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Environmental Authorisation Process for the Expansion of the Copper Sunset Mining Right Area

Environmental Noise Impact Assessment

Prepared for:

Copper Sunset Sands (Pty) Ltd

Project Number:

COP6679



May 2021



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- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
 - I declare that there are no circumstances that may compromise my objectivity in performing such work;
 - I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- All the particulars furnished by me in this form are true and correct; and

- I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.



Signature of the Specialist

15/02/2021

Date

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EXECUTIVE SUMMARY

Copper Sunset (Pty) Ltd (Copper Sunset) has an approved Mining Right (MR) (DMRE Ref. No. FS30/5/1/1/2/164 MR) and Environmental Management Programme (EMPr), in terms of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) (MPRDA), for the mining of sand on the Farm Bankfontein No. 1849. The MR was approved in 2008 and amended in 2011, 2016 and 2017 to incorporate additional areas into the Mining Right Area (MRA).

Copper Sunset intends to expand its MRA to incorporate adjacent properties to extend the Life of Mine (LoM). The extension of the existing MRA triggers activities incorporated in Listing Notice 1 and Listing Notice 2 of the Environmental Impact Assessment (EIA) Regulations, 2014 (GN R982 of 04 December 2014 as amended), promulgated under the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA). The Listed Activities require a Scoping and Environmental Impact Reporting (S&EIR) process to be carried out as part of the authorisation process.

Digby Wells Environmental (Digby Wells) has been appointed by Copper Sunset as the independent Environmental Assessment Practitioner (EAP) to complete the EIA in support of the EIA application. In turn, the EIA will be supported by several specialist studies, including an Environmental Noise Impact Assessment (ENIA).

The ENIA focused on completing a noise modelling assessment to predict the Sound Pressure Levels (SPLs) expected during the establishment and operational phases associated with mining in the extension area (i.e. emissions generated and impacts on the background soundscape and noise-sensitive receivers). The SPLs in the form of isolines were predicted using the SoundPLAN software tool, which is an industry-standard. The baseline noise conditions (background noise) were determined in the MRA based on the results from field measurement campaign that were conducted in October 2020.

The average daytime ambient noise level measured throughout the measuring period was 49 decibels (dBA). The daytime noise levels at the different measurement locations indicate that the ambient daytime noise levels at all measurement locations were above the SANS guidelines maximum limit rating of 45dBA allowable for outdoor ambient noise in rural districts. The average night-time ambient noise level measured throughout the measuring period was 43dBA. The night-time noise levels at the different measurement locations indicate that the ambient night-time noise levels at all measurement locations were above SANS guidelines rating levels of 35dBA allowable for outdoor ambient noise in rural districts.

Based on the results from the model simulations pre-mitigation, it is confirmed that sound propagation is highest (exceeds the daytime limit of 45dBA) within a 1km radius of all noise-generating components of the project (confined mainly within the MRA) for the daytime establishment and operational phase. The noise levels will be highest (exceeds night-time limit of 35 dBA) within a 2km radius of all noise-generating components of the project (this is mostly confined within the MRA) for the night-time operational phase. The predicted noise expected at all three measurement locations for the daytime establishment and operational phase will

be below the daytime limit of 45dBA. The predicted noise expected at all three measurement locations for the night-time operational phase will be below the night-time limit of 35dBA.

The baseline noise levels measured include emissions from the ongoing sand mining activities at the Copper Sunset Mine. Also, the annual tonnage to be mined and the total number of equipment on site will be similar to the current mining operation. Therefore, no additional noise impacts are anticipated, even when mining progresses to the extension area.

Overall, anticipated impacts on a receiver will vary as mining progresses from one section of the extension area to another (i.e. from negligible to major even though the anticipated noise emissions from the operational phase will be relatively constant). Therefore, it is recommended that mitigation and management measures recommended in this report be implemented, as this would significantly reduce the impacts of the project on site, and at nearby sensitive receptors.



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Appendix A: Impact Assessment Ranking

ACRONYMS, ABBREVIATIONS AND DEFINITION

DMRE	Department of Mineral Resources and Energy
Ambient Noise	Ambient noise is the noise from all sources combined – mining noise, traffic noise, birdsong, running water, etc.
CONCAWE	CONservation of Clean Air and Water in Europe
dB	Decibels
dBA	Decibels 'A' Weighted, the most commonly used standard frequency weighting designed to reflect the response of the human ear to noise.
Disturbing Noise	Disturbing noise refers to 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 7dBA or more.
DWS	Department of Water and Sanitation
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
EIA	Environmental Impact Assessment
EMPr	Environmental Management Programme Report
ENIA	Environmental Noise Impact Assessment
IAIAsa	International Association for Impact Assessment South Africa
L_{A90}	The noise level exceeded for 90% of the measurement, calculated by statistical analysis
L_{Aeq}	A-frequency weighted, equivalent sound level value for a specific period measured using Impulse – time weighting.
L_{Amax}	The maximum Sound Level with 'A' Frequency weighting and Fast Time weighting during the measurement period.
L_{Amin}	The maximum Sound Level with 'A' Frequency weighting and Fast Time weighting during the measurement period.
LoM	Life of Mine
L_{Req,T}	Is the equivalent continuous A-weighted sound pressure level, in decibels (dBA), determined over a specific time period
MPRDA	Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002)
MR	Mining Right
MRA	Mining Right Area
NACA	National Association for Clean Air

NCRs	Noise Control Regulations
NEMA	National Environmental Management Act, 1998 (Act No. 107 of 1998)
Noise Level	Means the reading on an integrating impulse sound level meter taken at a measuring point in the presence of any alleged disturbing noise at the end of a total period of at least 10 minutes, after such meter had been put into operation, and, if the alleged disturbing noise has a discernible pitch, to which 5 dBA has been added.
RE	Remaining Extent
RWD	Return Water Dam
S&EIR	Scoping and Environmental Impact Reporting
SABS	South African Bureau of Standards
SANS	South African National Standard
SLMs	Sound Level Meters
SPLs	Sound Pressure Levels

Legal Requirement		Section in Report
(1)	A specialist report prepared in terms of these Regulations must contain-	
	details of-	6
(a)	(i) the specialist who prepared the report; and	6
	(ii) the expertise of that specialist to compile a specialist report including a curriculum vitae;	6
(b)	a declaration that the specialist is independent in a form as may be specified by the competent authority;	Page iii to iv
(c)	an indication of the scope of, and the purpose for which, the report was prepared;	4
cA	And indication of the quality and age of the base data used for the specialist report;	8.1
cB	A description of existing impacts on site, cumulative impacts of the proposed development and levels of acceptable change;	10
(d)	The duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment;	8.1.1
(e)	a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of the equipment and modelling used;	8
(f)	Details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure inclusive of a site plan identifying site alternatives;	3
(g)	an identification of any areas to be avoided, including buffers;	N/A
(h)	a map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	Page 8
(i)	a description of any assumptions made and any uncertainties or gaps in knowledge;	5
(j)	a description of the findings and potential implications of such findings on the impact of the proposed activity or activities;	9
(k)	any mitigation measures for inclusion in the EMPr;	11
(l)	any conditions/aspects for inclusion in the environmental authorisation;	N/A
(m)	any monitoring requirements for inclusion in the EMPr or environmental authorisation;	12
(n)	a reasoned opinion (Environmental Impact Statement) -	0

Legal Requirement		Section in Report
	whether the proposed activity, activities or portions thereof should be authorised; and	
	if the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMP, and where applicable, the closure plan;	11
(o)	a description of any consultation process that was undertaken during the course of preparing the specialist report;	N/A
(p)	a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	N/A
(q)	any other information requested by the competent authority.	N/A

1. Introduction

Copper Sunset (Pty) Ltd (Copper Sunset) has an approved Mining Right (MR) (DMRE Ref. No. FS30/5/1/1/2/164 MR) and Environmental Management Programme (EMPr), in terms of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) (MPRDA), for the mining of sand on the Farm Bankfontein No. 1849. The MR was approved in 2008 and amended in 2011, 2016 and 2017 to incorporate additional areas into the Mining Right Area (MRA).

The existing operations are situated on the Farm Bankfontein No. 1849, the Remaining Extent (RE) of the Farm Zandfontein No. 259, a portion of the RE of the Farm Bankfontein No. 9, and a portion of the RE of the Farm Rietfontein No. 152, situated in the Free State Province.

Copper Sunset currently holds the following Environmental Authorisations (EAs) and EMPrs, which are applicable to the Mining Right boundary:

- The original EMPr associated with the application for a MR on the Farm Bankfontein No. 1849, approved in 2008 (DMRE Ref. No. FS30/5/1/1/2/164 MR dated 28/04/2009);
- The 2011 EA and EMPr associated with the construction of a washing plant, a Return Water Dam (RWD), a settling dam and brick building (DMRE Ref. No. FS30/5/1/2/3/2/1 (164) EM dated 19/09/2011);
- The 2015 and 2016 EA and EMPr associated with the incorporation of additional areas into the MRA (DMRE Ref. No. FS30/5/1/2/3/2/1 (164) EM dated 08/03/2016 and 20/12/2016); and
- The 2017 EMPr associated with the incorporation of additional areas into the MR (DMRE Ref. No. FS30/5/1/2/2 (164) MR dated 30/05/2018).

The applicant now intends to expand its MRA to incorporate adjacent properties to extend the Life of Mine (LoM). The intent is to expand the current mining operations to include additional portions of the Remaining Extent (RE) of the Farm Bankfontein No. 9 and a portion of the RE of the Farm Zandfontein No. 259. The proposed extension of the MRA amounts to approximately 1642 ha (Bankfontein) and 1153.6 ha (Zandfontein), for the mining of sand. The extension of the existing MRA triggers activities incorporated in Listing Notice 1 and Listing Notice 2 of the EIA Regulations, 2014 (GN R982 of 04 December 2014 as amended), promulgated under the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA). The Listed Activities require a Scoping and Environmental Impact Reporting (S&EIR) process to be carried out as part of the authorisation process.

Digby Wells Environmental (Digby Wells) has been appointed by Copper Sunset as the independent EAP to conduct the required environmental authorisation process to expand their existing and approved MR for the mining of sand over the proposed areas. In turn, the EIA will be supported by several specialist studies, including an ENIA study.

Additionally, it is recommended that as part of this application Digby Wells consolidate all EAs and EMPs into one consolidated EMP that applies to the approved MR and the new area being incorporated.

Therefore, the following processes will be conducted:

- A Section 102 amendment application process as per the MPRDA to amend the MR boundary;
- A S&EIR process to authorise the new Listed Activities as per the NEMA;
- An Integrated Water Use Licence Application (IWULA) process in terms of the National Water Act, 1998 (Act No. 36 of 1998) (NWA) to mine the wetland areas found within the expansion area; and
- A Regulation 31 amendment process to consolidate the EAs and EMPs into one consolidated report as per the NEMA.

2. Project Locality

The Copper Sunset MRA is located within Viljoensdrif, a coal-mining village, under the jurisdiction of the Metsimaholo Local Municipality, which is located in the Fezile Dabi District Municipality, Free State Province near the Vaal River and Lethabo Power Station. The site is located approximately 8 kilometres (km) south of Vereeniging, 10 km south-east from Vanderbijlpark and 13 km north-east from Sasolburg. Table 2-1 and Figure 2-1 provide the location of the mine in relation to the nearest towns.

Table 2-1: Summary of the Copper Sunset Project Location Details

Province	Free State
District Municipality	Fezile Dabi District Municipality
Local Municipality	Metsimaholo Local Municipality
Nearest Town	Vereeniging (8 km), Vanderbijlpark (10 km), Sasolburg (13 km).
Property Name and Number	Farm Bankfontein No. 1849, the Remaining Extent (RE) of the Farm Zandfontein No. 259, a portion of the RE of the Farm Bankfontein No. 9 and a portion of the RE of the Farm Rietfontein No. 152.

2.1. Study Area

The MRA is subdivided into portions of the RE of the Farm Zandfontein No. 259 and portions of the RE of the Farm Bankfontein No. 9 (Eastern and Western Extensions), see Figure 2-2. Mining will commence on the RE of Farm Bankfontein No. 9 (Eastern Block), extend to the western extension of the RE of Bankfontein No. 9 and conclude on a portion of the RE of Farm Zandfontein No. 259. The expected LoM for the extension areas is depicted in Figure 2-2.

