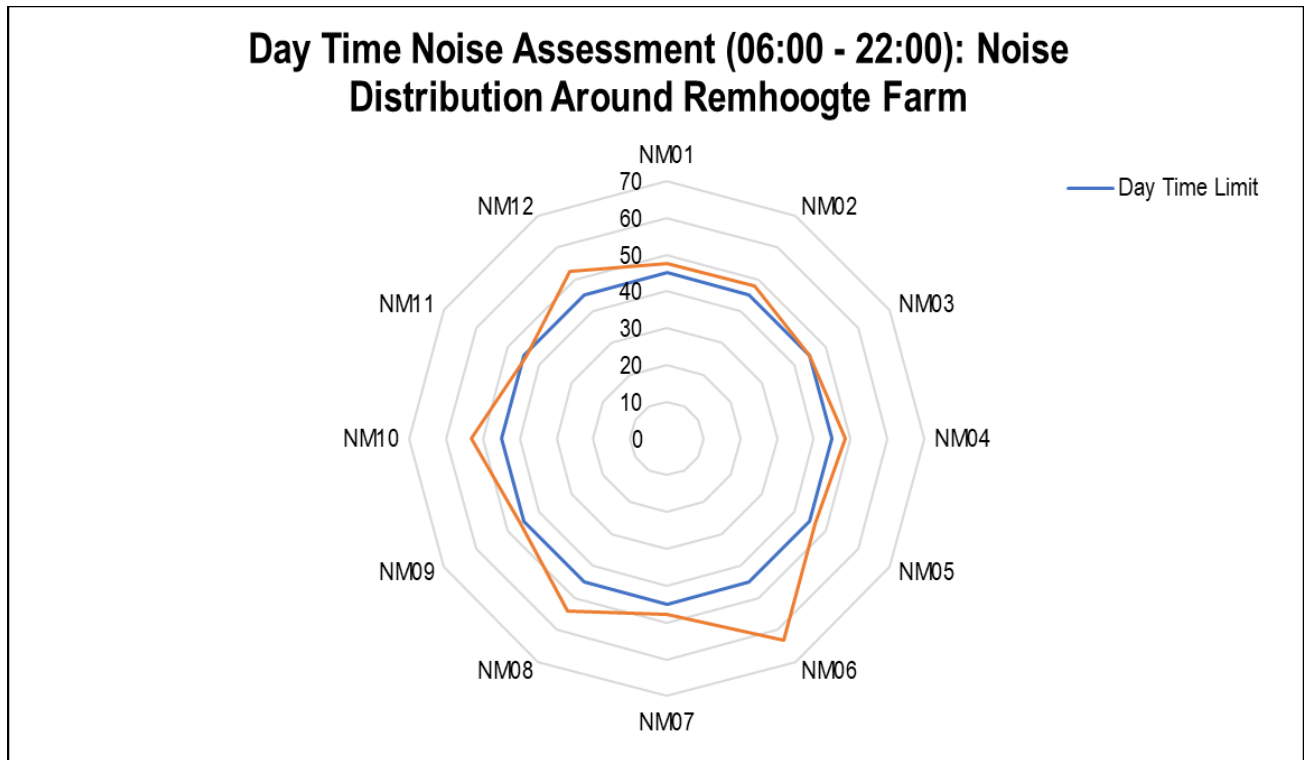


Figure 3: Day-time Noise Distribution around Remhoogte Farm

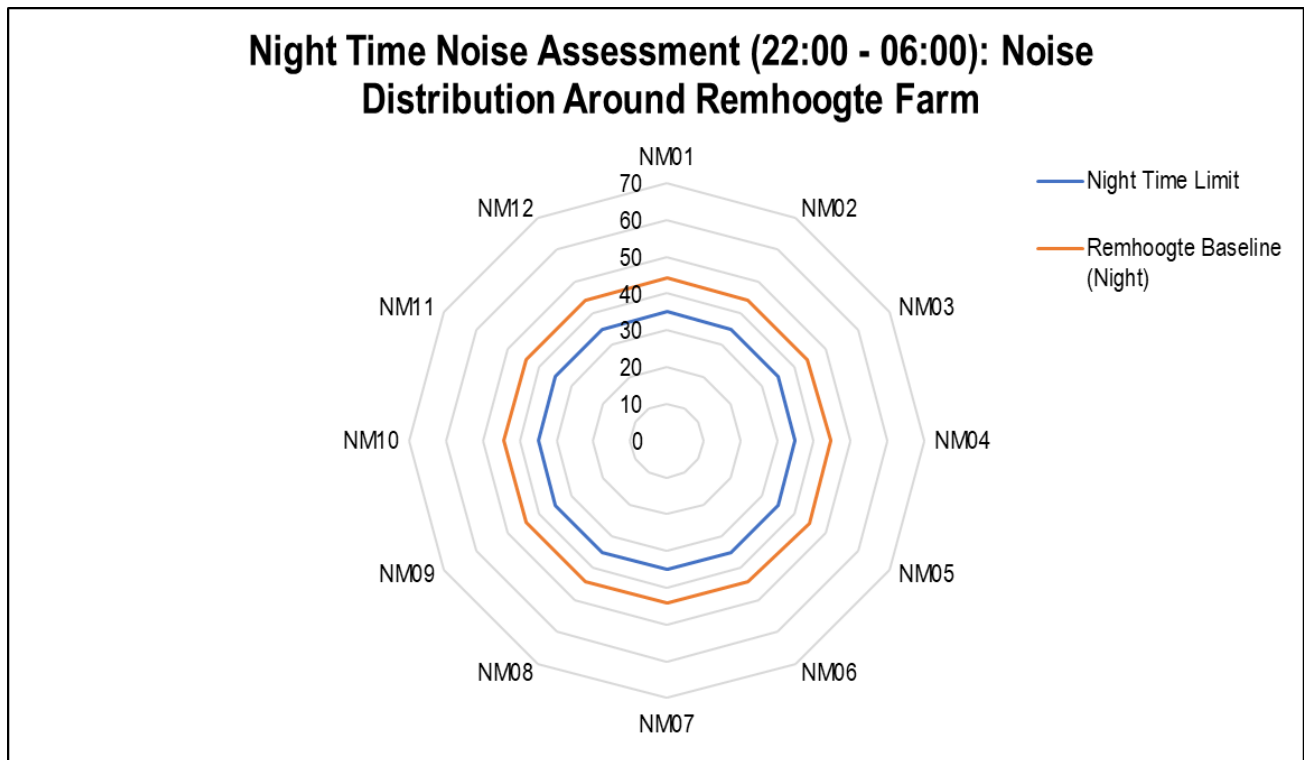


Figure 4: Night-time Noise Distribution around Remhoogte Farm

## 5 DISCUSSION

The noise assessment points as indicated in Figure 4 are used as the environmental noise baseline (NM01 to NM12), of which only two monitoring localities – NM03 and NM11 did not exceed the limit during the day-time (45 dB<sub>Leq</sub> - A-weighted and as per SANS10103). During the night-time assessment all of the monitoring localities presented exceedance of the set night-time sound level limit of 35dB<sub>Leq</sub> (A-weighted and as per SANS10103). It should be noted that extremely similar noise measurements were recorded during the night-time assessment with minimal fluctuation.

### 5.1 MEASUREMENTS AND OBSERVATIONS

#### 5.1.1 NM01

This monitoring point indicated an exceedance of the applicable rural limit during the day-time monitoring period. During the day-time, the noise level was measured at 47.6 dBA, exceeding the limit of 45 dBA. The Category exceedance noted is “little” and could lead to sporadic from communities according to SANS 10103. The night-time assessment indicated an exceedance of the 35-dBA limit, measuring at 44.2 dBA which is also categorised as “little”. This point is situated in the southern Remhoogte Farm 152 remaining portion adjacent to the main gravel road and the Brak river. This location was dominated by a buzzing sound from the electricity wires, the sound of passing vehicles and trucks with contributing sound of birds chirping.