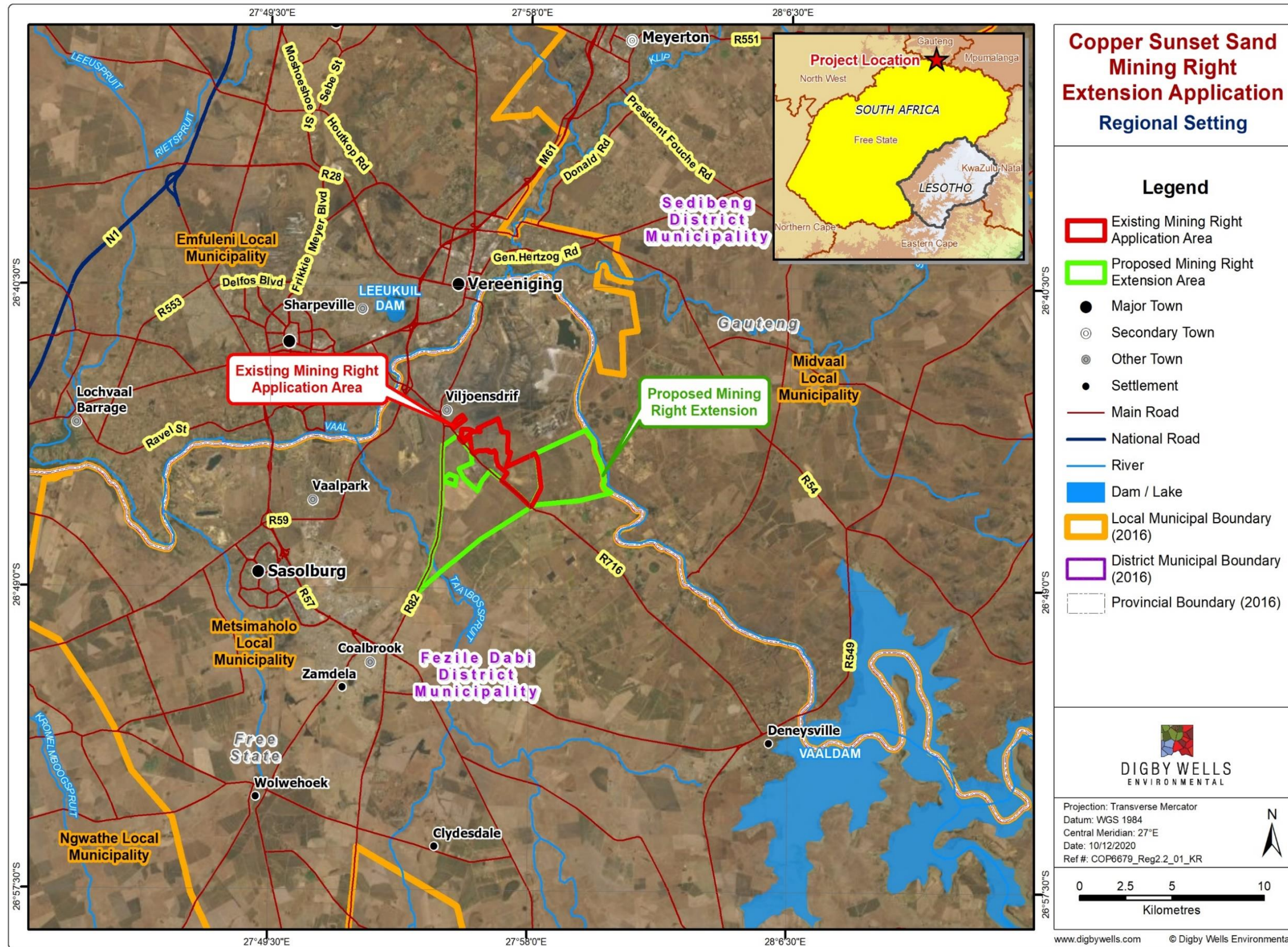


Figure 2-1: Project Locality

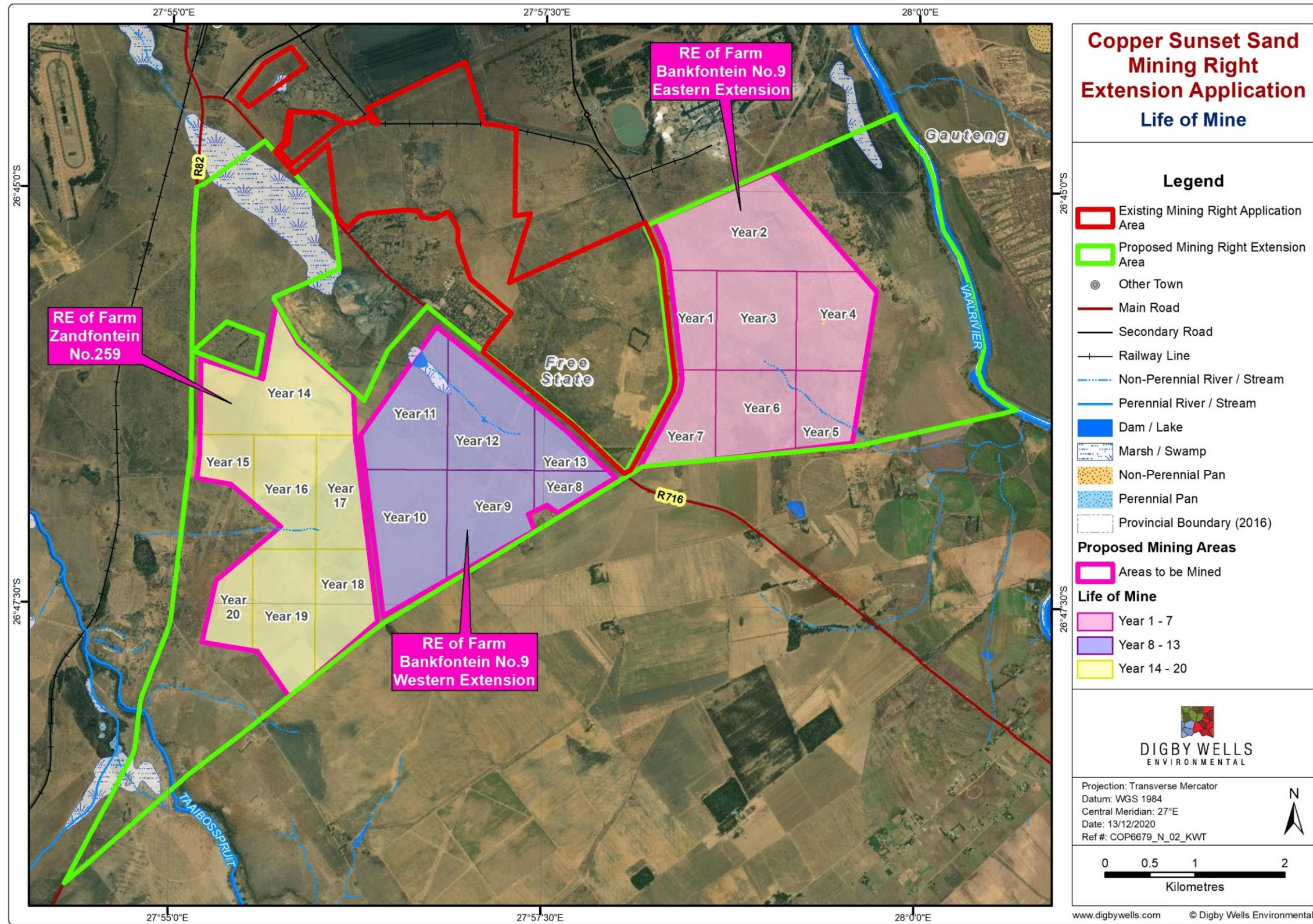


Figure 2-2: Life of Mine

3. Description of the Activities to be Undertaken and Phases

Copper Sunset began sand mining in 2009. There are currently about nine months left of the LoM. Therefore, Copper Sunset wishes to expand the MRA to include additional portions of the RE of the Farm Bankfontein No. 9 and a portion of the RE of the Farm Zandfontein No. 259. The properties are located within Seriti's MRA. The intention of the Application is to maximise the mineral resource and to further extend the LoM. The mining infrastructure already established will be used for the expanded areas. However, mobile offices will be established at the entrance to the new mining areas. A total of two new office areas, each approximately 1ha, will be established at each mining area when mining commences. The infrastructure onsite will include the following:

- Mobile offices;
- Hydrocarbon storage tank (14,000 L) with associated bund. Machinery will be refuelled in the area;
- Waste storage area;
- Parking area for the storage of mobile infrastructure; and
- A generator and solar panels to provide electricity to the offices.

The sand deposit lies between 0.4 – 5 m below the surface. Strip mining will be utilised to recover the resource, with the sand mined in strips of 30 – 35 m in width and 0.4 - 5 m in depth. The length of the strips is dependent on the area to be mined but approximate lengths are in the region of 180 – 600 m. The type of sand present in the mining area includes building sand and plaster sand.

The mining activities to be undertaken on site includes:

- Stripping and stockpiling of topsoil;
- Construction of a temporary haul road (20m wide and length approximately 10 km);
- Mining of the sand resource including screening;
- Backfilling of the mined excavations with stockpiled topsoil; and
- Concurrent rehabilitation.

Figure 3-1 provides an indication of the proposed office locations and the mining area.

3.1. Resource Deposit

Copper Sunset is applying for an extension to their Mining Right Area (MRA) to include adjacent farms to continue mining general sand (90% plaster and 10% building sand) and clay. Copper Sunset intends to supply several clients with building and plaster sand for use mainly in the construction industry. The deposit extends over an area of 2795.7 ha. The deposit is known to have an average thickness of 5 m. The current mining rate for Copper

Sunset is approximately 2 000 m³ per day. This is expected to continue, and at this rate the proposed extension area will extend the LoM for Copper Sunset by approximately 20 years.

3.2. Establishment Phase

During the establishment phase of the proposed project, the following activities will be undertaken:

- Site Clearance: Vegetation and topsoil will be removed with a bulldozer and stockpiled along the mined-out strip; and
- Construction of a haul road (20m width) to gain access to the sand mining areas. The haul road will move as mining progresses through life of mine.

No permanent infrastructure will be constructed on site for the sand mining operation. All machinery will be mobile and brought in by Copper Sunset. This will include:

- Placement of mobile office;
- Establishment of parking area;
- Establishment mobile screening plant; and

Placement of portable toilets, a hydrocarbon storage tank and water bowser.

3.3. Operational Phase

The operation will make use of a fleet of tipper trucks, front-end loaders, excavators, water trucks, tractors, and bulldozers. Mining will commence with the removal of vegetation using a bulldozer. The topsoil will be removed by a bulldozer to a depth of about 0.3 – 0.4 m and stockpiled in a separate area for use during rehabilitation.

During the operational phase of the proposed project, the following activities will be undertaken:

- Strip mining will take place in sequences of 30 – 50 m wide to extract the sand by means of light weight excavators;
- A screening process will be utilised where required should sand become contaminated with unusable particles;
- The customer trucks (100-200 trucks per day) will enter via the haul road into the mining area. The haul road will be constructed as a loop to allow continuous flow of traffic. The mined-out sand / screened sand will be placed directly onto the customers trucks;
- The refuelling of equipment will take place at the mobile office areas within the expanded mining area;
- Water will be abstracted from an authorised borehole, located at the existing Copper Sunset MRA. This borehole is authorised by the Department of Water and Sanitation

(DWS) under Water Use Licence (WUL) No. 08/C22F/AG/2315 granted 18 September 2013. It is anticipated that water will only be required for potable water and dust suppression on the expansion area. The amount of water used will remain within the limits of the existing license; and

- No mining will take place within a 100 m buffer from the edge of the Vaal River.

3.4. Rehabilitation Phase

Sand mining will cease once the resource has been extracted. Concurrent rehabilitation will be implemented during the sand mining process.

During the rehabilitation phase of the proposed project, the following activities will be undertaken:

- The areas which have been mined out will be backfilled with waste material from the screening plant which will be covered with topsoil stockpiled during the operational phase;
- The area will be levelled and contoured to mimic pre- mining natural topography to avoid ponding of water. The overall site topography is anticipated to be slightly diminished because of the removal of sand; and
- The area will be allowed to naturally re-vegetate. Where vegetation is not establishing well, an indigenous seed mix will be utilised to improve vegetation establishment.

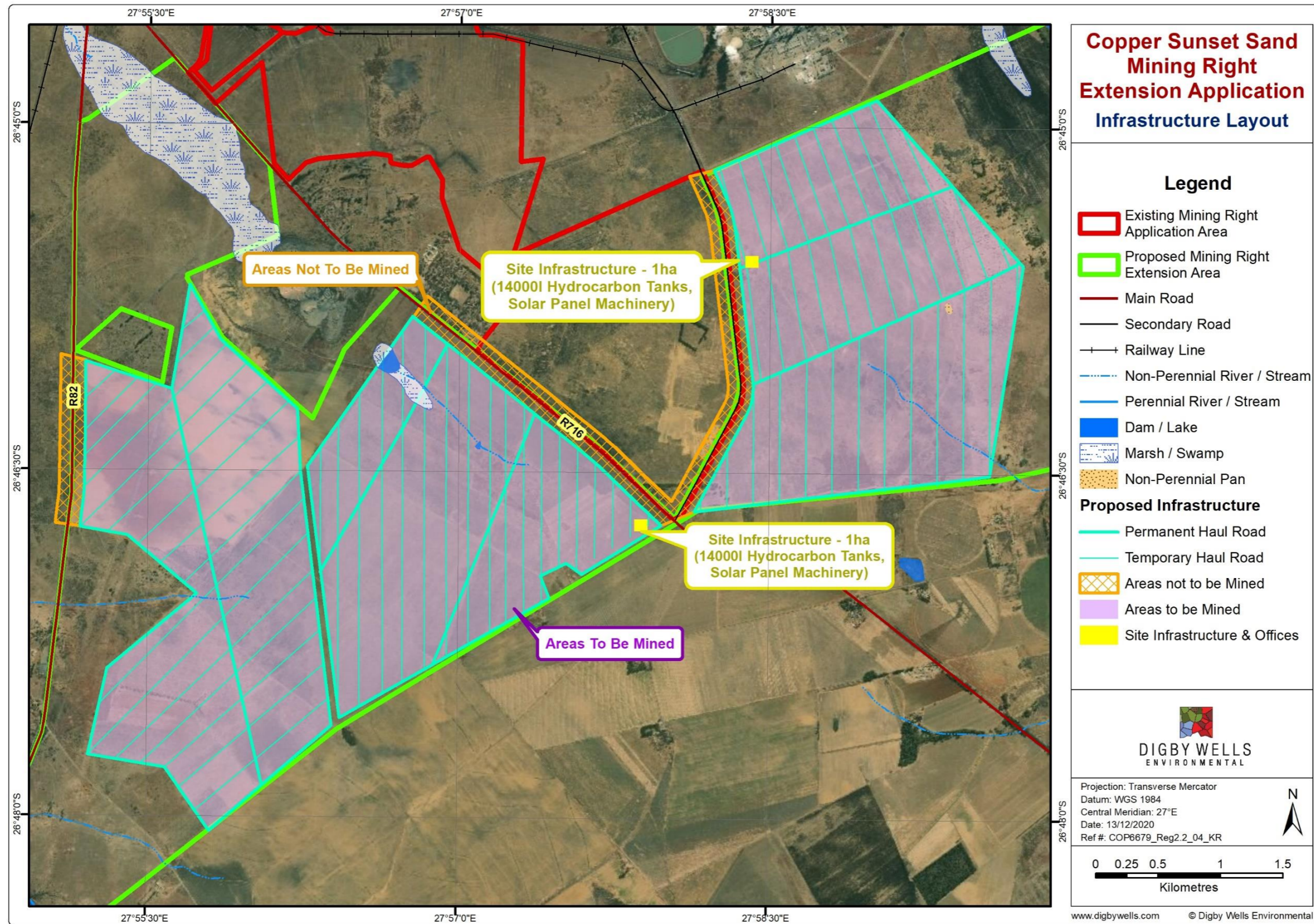


Figure 3-1: Proposed Mine Layout

4. Scope of Work

The ENIA aims to complete a noise modelling assessment to predict the Sound Pressure Levels (SPLs) expected during the establishment and operational phases of the project and to estimate the noise contribution from the mine to the current baseline conditions.

Based on the above, the noise impact assessment scope of work will encompass the following:

- Assessment of the existing ambient noise conditions;
- Assessment of the project related noise impacts and comparison against regulatory standards for compliance; and
- Recommendations of management measures, including mitigation and monitoring requirements.

5. Assumptions, Limitations, and Exclusions

Assumptions, limitations, and exclusions pertaining to this Project are discussed in Table 5-1 and are included as part of this assessment.

Table 5-1: Assumptions, Limitations, and Exclusions

Assumption, Limitation, or Exclusion	Consequence
Cumulative impact assessment has been excluded from the study	No implication, ongoing sand mining contributes to the existing background.
The modelling adopted a conservative worst-case scenario approach assuming that all activities for each phase are being carried out simultaneously.	This approach may lead to over prediction of the noise impact on-site and at a receiver.
The establishment phase is assumed to be carried out during the daylight hours only (06:00-18:00).	Only a daytime scenario was modelled.
It is assumed that during the operational phase of the project, 80% of the mining machinery will be operational for day and night-time.	No implication on the results, as the assumption was based on a realistic day-to-day scenario for the mine site.

6. Details of the Specialist(s)

Keenan Terry (Author) is the Noise Specialist at Digby Wells & Associates (Pty) Ltd. He obtained a BSc. degree in Environmental Science as well as a BSc (Hons) degree in Environmental Science from the University of Kwa-Zulu Natal. He is a member of the South African Council for Natural Scientific Professions (SACNASP), the International Association for Impact Assessment South Africa (IAIAsa), and the South African Geomatics Council (SAGC).



7. Relevant Legislation, Standards, and Guidelines

The legislation, regulation, and guidelines considered in this noise report are tabulated and discussed briefly in Table 7-1. The applicable standards in terms of compliance are discussed in Section 7.1 below.

Table 7-1: Applicable Legislation, Regulations, Guidelines and By-Laws

Legislation, Regulation, Guideline, or By-Law	Applicability
<p><u>National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA) as Amended</u></p> <p>The NEMA is the statutory framework to enforce Section 24 of the Constitution of the Republic of South Africa ... (Section 24: <i>the right to a healthy environment and the right to have the environment protected</i>). The NEMA is intended to promote co-operative governance and ensure that the rights of people are upheld, but also recognising the necessity of economic development.</p>	<p>Principles from NEMA relevant to noise pollution, Section 24(4) b(i) ... “the investigation and assessment of the potential impacts of activities that require authorisation or permission.”, and Section 24(7).</p> <p>Procedures for the Assessment and minimum criteria for reporting on identified environmental themes in terms of Sections 24(5)(a) and (h) and 44 of the NEMA, when applying for environmental authorisation.</p>
<p><u>National Noise Control Regulations, R.154 of 1992 (the Noise Regulations) promulgated in terms of Section 25 of the Environmental Conservation Act, 1989 (Act 73 of 1989)</u></p> <p>The National Noise-Control Regulations (GN R154 in Government Gazette No. 13717 dated 10 January 1992) (NCRs) form part of the Environmental Conservation Act and these Regulations apply to external noise.</p> <p>The NCRs differentiates between Disturbing Noise levels (which is objective and scientifically measurable which are generally compared to existing ambient noise level) and Noise Nuisance (which is a subjective measure and is defined as noise that “<i>disturbs or impairs or may disturb or impair the convenience or peace of any person</i>”).</p> <p>Local Authorities use Controlled Areas to identify areas with high noise levels. Restrictions have been set out for development that occurs in these Controlled Areas. These regulations make provision for guidelines pertaining to noise control and measurements. The regulations make reference to the use of the South African National Standards 10103:2008 (SANS) guidelines for the Measurement and Rating of Environmental Noise with Respect to Land Use, Health, and Annoyance and to Speech Communication.</p>	<p>The purpose of these Regulations is to prescribe general measures for the control of noise nationally.</p>

Legislation, Regulation, Guideline, or By-Law	Applicability
<p>As such, a Noise Impact Assessment in accordance with the NCRs must be undertaken for submission to determine the potential disturbing and nuisance noise levels associated with a particular development.</p>	
<p><u>Noise Control Regulations for the Free State Province, PN.242 of 1997 promulgated in terms of Section 25 of the Environmental Conservation Act, 1989 (Act 73 of 1989) (ECA)</u></p> <p>The control of noise in the Free State Province is legislated in the form of Noise Control Regulations specific to the Free State province and is promulgated in terms of section 25 of the Environment Conservation Act No. 73 of 1989.</p> <p>In 1996, Schedule 5 of the Constitution devolved responsibility to the provinces to administer these regulations themselves. Free State (GN 24/PG 35/19980424) is one of three provinces that have done so. Subsequently, the NCRs have been repealed in these provinces. Also, various municipalities have their By-Laws regarding noise control.</p>	<p>The purpose of these Regulations is to prescribe general measures for the control of noise in the Free State province.</p>
<p><u>South African National Standard (SANS) 10103:2008 Edition 6: The measurement and rating of environmental noise with respect to annoyance and to speech communication</u></p> <p>The standard covers methods and gives guidelines to assess working and living environments with respect to acoustic comfort, excellence, and with respect to possible annoyance by noise (i.e. whether complaints can be expected). It also gives a method to predict speech communication efficiency</p>	<p>The purpose of this standard is to provide a guideline for the measurement and rating of environmental noise.</p>
<p><u>South African National Standard (SANS) 10328:2008 Edition 2: Methods for environmental noise impact assessments</u></p> <p>The standard covers procedures for environmental noise impact investigations and assessments.</p>	<p>The purpose of this standard is to provide a guideline for environmental noise impact investigations and assessments. Therefore, this ENIA has been prepared in compliance with this standard.</p>

7.1. Applicable South African Standards

The NEMA as amended, provides a legislative framework for environmental management in South Africa. Pollution, as described in NEMA from a noise perspective, means any change in the environment caused by noise emitted from any activity, whether engaged in by any

person or an organ of state, where that change has an adverse effect on human health or well-being or will have such an effect in the future. Principles from NEMA relevant to noise pollution include; Section 28(1) *“Every person who causes, has caused or may cause significant pollution, must take reasonable measures to prevent such pollution”*, Section 24(4) b(i) ... *“the investigation and assessment of the potential impacts of activities that require authorisation or permission.”* and Section 24(7) *“Procedures for the investigation, assessment, and communication of the potential impact of activities”*. Principles from NEMA (GN R320 of 20 March 2020) provides the criteria for the specialist assessment and minimum report content requirements for the impacts of noise on the environment for activities requiring environmental authorisation.

The National NCRs is the primary law on noise in the Republic of South Africa (GN R154 of 10 January 1992) and is promulgated in terms of Section 25 of the ECA No. 73 of 1989. The Regulations put in place includes various measures for the prevention of noise pollution and national norms as well as standards for the regulation/control of noise in South Africa. Schedule 5 of the Constitution, devolved responsibility to the provinces to administer these regulations themselves, subsequently, the NCRs were repealed in the Free State province. The control of noise in the Free State Province is now legislated in the form of Noise Control Regulations specific to the Free State (GN 24/PG 35/19980424) province and is promulgated in terms of Section 25 of the ECA. Based on the Free State NCRs, it is prohibited to 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. The Free State NCRs describes a "disturbing noise" as a noise level that exceeds the ambient sound level measured continually at the same measuring point by 7dBA or more.

The South African Bureau of Standards (SABS) is the National Standards Body in the Republic of South Africa that is responsible for the development, maintenance, and promotion of South African National Standards (SANS) as mandated by the Standards Act No.8 of 2008. The SANS 10103:2008 and SANS 10328:2008 have been identified in NEMA (GN R320 of 20 March 2020) as the national standard for the assessment of noise impacts for residential and non-residential areas as defined in these standards. The acceptable rating levels according to SANS 10103:2008 for ambient noise in different districts (residential and non-residential) are presented in Table 7-2.

**Table 7-2: Acceptable Rating Levels for Noise in Districts (SANS 10103, 2008)**

Type of District	Equivalent continuous rating level ($L_{Req,T}$) for noise (dBA)					
	Outdoors			Indoors, with open windows		
	Day-night	Daytime	Night-time	Day-night	Daytime	Night-time
	$L_{R,dn}^a$	$L_{Req,d}^b$	$L_{Req,n}^b$	$L_{R,dn}^a$	$L_{Req,d}^b$	$L_{Req,n}^b$
RESIDENTIAL DISTRICTS						
a) Rural districts	45	45	35	35	35	25
b) Suburban districts with little road traffic	50	50	40	40	40	30
c) Urban districts	55	55	45	45	45	35
NON-RESIDENTIAL DISTRICTS						
d) Urban districts with some workshops, with business premises, and with 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
NOTE 1 If the measurement or calculation time interval is considerably shorter than the reference time intervals, significant deviations from the values given in the table might result.						
NOTE 2 If the spectrum of the sound contains significant low frequency components, or when an unbalanced spectrum towards the low frequencies is suspected, special precautions should be taken and specialist advice should be obtained. In this case the indoor sound levels might significantly differ from the values given in columns 5 to 7						
NOTE 3 In districts where outdoor $L_{R,dn}$ exceeds 55 dBA, residential buildings (e.g. dormitories, hotel accommodation and residences) should preferably be treated acoustically to obtain indoor $L_{Req,T}$ values in line with those given in table 1.						
NOTE 4 For industrial districts, the $L_{R,dn}$ concept does not necessarily hold. For industries legitimately operating in an industrial district during the entire 24 h day/night cycle, $L_{Req,d} = L_{Req,n} = 70$ dBA can be considered as typical and normal.						
NOTE 5 The values given in columns 2 and 5 in this table are equivalent continuous rating levels and include corrections for tonal character, impulsiveness of the noise and the time of day.						
NOTE 6 The noise from individual noise sources produced, or caused to be produced, by humans within natural quiet spaces such as nature reserves, private game farms, national parks, wilderness areas and bird sanctuaries, should not exceed a maximum Weighted sound pressure level of 50 dBA at a distance of 15 m from each individual source.						

Type of District	Equivalent continuous rating level ($L_{Req,T}$) for noise (dBA)					
	Outdoors			Indoors, with open windows		
	Day-night	Daytime	Night-time	Day-night	Daytime	Night-time
	$L_{R,dn}^a$	$L_{Req,d}^b$	$L_{Req,n}^b$	$L_{R,dn}^a$	$L_{Req,d}^b$	$L_{Req,n}^b$
A - The values given in columns 2 and 5 are equivalent continuous rating levels and include corrections for tonal character and impulsiveness of the noise and the time of day.						
B - The values given in columns 3, 4, 6 and 7 are equivalent continuous rating levels and include corrections for tonal character and impulsiveness.						
C – $L_{Req,T}$ is the equivalent continuous A-weighted sound pressure level ($L_{Aeq,T}$) during a specified time interval, plus specified adjustments for tonal character, impulsiveness of the sound and the time of day.						
D – dBA ‘A-weighted’ is a standard weighting of the audible frequencies designed to reflect the response of the human ear to noise.						

The SANS10103:2008 also provides guidelines for addressing the issues concerning environmental noise and for estimating communities’ responses to increases in the general ambient noise level as a result of an intruding noise. The probable community/group response to levels over the acceptable rating levels are presented in Table 7-3, where $L_{Req,T}$ is the equivalent continuous A-weighted sound pressure level, in decibels (dBA), determined over a specific period. ‘A-weighted’ is a standard weighting of the audible frequencies designed to reflect the response of the human ear to noise.

Table 7-3: Categories of Community/Group Response (SANS 10103, 2008)

Excess ($\Delta L_{Req,T}$) ^a dBA	Estimated community/group response	
	Category	Description
0 – 10	Little	Sporadic complaints
5 – 15	Medium	Widespread complaints
10 - 20	Strong	Threats of action
>15	Very strong	Vigorous action
NOTE 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) $\Delta L_{Req,T} = L_{Req,T}$ of ambient noise under investigation MINUS $L_{Req,T}$ of the residual noise (determined in the absence of the specific noise under investigation);		
2) $\Delta L_{Req,T} = L_{Req,T}$ of ambient noise under investigation MINUS the maximum rating level for the ambient noise given in table 1;		

Excess ($\Delta L_{Req,T}$) ² dBA	Estimated community/group response	
	Category	Description
3) $\Delta L_{Req,T}$ = $L_{Req,T}$ of ambient noise under investigation MINUS the typical rating level for the applicable district as determined from table 2; or		
4) $\Delta L_{Req,T}$ = Expected increase in $L_{Req,T}$ of ambient noise in an area because of a proposed development under investigation.		

8. Methodology

The approach used in investigating the noise impacts of sand mining on the sensitive receivers and the ambient noise levels of the area is covered in the section below.