#### 5.1.2 NM02

This monitoring point indicated a slight exceedance of the applicable rural limit during the day-time monitoring period. During the day-time, the noise level was measured at 47.90 dBA, exceeding the limit of 45 dBA. The Category exceedance noted is “little” and could lead to sporadic complaints according to SANS 10103. During the night-time assessment the noise levels were 44.7 dBA and is classified as “little”. This point is situated north of the southern extension area adjacent to the main gravel road. The night-time assessment indicated an exceedance of the 35-dBA limit, measuring at 44.1 dBA which is also categorised as “little”. This location was dominated by a humming sound from the current mining activities, the sound of passing vehicles and trucks as well as birds and crickets.

#### 5.1.3 NM03

This monitoring point recorded compliant to applicable day-time rural limit. During the night-time assessment the sound level was recorded at 44.1 dBA, exceeding the 35-dBA limit and is classified as “little” and could lead to sporadic complaints. Heavy machinery, reverse hooters and humming from the mine was noted during the assessment. The monitoring locality is situated on the north-eastern boundary of the proposed southern prospecting area.

#### 5.1.4 NM04

A sound level of 48.7 dBA was recorded during the day-time assessment, exceeded the set 35-dBA rural limit. The Category exceedance noted is “little” and could lead to sporadic from communities according to SANS 10103. During the night-time

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assessment the sound levels were noted at 44.6 dBA, exceeding the set rural limit. The night-and day-time assessments were dominated by ambient natural sounds, while anthropogenic sound was not noted. The locality is situated on the eastern boundary of the proposed southern prospecting area.

#### **5.1.5 NM05**

This monitoring point indicated an exceedance of the applicable rural limit during the day-time monitoring period (measured at 46.5 dBA). The night-time measurement also presented an exceedance of the set limit and recorded at 44.7 dBA. Both exceedances are classified as “little”. This point is situated at on the south-eastern boundary of the proposed southern prospecting area adjacent to the Brak river and was dominated by natural ambient sounds including wind.

#### **5.1.6 NM06**

This monitoring point indicated exceedance during both the day and night-time assessments. The day-time assessment recorded a sound level of 63.40 dBA, while night-time measurements were detected at 44.2 dBA. The day-time category exceedance is noted as “strong” and could lead to treats of the community or a group action. This point is situated southwest of the norther prospecting boundary. Sound noted included mining machinery, excavations, a car horn along with ambient animal sounds.

#### **5.1.7 NM07**

This monitoring point indicated a slight exceedance of the applicable rural limit during both the day and night-time assessments. During the day-time, the noise level was measured at only 47.90 dBA, while the night-time measured at 44.20 dBA. This point is situated along the main gravel road adjacent to the local school. Both exceedances are classified as “little” according to SANS 10103. Sound noted included mining machinery, excavations, reverse hooters, along with ambient animal sounds.

#### **5.1.8 NM08**

The monitoring point indicated an exceedance of the applicable rural limit during the both assessments. During the day-time, the sound level was measured at 54.10 dBA, exceeding the limit of 45 dBA. The night-time assessment indicated an exceedance of the 35-dBA limit, measuring at 44.1 dBA. Both exceedances are classified as “little” according to SANS 10103 relating to sporadic complaints. This locality is situated directly adjacent to the main gravel road and spill-point farming area, dominated by ambient animal sounds (crickets and birds), while noise originating from a generator was also noted in the vicinity.