8.1. Baseline Assessment

The ambient (background) noise conditions were determined in the Project Area based on the results of one monitoring campaign that was conducted in October 2020 at selected sensitive receiver locations. Google Earth® Imagery was used to identify the optimal noise-sensitive receivers in the vicinity of the MRA, where measurements were conducted. The approach used in investigating the noise impacts was based on the guidelines provided by SANS10103:2008.

8.1.1. Ambient Noise Measurements

Ambient noise levels were measured over four days from the 1st of October till 5th October 2020 in accordance with SANS 10103:2008. Continuous day and night-time measurements were taken at three locations designated as N1, N2, and N3 (see Figure 8-1). The SANS10103:2008 guidelines describe Daytime as 6 am to 22 pm and Night-time means 22 pm to 6 am.

According to the guidelines in GN R320 of 20 March 2020, measurement of current ambient sound levels at each receiver must be collected over a minimum period of two nights, with each sample being a minimum of ten minutes and taken at two different times of the night (such as early evening and late at night). The approach in this campaign fulfilled the latter.

Three 'Class 1, precision grade' Sound Level Meters (SLMs), compliant with International Standards IEC 61672-1 and the SANS10103:2008 standard was used to conduct the continuous day and night-time ambient noise measurements, see Table 8-1. The instruments were field calibrated with a Quest CA-22, sound level calibrator, and 1/3 octave band logging were employed. The SLMs would measure "average" sound levels over 10-minute periods, save the data and start with a new 10-minute measurement till the instrument was stopped. The parameter measured at each location included but were not limited to, the equivalent continuous sound pressure level (L_{Aeq}). It is a common practice to measure noise levels using the A-weighting setting built into all SLMs. The L_{Aeq} noise level data describes the average noise level for the measurement period taking into account all noise sources that were audible

at the specific measurement location. The L_{Aeq} noise levels recorded for the measurement period were used to determine ambient noise levels in and around the MRA.

Table 8-1: Noise Measurement Equipment

Model	Equipment Type
SVAN 955	Integrating Sound Level Meter
SVAN 977	Integrating Sound Level Meter
RION NA-28	Integrating Sound Level Meter
Quest CA-22	Sound Level Calibrator
RION WS-03	Outdoor Weatherproof Microphone Kit

The background noise measurements, including the A-weighted sound level parameters L_{Aeq} , minimum (L_{Amin}), maximum (L_{Amax}), 90th percentile (L_{A90}) for the three measurement locations were recorded and archived. Table 8-2 and Figure 8-1 presents the location where noise measurements were conducted.

Table 8-2: Noise Measurement Locations

Site ID	Farm/location	Category of receiver	GPS coordinates
N1	Bankfontein No.9	Rural	26°45'37.73"S / 27°56'43.76"E
N2	Modderfontein No.1279	Rural	26°47'6.44"S / 27°58'53.96"E
N3	Zandfontein No.259	Rural	26°47'29.46"S / 27°54'55.90"E

The meteorological conditions recorded for the duration of the measuring period can be found in Table 8-3 below.

Table 8-3: Meteorological Conditions

	Air Pressure (hPA)	Relative Humidity (%)	Temperature (°C)	Wind Speed (m/s)
Average	1014.2	62	17.6	1.6
Maximum	1014.2	99	31.8	8.3
Minimum	1014.2	22	6.8	0

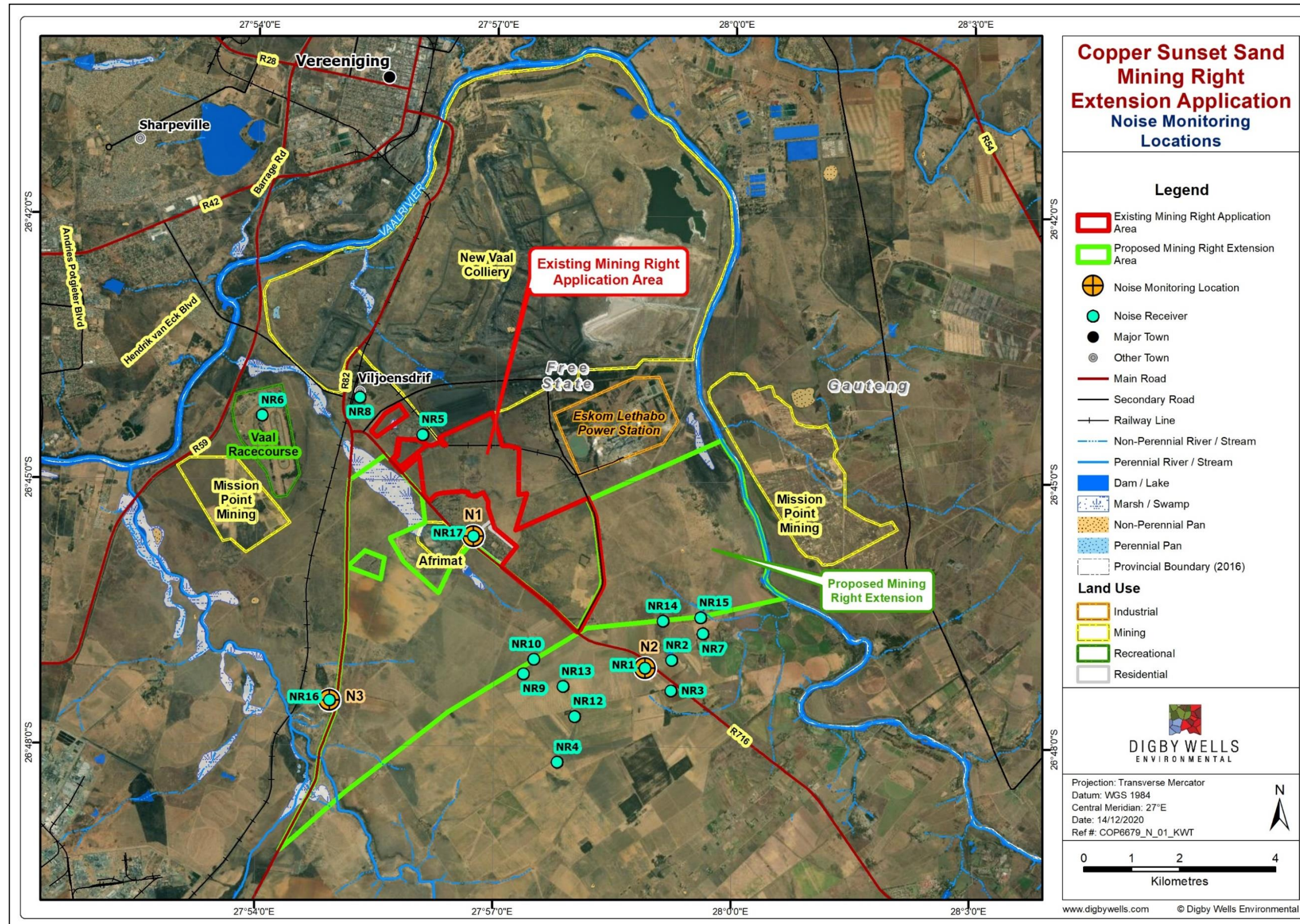


Figure 8-1: Noise Monitoring Locations

8.2. Noise Dispersion Modelling

To predict future noise impacts of a proposed or existing facility, noise dispersion modelling is conducted. In doing so, a noise emissions inventory was conducted, taking into account all noise-generating sources associated with the proposed project. The total number of equipment, sound power levels, operational frequency, coupled with the correction factors were estimated using industry accepted equations before importing into the SoundPlan software modelling environment.

8.2.1. Inventory of Noise Sources

An inventory of noise generating equipment and sources, point, line, and area sources was conducted based on the information received from Copper Sunset. Table 8-4 indicates the equipment that will be employed and the associated sound power levels, octave band frequencies (Hz). A correction factor was applied to account for the operational hours of machinery, as most are not used 100% of the time. The correction for the working hours is calculated with the equation below as follows (Licitra, 2012):

$$C_w = 10 \log \frac{t}{T_0}$$

Where;

- C_w = Correction for active hours in dB
- t = Active source time per period based on a yearly averaged situation (hours)
- t_0 = Reference period of time (hours) (day: 12 hours; Evening: 4hours; Night: 8hours)

Table 8-4: Sound Power Levels from Main Noise Generating Equipment

Noise Source	Sound power levels dB						
	63	125	250	500	1000	2000	4000
Bulldozer	118	118	115	114	110	106	102
Screening Facility	90	95	94	97	102	100	95
Tractor	93	86	76	76	73	72	64
Dump/Tipper Trucks	61	75	83	92	87	81	71
Generator	79.9	84.3	82.8	89	95.4	79.1	69.9
TLB	101	105	104	105.5	104.5	101	99
Excavator	108.4	108.2	110	104.8	102.7	97.7	97.9
General Noise	100	98	95	92.3	91.7	89.3	86

The SANS 10210 of 2004, “the national standard for the calculating and predicting of road traffic noise” was used to calculate the noise level to be generated by traffic (additional trucks and other vehicles) along with the proposed diversion, haul, and access roads based on the following formula:

Basic Model

$$L_{Basic} = 38.3 + 10 \text{ Log } (Q_r) \text{ dBA},$$

Where L_{Basic} = basic noise level in dBA and Q_r is the mean traffic flow per hour.

Primary Corrections to the Basic Model:

- Corrections for speed of traffic and percentage of heavy vehicles, $L_{P,v}$;
- Correction for gradient, L_{gr} ;
- Correction for road surface texture, L_t ;
- Correction for ground conditions and distance of the receiver, $L_{d,hr}$;
- $L_{Aeq}(1h) = L_{Basic} + L_{P,v} + L_{gr} + L_t + L_{d,hr}$

The calculated road traffic noise level (dB) for the abovementioned road sources was included in the SoundPlan model.

8.2.2. Noise Modelling

The SoundPlan modelling software was used for carrying out computational calculations for noise dispersion modelling. This program allows the use of the **CON**servation of **C**lean **A**ir and **W**ater in **E**urope (CONCAWE) calculation method for modelling atmospheric attenuation of noise from industrial complexes. Also, the site meteorological conditions are input parameters that goes into the model.

The propagation of sound was calculated in accordance with the CONCAWE method, as described in the SANS 10357:2004 ‘The calculation of sound propagation by the CONCAWE method’. The model takes into account the noise emission levels of the different equipment for establishment and operational conditions. Also, the attenuation of noise due to the geometrical spreading of the noise, ground, atmosphere, and the screening effect of the topography and other barriers were considered. According to da Silva (2017), the method was designed for outdoor sound propagation over long distances (distances up to 2 km). The computational calculations according to the CONCAWE method were run on the SoundPlan modelling software.

9. Findings and Discussion

A summary of the ENIA findings as they relate to the baseline noise soundscape of the area and the future impacts associated with the establishment and operation of the proposed Copper Sunset extension project are provided below.

9.1. Baseline Environment

The MRA and surroundings are characterised by scattered farmstead, low population density and can therefore be classified as Rural (Pateman, 2011). The predominant land use types in and around the Project Area as identified from the Google Earth® imagery are agriculture, mining (New Vaal Colliery, Afrimat, Copper Sunset Mine and Mission Point Mining), industry (Eskom Lethabo Power Station), recreational (Vaal Racecourse) and residential. The activities associated with these land-use types have the potential to generate a disturbing noise that may influence the existing noise soundscape. The road network R82 and R716 surrounding the MRA are also contributors to the background noise.

The results of the baseline measurements are presented in Table 9-1 below. The ambient noise levels recorded on site and the rating limits according to the SANS 10103:2008 guidelines, are presented for comparison. The time history graph per noise measurement location (N1, N2, and N3) can be seen in Figure 9-1 to Figure 9-3.

Table 9-1: Results of the Baseline Noise Levels Measured

Sample ID	SANS 10103:2008 rating limit					
	Type of district	Period	Acceptable rating level dBA	L _{Aeq,T} dBA	Maximum/Minimum dBA	Date
N1	Rural	Daytime	45	51	90 / 34	01/10/2020 – 05/10/2020
		Night-time	35	43	54 / 31	01/10/2020 – 05/10/2020
N2	Rural	Daytime	45	47	74 / 33	01/10/2020 – 05/10/2020
		Night-time	35	41	59 / 28	01/10/2020 – 05/10/2020
N3	Rural	Daytime	45	50	65 / 40	01/10/2020 – 05/10/2020
		Night-time	35	46	56 / 32	01/10/2020 – 05/10/2020
	Indicates current L _{Aeq,T} levels above either the daytime rating limit or the night time rating limit					

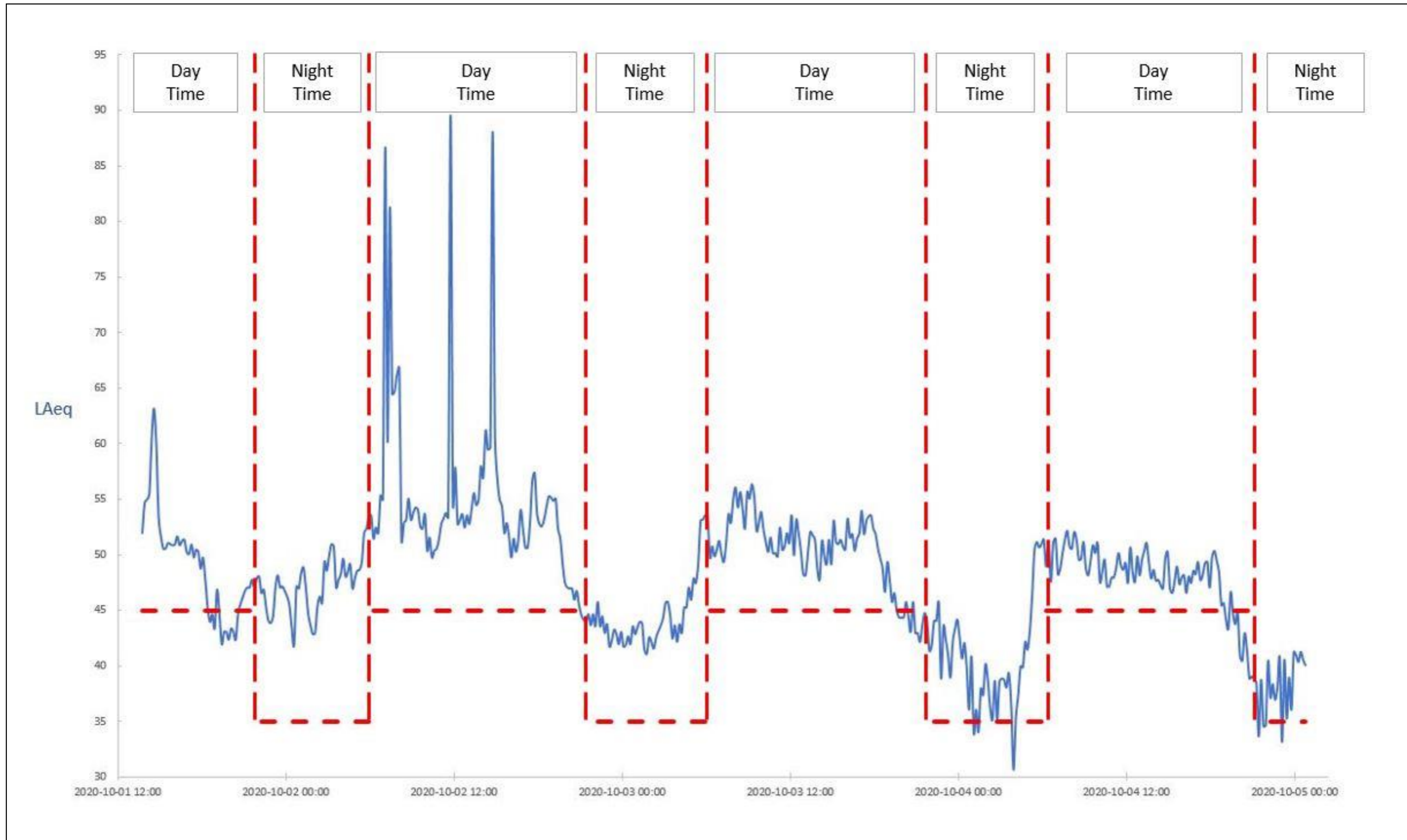


Figure 9-1: Noise Time Series Graph for N1 Monitoring Location

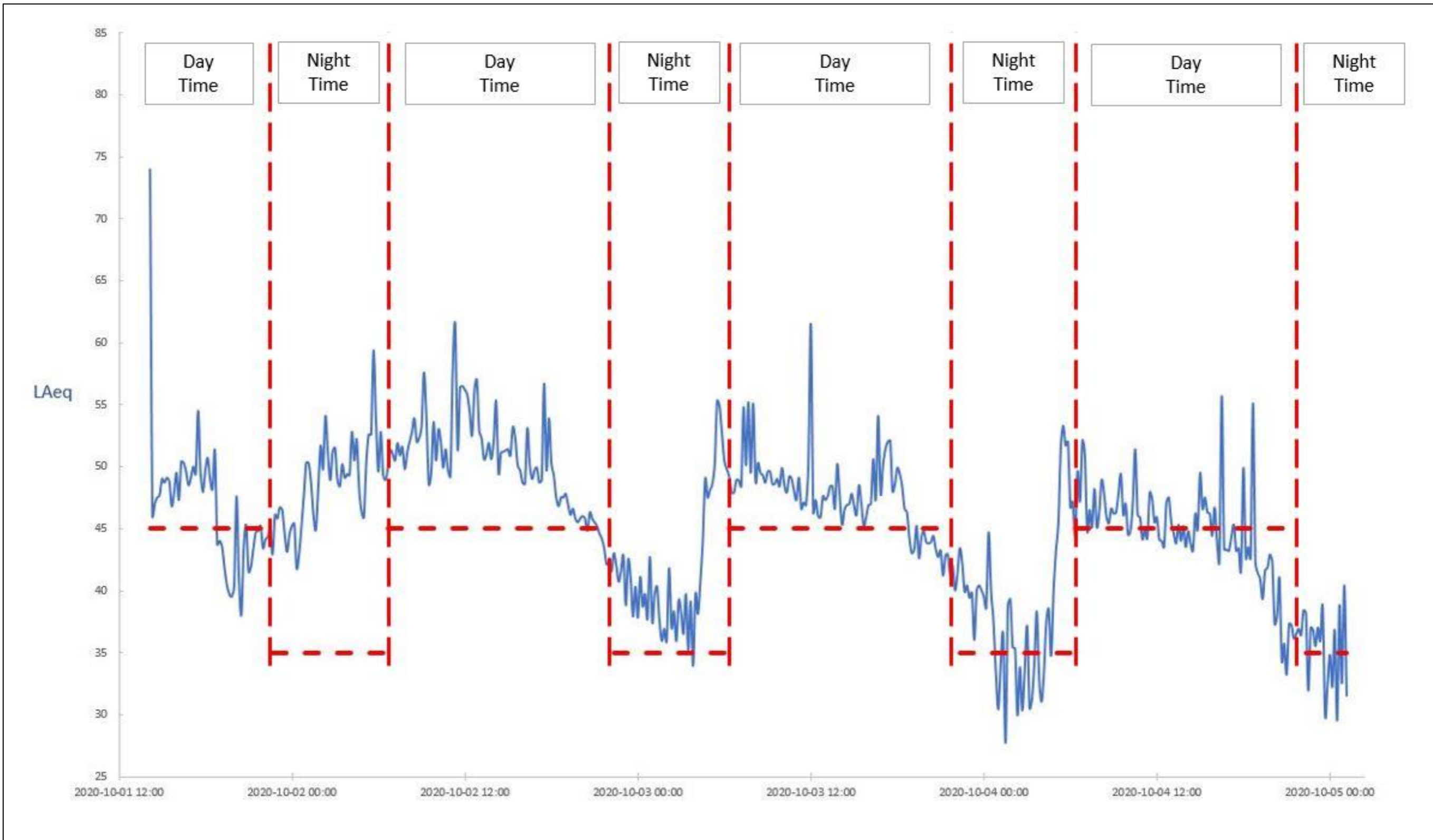


Figure 9-2: Noise Time Series Graph for N2 Monitoring Location

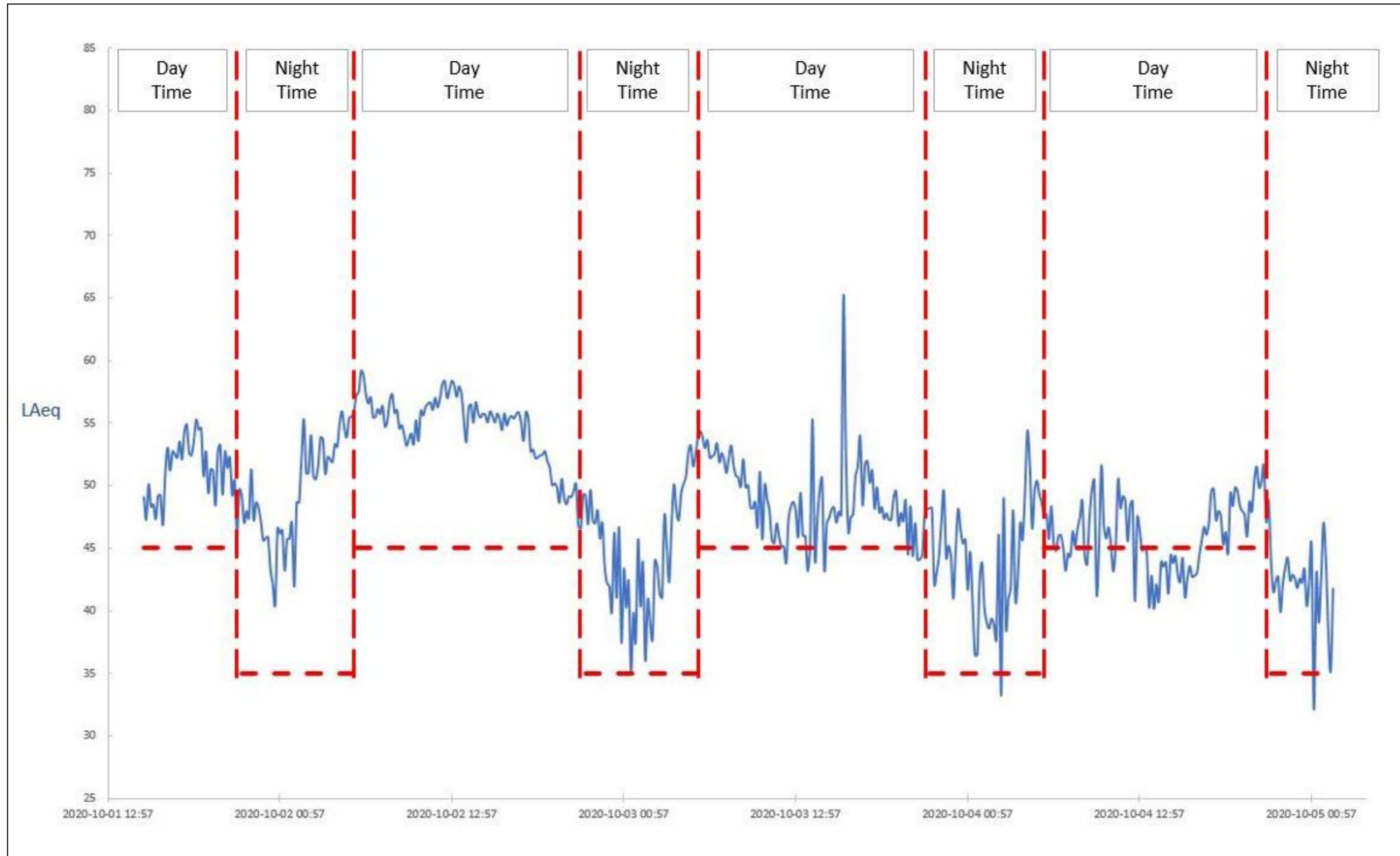


Figure 9-3: Noise Time Series Graph for N3 Monitoring Location

9.1.1. Day-Time Results

The average daytime ambient noise level measured throughout the measuring period was 49dBA. The daytime noise levels at the different measurement locations indicate that the ambient daytime noise levels at all measurement locations were above the SANS guidelines maximum limit rating of 45dBA allowable for outdoor ambient noise in rural districts. The main noise sources influencing the daytime sound levels at the various measurement locations were mining activities to the north of the MRA, sound from kids screaming and playing from the residential area at N1, continuous birdsong, metal clanging, and hammering from the workshop in the vicinity of N2, intermittent noise from domestic animals (dogs) and vehicular activity on the R716 road.

9.1.2. Night-Time Results

The average night-time ambient noise level measured throughout the measuring period was 43dBA. The night-time noise levels at the different measurement locations indicate that the ambient night-time noise levels at all measurement locations were above SANS guidelines rating levels of 35dBA allowable for outdoor ambient noise in rural districts. The main noise sources influencing the night-time sound levels at the various measurement locations were the continuous mining activities to the north of the MRA, coupled with intermittent noise from domestic animals (dogs) and vehicular activity on the R716 road.

The noise sources that were audible during the baseline survey, contributing to the background soundscape measured in the MRA are depicted in Table 9-2.

Table 9-2: Noise Sources During Baseline Measurements

Noise source description			
Day	Noise Type	Night	Noise Type
Birdsong	Continuous	Domestic animals (dogs)	Intermittent
Kids screaming and playing	Continuous	Mining activities to the north of measurement location N2	Continuous
Domestic animals (dogs)	Intermittent	Vehicular activity on the R716 road	Intermittent
Vehicular activity on the R716 road	Intermittent		
Mining activities to the north of measurement location N2	Continuous		

9.2. Noise Model Simulations

The project-related isolines (lines of equal sound pressure levels) generated using the SoundPLAN software are reported and discussed for the establishment phase (daytime only) and operational phase (daytime and night-time). Findings are presented in the sections below.

9.2.1. Establishment

The noise isolines or contour lines for the establishment phase are depicted in Figure 9-4 and the predicted noise expected at the locations where noise measurements were conducted is presented in Table 9-3.

The model results indicate that sound propagation is highest (exceeds the daytime limit of 45dBA) within a 1km radius of all noise generating components of the project (without mitigation measures). Therefore, receivers at a distance greater than 1km from the project's noise generating components are likely to experience limited noise disturbances. The impact that the project, pre-mitigation will have on the existing ambient noise levels at selected receivers is varied due to the project's mining schedule. As mining activities progress from one extension area to the other, the impacts on sensitive receivers' changes based on the proximity to the active sand mining operation. Results from the establishment phase model suggest that a distance of 1km from sensitive receivers would result in the receivers experiencing negligible impacts pre-mitigation regardless of the progression of the mine.

Table 9-3 indicates that the predicted noise expected at all three measurement locations for the daytime establishment phase will be below the daytime limit of 45dBA, therefore is unlikely to cause a noise disturbance.

9.2.2. Operational

The noise contour lines map in Figure 9-5 and Figure 9-6 displays the noise propagation during the operational phase of the project for daytime and night-time, respectively. Table 9-3 presents the predicted noise expected at the locations where noise measurements were conducted.

9.2.2.1. Day Time

The model results for the daytime operational phase presented in Figure 9-5, indicate that sound propagation is highest (exceeds the daytime limit of 45dBA) within a 1km radius of all noise generating components of the project (without mitigation measures). Therefore, receivers at a distance greater than 1km from the project's noise generating components are likely to experience limited noise disturbances. Results from the operational phase daytime model suggest that a distance of 1km from sensitive receivers would result in the receivers experiencing negligible impacts pre-mitigation regardless of the mines progression.