#### **5.1.9 NM09**

This monitoring point indicated an exceedance of the day and night-time applicable rural limits. Day-time measurements were noted at 46.00 dBA, while the night-time assessment indicated 44.10 dBA. Both assessments were categorised as “little” impact. The point is situated within the north proposed prospecting area. Sounds were dominated by the mining activity (excavator machinery, reverse hooters and a humming), while squeaking from a local farm gate was also present.

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### 5.1.10 NM10

This monitoring point indicated slight exceedances of the applicable rural limits during the day and night-time assessments. During the day-time, the noise level was measured at 53.30 dBA, exceeding the limit of 45 dBA. The night-time assessment indicated an exceedance of the 35-dBA limit, measuring at 44.30 dBA. The assessment exceedances are categorised as “little”. The monitoring point is situated south of the norther prospecting boundary. This location was dominated by similar sounds as NM09 during both assessment periods.

### 5.1.11 NM11

This monitoring point recorded compliant to applicable day-time rural limit. During the night-time assessment the sound level was recorded at 44.3 dBA, exceeding the 35-dBA limit and is classified as “little” and could lead to sporadic complaints. Anthropogenic sounds were not noted during the assessments, while ambient animal sounds and slight wind blowing through the surrounding corn field were present. The monitoring locality is situated far north outside of the northern prospecting boundary, adjacent to both the corn farm and Oranje river.

### 5.1.12 NM12

Both day and night-time measurements exceeded the stipulated rural limits, and could be categorised as “little” impact. Day-time measurements were noted at 52.50 dBA, while the night-time assessment indicated 44.20 dBA. NM12 is situated east of the northern prospecting boundary. During the night-time assessment sounds of vehicles were noted in a distance, while birds chirping and slight winds were also present. The day-time assessment indicated sounds relating to animals (birds), while slight windy conditions were also present.

## 5.2 IMPACT OF PROSPECTING ACTIVITIES

As can be reasonably expected, activities associated with the prospecting would conceivably give rise to a certain level of noise generated. The table below represents some machinery and activities which may be associated with the operation and prospecting and typical sound levels produced by them:

Table 5: Typical noise levels from equipment (AS 2436, 2010)

Activity description	Sound power level at source (dB)
Air Compressor (power tools)	101
Backhoe	104
Bulldozer	108
Compactor	113
Concrete Pump	108
Concrete Saw	117

Activity description	Sound power level at source (dB)
Concrete Truck	109
Dump Trucks	117
Excavator	107
Front End Loader	113
Generators	99
Grader	110
Mobile Crane	104
Piling (bored)	111
Pneumatic hand tools	116
Vibratory Roller	108
Water Cart	107
Combined equipment (10 most noisy)	123.5

These typical activities associated with operating activities will generate noise and will be perceived as an annoyance if not correctly managed.

Any future noise generation would conceivably increase from the current activities and would be closer to the sensitive receptor areas around Remhoogte Farm. If these activities are not regulated and the sound generation is mitigated it could lead to intolerable impact on the adjacent land users and farmers of the area in the future. From Table 2 an increase in observable noise could potentially warrant a negative response from communities (farmers, adjacent land users or rural villages/settlements). Table 3 further provides a possible response from communities towards increases in noise observed. This study provides a baseline for the Remhoogte operation that is currently in place before the prospecting commences.

If increases occur from the baseline (in areas where no sound originated from the mine) record sound over the limits to higher measurements within the range from approximately 2 – 20 dBA, Table 3 indicates that the community response to these increases can at the lower end lead to sporadic complaints. Increases of 5 – 15 dBA over the limit can lead to widespread complaints while further increases can lead to threats, complaints and group action taken by the community. It is of great importance to ensure and maintain noise mitigation measures as far as possible. Section 5.3 provides possible measures that can be implemented if not already in place.