Table 9-3 indicates that the predicted noise expected at all three measurement locations for the daytime operational phase will be below the daytime limit of 45dBA, therefore is unlikely to cause a noise disturbance.

9.2.2.2. Night-Time

The results for the night-time operational phase presented in Figure 9-6 indicate that sound propagation is highest (exceeds night-time limit of 35dBA) within a 2km radius of all noise generating components of the project (without mitigation measures). Therefore, receivers at a

distance greater than 2km from the project's noise generating components can expect limited noise disturbances. Figure 9-6 also indicates that three receivers (NR14, NR15, and NR7) fall within 2km of the project's noise generating components and are predicted to experience noise levels that exceed the night-time limit. Results from the operational phase night-time model suggest that a distance of 2km from sensitive receivers would result in the receivers experiencing negligible impacts pre-mitigation regardless of the mine's progression.

Table 9-3 indicates that the predicted noise expected at all three measurement locations for the night-time operational phase will be below the night-time limit of 35dBA, therefore is unlikely to cause a noise disturbance.

Table 9-3: Predicted Noise at the Measurement Locations

Sample ID	SANS 10103:2008 rating limit				
	Type of district	Period	Acceptable rating level dBA	Establishment Phase Model Results	Operational Phase Model Results
N1	Rural	Daytime	45	26.2	25.8
		Night-time	35		25.6
N2	Rural	Daytime	45	29.3	32.1
		Night-time	35		31.6
N3	Rural	Daytime	45	0	0
		Night-time	35		0
	Indicates current $L_{Aeq,T}$ levels above either the daytime rating limit or the night time rating limit				
	Indicates that daytime or night-time ratings were not considered.				

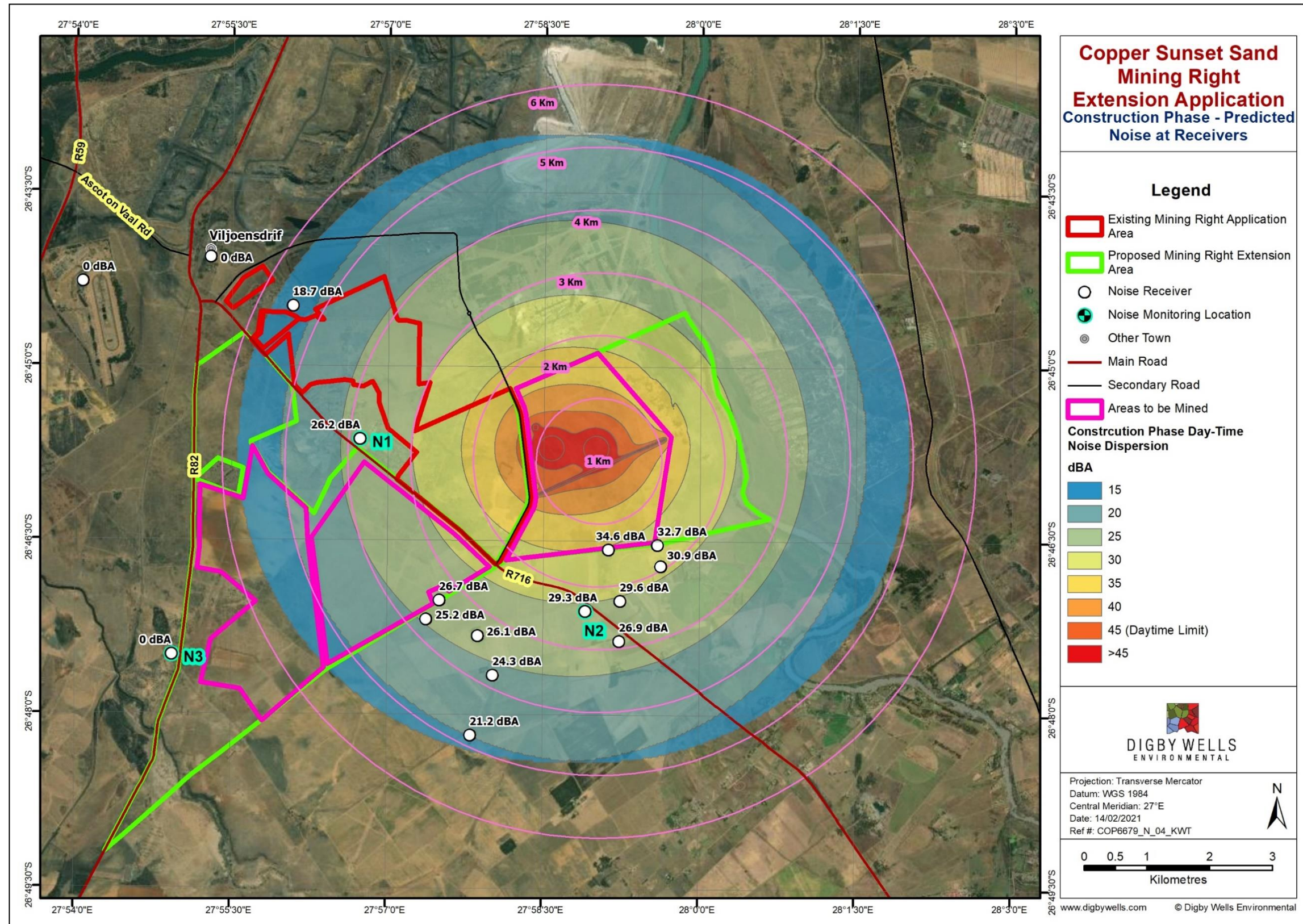


Figure 9-4: Predicted Noise at Selected Receivers for the Establishment Phase (Day-Time)

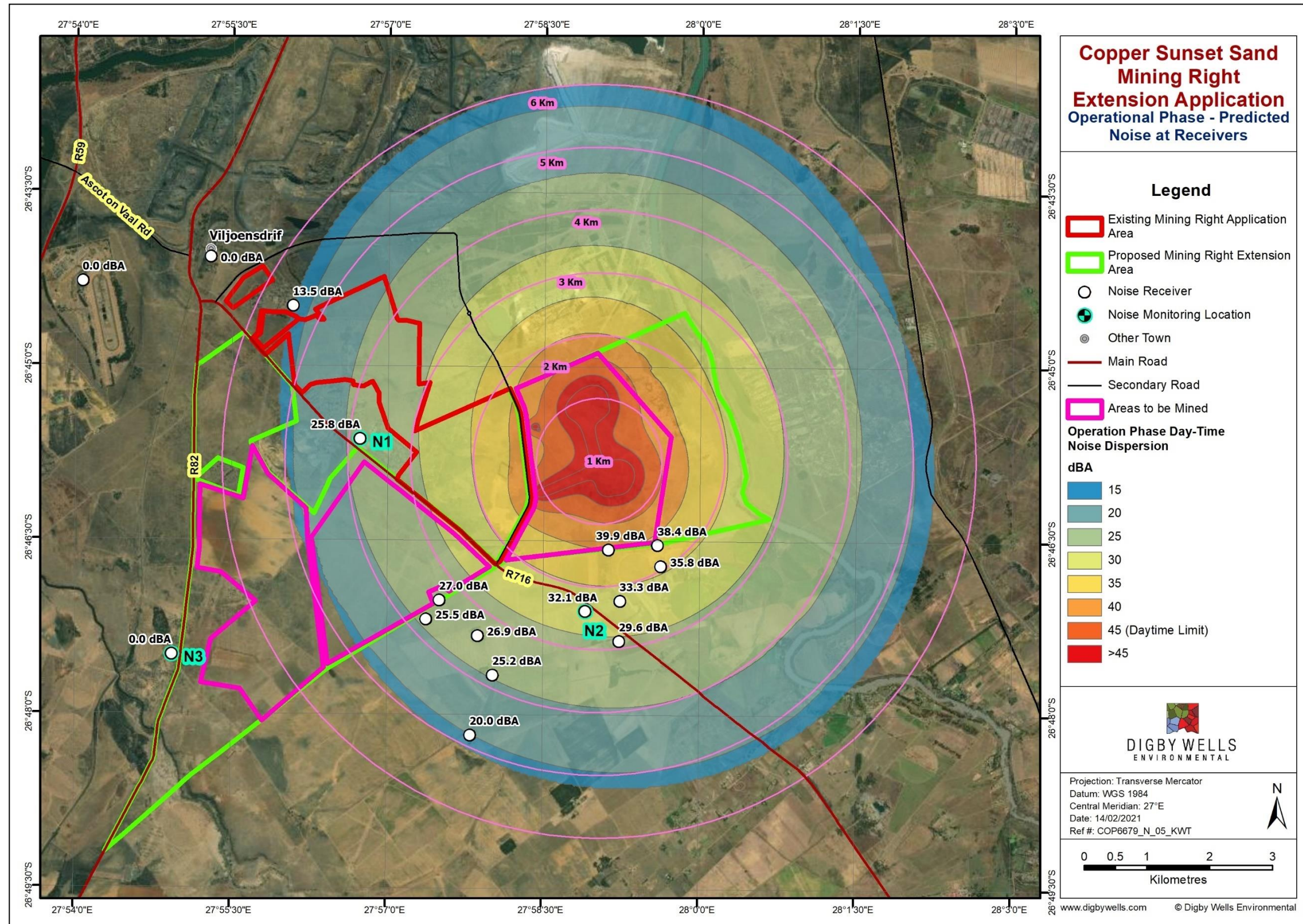


Figure 9-5: Predicted Noise at Selected Receivers for the Operational Phase (Day-Time)

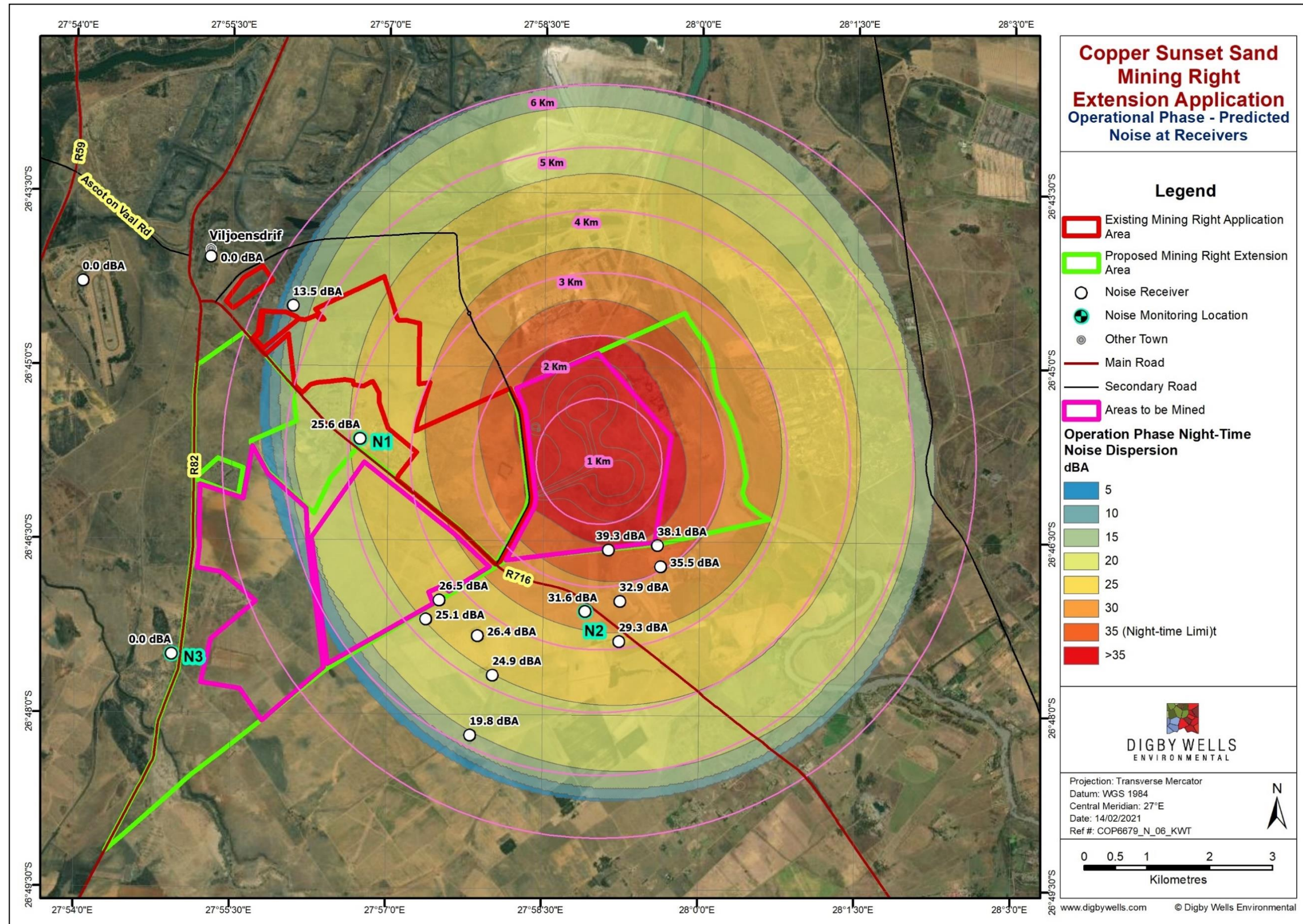


Figure 9-6: Predicted Noise at Selected Receivers for the Operational Phase (Night-Time)

10. Impact Assessment

This section rates the significance of the potential impacts, pre-mitigation, and post-mitigation. The impacts below are a result of both the environment in which the activity takes place, as well as the activity itself. The impacts associated with the proposed project include the NEMA EIA Regulations, 2014 (as amended) Listed Activities, as well as the mining and associated activities to take place at the MRA. The methodology utilised to assess the significance of the potential impacts is described in Appendix A. The following activities will be assessed as discussed in Table 10-1.

Table 10-1: Summary of Project Activities

Activity No.	Activity
Establishment Phase	<ul style="list-style-type: none"> ● Site clearance and vegetation removal; ● Placement of the Offices and associated mining equipment; ● Construction of the hydrocarbon storage tank and refuelling area; ● Establishment of a haul road/tracks; and ● Stockpiling of topsoil.
Operational Phase	<ul style="list-style-type: none"> ● Mining of sand resources including screening (if required); ● Transportation of sand; ● Refuelling of machinery within the mining area or at the mobile offices; and ● Handling of general and hazardous waste.
Decommissioning Phase	<ul style="list-style-type: none"> ● Backfilling of the mined excavations with topsoil and waste from the screening plants; ● Dismantling and removal of infrastructure; ● Concurrent rehabilitation (topsoil cover, ripping, and vegetation establishment); and ● Post-closure monitoring

10.1. Establishment Phase

Activities during the Establishment Phase that may have potential impacts on the ambient noise levels in the MRA and surroundings are indicated in Table 10-2.

Table 10-2: Interactions and Impacts of Activity

Interaction	Impact
Site clearance and vegetation removal;	Noise emanating from machinery while conducting these activities can cause noise disturbances at the surrounding sensitive receivers.
Placement of the Offices and associated mining equipment;	
Construction of the hydrocarbon storage tank and refuelling area;	
Establishment of a haul road/tracks; and	
Stockpiling of topsoil.	

10.1.1. Impact Description

The activities associated with surface preparation for the construction of infrastructure such as the establishment of a haul road/tracks, stockpiling of topsoil, site clearance, and vegetation removal will lead to the emission of noise. Additionally, the placement of the offices and associated mining equipment as well as the construction of the hydrocarbon storage tank and refuelling area will also lead to the emission of noise, subsequently causing a noise disturbance at the surrounding sensitive receivers.

The establishment phase activities will occur during the daytime only and in phases. Also, this phase will be short-term in nature, therefore, the anticipated noise impacts associated with these activities will be negligible. As indicated in the noise model simulation section above.

10.1.1.1. Management Objectives

The management objective is to ensure that on-site emissions are not in exceedance of the regulatory limits and to minimise/prevent the noise impact from causing a noise disturbance at the surrounding receivers. Mitigation measures will be implemented to ensure that emissions remain below limit values and are compliant with the relevant standards.

10.1.1.2. Management Actions

The following noise management actions are recommended as good practice guidelines:

- Ensure mitigation measures are factored into the day-to-day operation onsite; and
- Conduct noise monitoring periodically (i.e. on a quarterly basis to ensure the sand mining noise footprint is not exacerbating background condition).

10.1.1.3. Impact Ratings

The noise impact rating during the establishment phase of the project has been assessed and is provided in Table 10-3.

Table 10-3: Significance Ratings for Establishment Phase

Activity and Interaction: Establishment phase activities as per Table 10-2			
Dimension	Rating	Motivation	Significance
Impact Description: Noise will emanate from the machinery and vehicles operating during the establishment activities.			
<i>Prior to mitigation/ management</i>			
Duration	Short term (2)	Noise will be generated for the duration of each activity in the establishment phase	Minor (negative) – 36
Extent	Limited (2)	Based on model predictions, it is expected that the noise generated will be limited to the MRA and immediate surroundings.	
Intensity	Minor (2)	Minor implications on the surrounding area are anticipated due to the short-term nature of activities.	
Probability	Almost certain (6)	There are sound scientific reasons to expect that the impact will likely occur as mining progresses closer to receivers.	
Nature	Negative		
<i>Mitigation/ Management actions</i>			
<ul style="list-style-type: none"> • Construction activities should be restricted to daylight hours (06:00 – 18:00); • Construction machinery and vehicles should be switched off when not in use; • Construction vehicles should have buzzer type reverse alarms (producing band-limited white noise) installed, rather than the conventional beeping type reverse alarms (which produce a tonal sound); • Vehicles should be serviced as per their design requirements to ensure noise suppression mechanisms are effective (e.g. installed exhaust mufflers); and • Regulate vehicle speeds on the access and haul roads. 			
<i>Post- mitigation</i>			
Duration	Short term (2)	Noise will be generated for the duration of each activity in the establishment phase.	Negligible (negative) – 12
Extent	Very Limited (1)	The impact post-mitigation will be limited to specific isolated parts of the site.	
Intensity	Minimal (1)	Minimal implications on the surrounding area are anticipated post-mitigation.	

Activity and Interaction: Establishment phase activities as per Table 10-2			
Dimension	Rating	Motivation	Significance
Probability	Unlikely (3)	Unlikely: There are sound scientific reasons to expect that the impact will unlikely occur.	
Nature	Negative		

10.2. Operational Phase

Activities during the Operational Phase that may have potential impacts on the ambient noise levels in the MRA and surroundings are indicated in Table 10-4.

Table 10-4: Interactions and Impacts of Activity

Interaction	Impact
Mining of sand resources including screening (if required);	Noise emanating from machinery while conducting these activities can cause noise disturbance at the surrounding sensitive receivers.
Transportation of sand;	
Refuelling of machinery within the mining area or at the mobile offices; and	
Handling of general and hazardous waste	

10.2.1. Impact Description

The operational phase activities will result in the emission of noise. This encompasses the mining of the sand resource and the use and maintenance of haul roads as well as the concurrent rehabilitation (topsoil cover and ripping) process.

The operational phase activities will be long-term in nature (throughout projects life) and the impact will be varied as mining progresses. Results as indicated in the noise model simulation section above, suggest that significant impacts will be experienced at sensitive receivers located within 1km (Daytime operations) and 2km (Night-time operations) from the project's noise generating components pre-mitigation.

10.2.2. Management Objectives

The management objective is to ensure that on-site emissions are not in exceedance of the regulatory limits and to minimise/prevent the noise impact from causing a noise disturbance at the surrounding receivers. Mitigation measures will be implemented to ensure that emissions remain below limit values and are compliant with the relevant standards.

10.2.2.1. Management Actions

The following noise management actions are recommended as good practice guidelines:

- Ensure mitigation measures are factored into the day-to-day operation onsite; and
- Conduct noise monitoring periodically (i.e. on a quarterly basis to ensure the sand mining noise footprint is not exacerbating background condition).

10.2.2.2. Impact Ratings

The noise impact ratings during the operational phase of the Project have been assessed and are provided in Table 10-5.

Table 10-5: Significance Ratings for Operational Phase

Activity and Interaction: Operational phase activities as per Table 10-4			
Dimension	Rating	Motivation	Significance
Impact Description: Noise will emanate from the machinery and vehicles operating during the operational activities.			
<i>Prior to mitigation/ management</i>			
Duration	Project Life (5)	The impact will cease after the operational life span of the project.	Minor (negative) – 70
Extent	Limited (2)	Based on model predictions, it is expected that the noise generated will be limited to the MRA and immediate surroundings.	
Intensity	On-going Natural (3)	Based on the LoM schedule and model predictions, as mining activities progress closer (within 1km Daytime and 2km Night-time) to sensitive receivers the noise levels will increase, and the impact will be significant and as mining progresses away from sensitive receivers the noise levels will decrease and the impact will be negligible.	
Probability	Definite (7)	Based on model predictions, the impact has occurred for noise receivers (NR14, NR15, and NR7) for night-time operation activities. Therefore, it is expected that as mining progresses the impact will occur.	
Nature	Negative		
<i>Mitigation/ Management actions</i>			
<ul style="list-style-type: none"> • Machinery and vehicles should be switched off when not in use; • It should be considered to prescribe the installation of buzzer type reverse alarms (producing band-limited white noise), rather than the conventional beeping type reverse alarms (which 			



Activity and Interaction: Operational phase activities as per Table 10-4			
Dimension	Rating	Motivation	Significance
		produce a tonal sound) on machinery and vehicles employed in surface operations and haul roads;	
		<ul style="list-style-type: none"> Vehicles should be serviced as per their design requirements to ensure noise suppression mechanisms are effective (e.g. installed exhaust mufflers); Regulate vehicle speeds on the access and haul roads; The generator and screening facility (if possible) should be enclosed to limit noise; The concentration (i.e., number of machineries being utilised) of mining activities should be limited in close proximity to sensitive receivers; The mine should plan and consider a mining schedule that limits the duration of mining activities in close proximity to sensitive receivers i.e., South (closest to receivers) to North (furthest from receivers) mining approach; and The mine should implement a long-term (48 hour) quarterly noise monitoring programme to detect any changes in ambient sound levels due to the activities of the mine. 	
Post- mitigation			
Duration	Project Life (5)	The impact will cease after the operational life span of the project.	Negligible (negative) – 27
Extent	Limited (2)	The impact post-mitigation will be limited to the MRA and immediate surroundings.	
Intensity	Minor (2)	The impact post-mitigation will be minor.	
Probability	Unlikely (3)	The impact post-mitigation will unlikely occur.	
Nature	Negative		

10.3. Decommissioning Phase

Activities during the Decommissioning Phase that may have potential impacts on the ambient noise levels in the MRA and surroundings are indicated in Table 10-6.

Table 10-6: Interactions and Impacts of Activity

Interaction	Impact
Backfilling of the mined excavations with topsoil and waste from the screening plants;	Noise emanating from machinery while conducting these activities can cause noise disturbance at the surrounding sensitive receivers.
Dismantling and removal of infrastructure;	
Concurrent rehabilitation (topsoil cover, ripping, and vegetation establishment); and	

Interaction	Impact
Post-closure monitoring	

10.3.1. Impact Description

The dismantling and removal of all infrastructure (incl. transportation off-site), rehabilitation (topsoil cover, ripping, and vegetation establishment), and the backfilling of the mined excavations with topsoil and waste from the screening plants will result in the emission of noise, subsequently causing a noise disturbance at the surrounding sensitive receivers.

10.3.1.1. Management Objectives

The management objective is to ensure that on-site emissions are not in exceedance of the regulatory limits and to minimise/prevent the noise impact from causing a noise disturbance at the surrounding receivers. Mitigation measures will be implemented to ensure that emissions remain below limit values and are compliant with the relevant standards.

However, it is expected that the decommissioning activities will have a negligible impact due to the limited activities being undertaken. Furthermore, noise-intensive machinery such as the excavators, dozers, screening facilities, etc. will be removed from the site.

10.3.1.2. Management Actions

The following noise management actions are recommended as good practice guidelines:

- Ensure mitigation measures are factored into the day-to-day operation onsite; and
- Conduct noise monitoring periodically (i.e. on a quarterly basis to ensure the sand mining noise footprint is not exacerbating background condition).

10.3.1.3. Impact Ratings

The noise impact during the decommissioning phase of the Project has been assessed and is provided in Table 10-7.

Table 10-7: Significance Ratings for Decommissioning Phase

Activity and Interaction: Operational phase activities as per Table 10-6			
Dimension	Rating	Motivation	Significance
Impact Description: Noise will emanate from the machinery and vehicles operating during the establishment activities.			
<i>Prior to mitigation/ management</i>			
Duration	Short term (2)	Noise will be generated for the duration of each activity in the decommissioning phase.	Negligible (negative) – 18
Extent	Limited (2)	It is expected that the noise generated will be limited to the MRA and immediate surroundings.	
Intensity	Minor (2)	Minor implications on the surrounding area are anticipated.	
Probability	Unlikely (3)	Unlikely: There are sound scientific reasons to expect that the impact will unlikely occur.	
Nature	Negative		
<i>Mitigation/ Management actions</i>			
<ul style="list-style-type: none"> • Restrict decommissioning activities to daylight hours (06:00 – 18:00); • Regularly service decommissioning related machines and vehicles to ensure noise suppression mechanisms are effective (e.g. installed exhaust mufflers); • Vehicles should have buzzer type reverse alarms (producing band-limited white noise) installed, rather than the conventional beeping type reverse alarms (which produce a tonal sound); • Regulate speed limits on access roads; and • Switch off equipment when not in use. 			
<i>Post- mitigation</i>			
Duration	Short term (2)	Noise will be generated for the duration of each activity in the decommissioning phase.	Negligible (negative) – 12
Extent	Site-Specific (1)	Noise generated post-mitigation will be limited to specific isolated parts of the site.	
Intensity	Minimal (1)	Minimal implications on the surrounding area are anticipated post-mitigation	

Activity and Interaction: Operational phase activities as per Table 10-6			
Dimension	Rating	Motivation	Significance
Probability	Unlikely (3)	Unlikely: There are sound scientific reasons to expect that the impact will unlikely occur.	
Nature	Negative		

10.4. Cumulative Impacts

The proposed project based on the findings detailed in this report is considered to have minor to negligible impacts on the ambient noise levels in the area. Results from the baseline assessment indicate that ambient noise levels are relatively high (exceeding the acceptable rating levels for ambient noise in different districts) with the main contributors being existing mining activities (i.e. the New Vaal Colliery, Afrimat, Mission Point Mining, including ongoing sand mining at Copper Sunset, coupled with Eskom's Lethabo Power Station, Vaal Racecourse and noise from vehicles plying the R716 and R82 routes) in the area.

In essence, the continuation of mining by Copper Sunset in the extension area will not change the background soundscape in the MRA. The reason being that the tonnage and equipment employed will remain the same for the LoM.

The Copper Sunset Mine has an approved MR and has been in operation since 2009. The tonnage and number of equipment will remain the same, therefore the impact on the background soundscape will be similar as mining shifts from the existing MRA (current operations) to the proposed extension MRA. As a result, it is considered that the cumulative impact is as measured in the baseline field survey and will remain the same, and if changes occur, this will be negligible.

It has been recommended that as mining progresses to the extension area, quarterly noise monitoring surveys be conducted in line with the commitments in the EMP to ensure that the noise levels measured at these receptors are not getting worse. The data generated from the noise monitoring programme would be instrumental in indicating the effectiveness of the mitigation measures in place.