## 5.3 MITIGATION MEASURES

In order to minimise the possible effect of noise the following general mitigation measures can be implemented for both the construction and operational phases of the mining project:

### 5.3.1 GENERAL

- Regular monitoring of noise generating activities should occur. This will serve as the core of noise mitigation as it will enable the determination of problem areas. If deemed necessary, the points indicating exceedances in the current study could be re-measured. The current plan in place could possibly be expanded to identify and measure location / source specific noise generating activities to better understand and manage noise sources of the activity itself.
  - If it is found that noise impacts are minimal, the frequency can be reduced to a basis of only conducting noise assessments upon receipt of noise-related complaints.
- Personal Protective Equipment must be provided to all persons working in areas where high levels of noise can be expected.
  - An occupational health specialist can be consulted to determine the correct level of noise reducing PPE to be issued.
- Placement of noise generating activities can be planned as far away as possible from affected areas and/or persons.
- Installation of acoustic enclosures for equipment to stop noise at the source.
- Ensure that all staff on the activity is provided with “noise sensitivity” training to ensure noise generation is limited.
- The efficiency of noise mitigation measures should be assessed on a regular basis.
- No amplified music should be allowed on the site.
- Good public relations are essential. The information provided to stakeholders should be factual and not set unrealistic expectations.
- A clear line of communication should be in place where complaints can be lodged and response can be provided on.
- A clear commitment should be made on accommodating the local communities in preventing noise as far as possible; and
- Should any complaints regarding noise be received from the adjacent community / staff, follow-up investigations should be conducted to determine and mitigate noise measured.

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### 5.3.2 VEHICLES AND VEHICLE MOVEMENT

- Limit vehicle movement to daylight hours as far as possible.
- Limit vehicles speeds.
- All vehicles must be fitted with low noise and frequency hooters.
- Ensure that vehicles are fitted with noise reduction measured such as mufflers, etc.
- Ensure that vehicles on the site are serviced on a regular basis to ensure that noise suppression mechanisms are effective.
- Regular inspections and maintenance of equipment, vehicles and machinery to prevent unnecessary noise; and
- All vehicles should be switched off when not in use.

### 5.3.3 EXPANSION ACTIVITIES (FUTURE)

- A noise prevention barrier should be erected in areas where noise can travel to sensitive receptors. This barrier should be placed as close to the noise generating activity as possible.
- All equipment and machinery should be serviced on a regular basis.
- All construction equipment and machinery should be fitted with noise reduction technology to prevent noise generation as far as possible.
- All construction activities should be limited to daylight hours as far as possible. Generally, work should not be allowed on Sundays and Public Holidays.
- All noise generating activities/installations should be planned and placed as far away from sensitive receptors as possible. Should this not be possible, noise barriers should be installed at various positions around these noise generators.
- All equipment should be switched off when not in use.
- No workers should be allowed to stay on the site.
- Site workers must comply with the Provincial Noise Regulations.
- Appropriate directional and intensity settings are to be maintained on all hooters and sirens; and
- Excessively noisy machinery must only be used during regular operating hours and not after hours where possible.

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## 6 CONCLUSION

The report indicates that the baseline conditions for the proposed activity had several exceedances measured during the day- and night-time noise assessment, while only two monitoring points (NM03 and NM11) present compliant measurements during the day-time.

It should be explicitly noted that the lowest limit was used and areas with only ambient environmental sound was already exceeding the day and night-time limits. The closest sensitive receptor areas are that of the adjacent land users and farms directly surrounding the proposed prospecting areas.

Prospecting unto the proposed areas will generate noise and could result in increased exceedances if not correctly mitigated, this could in turn lead to community or group action. Generated noise can become a nuisance (or health risk) when it is not properly managed and mitigated. Noise can be a concern to the surrounding land users and receiving environment. It is important to determine the extent of noise generated by the activities which can aid in the management and mitigation of noise generating activities by means of implementing different measures with the aim of preventing the noise generated from being perceived as a nuisance.

It is recommended that Pioneer Minerals (Pty) Ltd. use the information from this report to prevent increases in environmental noise in future. It is also recommended that the mitigation measures, as suggested, be considered for implementation as a preventative measure.

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