11. Environmental Management Plan

Table 11-1 provides a summary of the proposed project activities, environmental aspects, and impacts on the receiving environment. Information on the mitigation measures, mitigation type, timing of implementation of the EMP are specified.

Table 11-1: Environmental Management Plan

Activities	Potential Impacts	Aspects Affected	Phase	Mitigation Measure	Mitigation Type	The time period for implementation
<ul style="list-style-type: none"> Site clearance and vegetation removal. Placement of the Offices and associated mining equipment. Construction of the hydrocarbon storage tank and refuelling area. Establishment of a haul road/tracks. Stockpiling of topsoil. 	Emission of noise from activities	Ambient noise soundscape	Establishment	<ul style="list-style-type: none"> Construction activities should be restricted to daylight hours (06:00 – 18:00); Construction machinery and vehicles should be switched off when not in use; Construction vehicles should have buzzer-type reverse alarms (producing band-limited white noise) installed, rather than the conventional beeping type reverse alarms (which produce a tonal sound); Vehicles should be serviced as per their design requirements to ensure noise suppression mechanisms are effective e.g., installed exhaust mufflers; and Regulate vehicle speeds on the access and haul roads. 	Control through noise management plan and control measures	Upon commencement of the establishment phase
<ul style="list-style-type: none"> Mining of sand resources including screening (if required). Transportation of sand. Refuelling of machinery within the mining area or at the mobile offices. Handling of general and hazardous waste. 	Emission of noise from activities	Ambient noise soundscape	Operational	<ul style="list-style-type: none"> Machinery and vehicles should be switched off when not in use; It should be considered to prescribe the installation of buzzer type reverse alarms (producing band-limited white noise), rather than the conventional beeping type reverse alarms (which produce a tonal sound) on machinery and vehicles employed in surface operations and haul roads; Vehicles should be serviced as per their design requirements to ensure noise suppression mechanisms are effective e.g. installed exhaust mufflers; Regulate vehicle speeds on the access and haul roads; The generator and screening facility (if possible) should be enclosed; The concentration (i.e., number of machinery being utilised) of mining activities should be limited in close proximity to sensitive receivers; The mine should plan and consider a mining schedule that limits the duration of mining activities in close proximity to sensitive receivers i.e., South (closest to receivers) to North (furthest from receivers) mining approach; and The mine should implement a long-term (48 hour) quarterly noise monitoring programme to detect any changes in ambient sound levels due to the activities of the mine. 	Control through noise management plan and control measures	Upon commencement of the operational phase



Activities	Potential Impacts	Aspects Affected	Phase	Mitigation Measure	Mitigation Type	The time period for implementation
<ul style="list-style-type: none"> Backfilling of the mined excavations with topsoil and waste from the screening plants. Dismantling and removal of infrastructure. Concurrent rehabilitation (topsoil cover, ripping, and vegetation establishment). Post-closure monitoring 	Emission of noise from activities	Ambient noise soundscape	Decommissioning	<ul style="list-style-type: none"> Restrict decommissioning activities to daylight hours (06:00 – 18:00); Regularly service decommissioning related machines and vehicles to ensure noise suppression mechanisms are effective (e.g., installed exhaust mufflers); Construction vehicles should have buzzer-type reverse alarms (producing band-limited white noise) installed, rather than the conventional beeping type reverse alarms (which produce a tonal sound); Regulate speed limits on access roads; and Switch off equipment when not in use. 	Control through noise management plan and control measures	Upon commencement of the decommissioning phase

12. Monitoring Programme

Although the noise impacts of the proposed project on the sensitive receivers are minor to negligible, it is recommended that a monitoring programme be implemented to record the future noise impacts (increases and/or decreases in noise levels) throughout the LoM (Table 12-1). Components to be included in the proposed monitoring plan are discussed below:

- Noise monitoring is to be conducted throughout all phases (Establishment, Operation, and Decommission); and
- Quarterly, long-term (48 hrs) noise measurements must be conducted at the prescribed locations (including historical monitoring sites).

Table 12-1: Noise Monitoring Programme

Monitoring Element	Comment	Frequency	Responsibility
Noise Monitoring	Noise monitoring in line with the requirements of SANS 10103:2008 on-site, and at selected receivers	Quarterly Noise Monitoring	Environmental Officer

13. Reasoned Opinion Whether Project Should Proceed

Based on the findings provided in this report, it is confirmed that the existing ambient noise levels in the area are relatively high (exceeding the acceptable rating levels for ambient noise in rural districts). However, a number of contributing sources account for the aforementioned, including Copper Sunset's ongoing mining operation.

Based on the results from the model simulations pre-mitigation, it is confirmed that sound propagation is highest (exceeds the daytime limit of 45 dBA) within a 1km radius of all noise generating components of the project (confined mainly within the MRA) for the daytime establishment and operational phase. The noise levels will be highest (exceeds night-time limit of 35 dBA) within a 2km radius of all noise generating components of the project (this is mostly confined within the MRA) for the night-time operational phase.

Overall, anticipated impacts on a receiver will vary as mining progresses from one section of the extension area to another, i.e., from negligible to major despite the noise emission being relatively constant. Therefore, it is recommended that mitigation and management measures recommended in this report be implemented, as this would significantly reduce the impacts of the project on nearby sensitive receptors.

It is, therefore, recommended that the proposed project be authorised from a noise impact perspective.

14. Conclusion and Recommendations

Results from a noise survey conducted in the MRA show that ambient noise levels in the area are relatively high (exceeding the acceptable rating levels for ambient noise in rural district) for both day and night-time. The noise levels measured include emissions from the ongoing sand mining activities at the Copper Sunset Mine. Also, the annual tonnage to be mined and the total number of equipment on site will be similar to the current mining operation. Therefore, no additional noise impacts are anticipated, even when mining progresses to the extension area.

It is recommended that even though the proposed activities could have a minor to negligible impacts on the noise sensitive receivers, the implementation of the proposed mitigation measures could further reduce the significance of the noise impacts. The implementation of a noise monitoring plan would also be imperative to identifying, monitoring, and managing future noise impacts (increases and/or decreases in noise levels) throughout the project's life.

15. References

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Appendix A: Impact Assessment Ranking

16. Impact Assessment Ranking

The potential impacts from the proposed Project have been assessed based on the severity predicted on-site and at sensitive receptor(s). This culminates in a significance rating which identifies the most important impacts that require mitigation and/or management.

Based on international guidelines and South African legislation, the following criteria were considered when examining potentially significant impacts:

- Nature of impacts (direct / indirect, positive / negative);
- Duration (short / medium / long-term, permanent (irreversible) / temporary (reversible), frequent / seldom);
- Extent (geographical area, size of affected population / habitat / species);
- Intensity (minimal, severe, replaceable / irreplaceable);
- Probability (high / medium / low probability); and
- Possibility to mitigate, avoid or offset significant adverse impacts.

Details of the impact assessment methodology used to determine the significance of physical, bio-physical and socio-economic impacts are provided below.

The significance rating process follows the established impact / risk assessment formula:

$$\text{Significance} = \text{Consequence} \times \text{Probability} \times \text{Nature}$$

Where

$$\text{Consequence} = \text{Intensity} + \text{Extent} + \text{Duration}$$

And

$$\text{Probability} = \text{Likelihood of an impact occurring}$$

And

$$\text{Nature} = \text{Positive (+1) or negative (-1) impact}$$

Note: In the formula for calculating consequence, the type of impact is multiplied by +1 for positive impacts and -1 for negative impacts

The matrix calculates the rating out of 147, whereby Intensity, Extent, Duration and Probability are each rated out of seven as indicated in Table 16-1. The weight assigned to the various parameters is then multiplied by +1 for positive and -1 for negative impacts. Impacts are rated

prior to mitigation and again after consideration of the mitigation measure proposed in the Environmental Management Plan Report (EMPr).

The significance of an impact is then determined and categorised into one of eight categories, as indicated in Table 16-2, which is extracted from Table 16-1. The description of the significance ratings is discussed in Table 16-3.

It is important to note that the pre-mitigation rating takes into consideration the activity as proposed, i.e., there may already be certain types of mitigation measures included in the design (for example due to legal requirements). If the potential impact is still considered too high, additional mitigation measures are proposed.

Table 16-1: Impact Assessment Parameter Ratings

RATING	INTENSITY/REPLACABILITY		EXTENT	DURATION/REVERSIBILITY	PROBABILITY
	Negative impacts	Positive impacts			
7	Irreplaceable damage to highly valued items of great natural or social significance or complete breakdown of natural and / or social order.	Noticeable, on-going natural and / or social benefits which have improved the overall conditions of the baseline.	<u>International</u> The effect will occur across international borders.	Permanent: The impact is irreversible, even with management, and will remain after the life of the project.	Definite: There are sound scientific reasons to expect that the impact will definitely occur. >80% probability.
6	Irreplaceable damage to highly valued items of natural or social significance or breakdown of natural and / or social order.	Great improvement to the overall conditions of a large percentage of the baseline.	<u>National</u> Will affect the entire country.	Beyond project life: The impact will remain for some time after the life of the project and is potentially irreversible even with management.	Almost certain / Highly probable: It is most likely that the impact will occur. <80% probability.
5	Very serious widespread natural and / or social baseline changes. Irreparable damage to highly valued items.	On-going and widespread benefits to local communities and natural features of the landscape.	<u>Province/ Region</u> Will affect the entire province or region.	Project Life (>15 years): The impact will cease after the operational life span of the project and can be reversed with sufficient management.	Likely: The impact may occur. <65% probability.
4	On-going serious natural and / or social issues. Significant changes to structures / items of natural or social significance.	Average to intense natural and / or social benefits to some elements of the baseline.	<u>Municipal Area</u> Will affect the whole municipal area.	Long term: 6-15 years and impact can be reversed with management.	Probable: Has occurred here or elsewhere and could therefore occur. <50% probability.
3	On-going natural and / or social issues. Discernible changes to natural or social baseline.	Average, on-going positive benefits, not widespread but felt by some elements of the baseline.	<u>Local</u> Local extending only as far as the development site area.	Medium term: 1-5 years and impact can be reversed with minimal management.	Unlikely: Has not happened yet but could happen once in the lifetime of the project, therefore there is a possibility that the impact will occur. <25% probability.
2	Minor natural and / or social impacts which are mostly replaceable. Very little change to the baseline.	Low positive impacts experience by a small percentage of the baseline.	<u>Limited</u> Limited to the site and its immediate surroundings.	Short term: Less than 1 year and is reversible.	Rare / improbable: Conceivable, but only in extreme circumstances. The possibility of the impact materialising is very low as a result of design, historic experience or implementation of adequate mitigation measures. <10% probability.
1	Minimal natural and / or social impacts, low-level replaceable damage with no change to the baseline.	Some low-level natural and / or social benefits felt by a very small percentage of the baseline.	<u>Very limited</u> Limited to specific isolated parts of the site.	Immediate: Less than 1 month and is completely reversible without management.	Highly unlikely / None: Expected never to happen. <1% probability.

Table 16-2: Probability/Consequence Matrix

		Significance																																					
Probability	7	-147	-140	-133	-126	-119	-112	-105	-98	-91	-84	-77	-70	-63	-56	-49	-42	-35	-28	-21	21	28	35	42	49	56	63	70	77	84	91	98	105	112	119	126	133	140	147
	6	-126	-120	-114	-108	-102	-96	-90	-84	-78	-72	-66	-60	-54	-48	-42	-36	-30	-24	-18	18	24	30	36	42	48	54	60	66	72	78	84	90	96	102	108	114	120	126
	5	-105	-100	-95	-90	-85	-80	-75	-70	-65	-60	-55	-50	-45	-40	-35	-30	-25	-20	-15	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	105
	4	-84	-80	-76	-72	-68	-64	-60	-56	-52	-48	-44	-40	-36	-32	-28	-24	-20	-16	-12	12	16	20	24	28	32	36	40	44	48	52	56	60	64	68	72	76	80	84
	3	-63	-60	-57	-54	-51	-48	-45	-42	-39	-36	-33	-30	-27	-24	-21	-18	-15	-12	-9	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60	63
	2	-42	-40	-38	-36	-34	-32	-30	-28	-26	-24	-22	-20	-18	-16	-14	-12	-10	-8	-6	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42
	1	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
		-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
		Consequence																																					


Table 16-3: Significance Rating Description

Score	Description	Rating
109 to 147	A very beneficial impact that may be sufficient by itself to justify implementation of the project. The impact may result in permanent positive change	Substantial (positive)
73 to 108	A beneficial impact which may help to justify the implementation of the project. These impacts would be considered by society as constituting a major and usually a long-term positive change to the (natural and / or social) environment	Major (positive)
36 to 72	An positive impact. These impacts will usually result in positive medium to long-term effect on the natural and / or social environment	Minor (positive)
3 to 35	A small positive impact. The impact will result in medium to short term effects on the natural and / or social environment	Negligible (positive)
-3 to -35	An acceptable negative impact for which mitigation is desirable. The impact by itself is insufficient even in combination with other low impacts to prevent the development being approved. These impacts will result in negative medium to short term effects on the natural and / or social environment	Negligible (negative)
-36 to -72	A minor negative impact requires mitigation. The impact is insufficient by itself to prevent the implementation of the project but which in conjunction with other impacts may prevent its implementation. These impacts will usually result in negative medium to long-term effect on the natural and / or social environment	Minor (negative)
-73 to -108	A moderate negative impact may prevent the implementation of the project. These impacts would be considered as constituting a major and usually a long-term change to the (natural and / or social) environment and result in severe changes.	Major (negative)
-109 to -147	A major negative impact may be sufficient by itself to prevent implementation of the project. The impact may result in permanent change. Very often these impacts are immitigable and usually result in very severe effects. The impacts are likely to be irreversible and/or irreplaceable.	Substantial (negative)