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ENVIRONMENTAL

Environmental Authorisations and Mining Right Application for Xivono Mining (Pty) Ltd Weltevreden Mine, Mpumalanga

Noise Impact Assessment Report

Project Number:

MBU5170

Prepared for:

Xivono Mining (Pty) Ltd

November 2019

Digby Wells and Associates (South Africa) (Pty) Ltd
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Project Name:	**Environmental Authorisations and Mining Right Application for Xivono Mining (Pty) Ltd Weltevreden Mine, Mpumalanga**
Project Code:	**MBU5170**

Name	Responsibility	Signature	Date
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Barbara Wessels	Review		November 2019
Matthew Ojelede	Review		November 2019

DECLARATION OF INDEPENDENCE

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I, Francois Malherbe (an Associate) as duly authorised representative of Digby Wells and Associates (South Africa) (Pty) Ltd., hereby confirm my independence (as well as that of Digby Wells and Associates (South Africa) (Pty) Ltd.) and declare that neither I nor Digby Wells and Associates (South Africa) (Pty) Ltd. have any interest, be it business, financial, personal or other, in any proposed activity, application or appeal in respect of Mbuyelo Group (Pty) Ltd, other than fair remuneration for work performed, specifically in connection with the Noise Impact Assessment for the proposed Xivono Mine (Pty) Weltevreden Mine, Mpumalanga Province.

Full name:	Francois Malherbe
Title/Position:	Noise Specialist
Qualification(s):	Pr. Eng
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Registration(s):	Engineering Council of South Africa (Pr Eng) The South Africa Acoustics Institute (Fellow)

EXECUTIVE SUMMARY

Xivono Mining (Pty) Ltd (hereinafter Xivono) is the holder of an approved Prospecting Right for the proposed Weltevreden Mining Project approximately 8 km south of Belfast in the Mpumalanga Province of South Africa. Xivono proposes to mine two pits, OC1 (162 ha footprint) and OC2 (200 ha footprint) through open pit mining. Refer to **Error! Reference source not found.** for the location of the proposed Weltevreden Mining Project area.

OC1 has in excess of 5 million tonnes of in-situ minable tonnes of coal at a depth of approximately 20 m below surface. OC1 will target the 2 Seam which is an average of 2.7 m thick. OC2 will target the Upper 4 Seam, Lower 4 Seam and 2 Seam which reaches a maximum depth of 30 m. OC2 will yield approximately 10 million tonnes of coal. The coal product will be for supply directly to Eskom. Coal from seams 2A, Seam 2D and Seam 2E are used as a blend to improve the inferior qualities coal from Seam 2B, 2C and Seam 4L where the blending ratio is 3:1.

The total proposed quantity of coal to be extracted is approximately 15 million tonnes over a 15-year Life of Mine. Currently, Pit OC2 will be mined first in a west-east direction and Pit OC2 will be mined thereafter in a south-north direction, with an assumed production rate of 150 000 tonnes of coal mined per month for the total pit area. Coal crushing and screening will take place on site and will be trucked directly to Eskom.

The proposed Project area is rural, and coal mining has a presence in the immediate vicinity, with seven coal mines within a radius of 13 km. The area is crossed by the R33 from North to South. Due to the large volumes of traffic it carries, it constitutes the major source of continuous noise in the area which determines present ambient noise levels.

The introduction of a new noise source into the environment in the form of a mining operation will result in negligible increase in ambient noise levels.

The noise impact assessment included the following tasks:

- Identification of noise sources and potential noise sensitive receptors;
- Estimating the average daily ambient noise levels during the summer and winter by modelling the major sources of noise in the environment of the project;
- Assessment of the anticipated noise impacts associated with the project activities during the construction, operational and decommissioning; and
- Recommending mitigation and management plans to minimise the expected impact.

The approach used in investigating the noise impacts is based on the guidelines published in SANS 10103.

A three-dimensional model to calculate the noise emissions and propagation from the mining operation was developed. The propagation of noise was calculated in accordance with the CONCAWE method as specified in SANS 103576. This method is an internationally accepted procedure for the calculation of noise propagation over long distances.

A further model was developed to estimate the existing ambient noise levels due to road traffic on the R33, based on Annual Average Daily Traffic numbers.

In addition, the activities and key sources of noise that were modelled encompasses the construction, operational and closure phases of the Project.

The noise impacts were presented as contours of the resulting total future ambient noise levels and the increases in existing ambient noise levels, superimposed on a scaled satellite image of the Project area and its environment.

The modelled noise propagation maps were used to determine the expected noise impacts. The following conclusions are drawn from the results of this noise impact study:

- For the construction and operational phases of the Project, the noise propagation contours indicate higher noise impacts fall within the mine boundary. These are the contours indicating the resulting total ambient noise levels during day- (06:00 – 22:00) and night-time (22:00 to 06:00), 55 dBA and 45 dBA , respectively, and a 5 dBA increase in ambient noise level;
- The future ambient noise levels in the environment close to the mine property boundaries will fall within the guideline levels of 55 dBA and 45 dBA during day- (06:00 – 22:00) and night-time (22:00 to 06:00), respectively;
- The magnitude of the noise impacts is mostly negligible or insignificant at most. The exception is during the operational phase and night-time, when there will be an increase of up to 5 dB in ambient noise levels outside the mining perimeter; and
- The severity of the noise impact during both the construction and operational phases of the mine will be negligible.

Despite the low severity of the noise impacts predicted, specific noise mitigation measures are recommended and should be implemented. The noise specialist does not object to the Project going ahead from a noise perspective due to the aforementioned.

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AAHT	Annual Average Hourly Traffic
dB	Decibel
dBA	A-weighted Decibel
ESIA	Environmental and Social Impact Assessment
FEL	Front End Loader
hr	Hour
IFC	International Finance Corporation
ISO	International Standards Organisation
kPa	Kilo Pascal (1000 Pascal)
L_{A90}	A-weighted 90 percentile sound pressure level
L_{Aeq}	Equivalent A-weighted sound pressure level
m/s	Meters per second
pW	Pico Watt (10^{-12} Watt)
SANS	South African National Standard
RHD	Relative Humidity
t	Tonne
tpa	Tonnes per annum
tpm	Tonnes per month
WHO	World Health Organisation
W/m^2	Watt per square meter
°C	Degrees Celsius

1 Introduction

Xivono Mining (Pty) Ltd (hereinafter Xivono) is the holder of an approved Prospecting Right for the proposed Weltevreden Mining Project approximately 8 km south of Belfast in the Mpumalanga Province of South Africa. Xivono proposes to mine two pits, OC1 (162 ha footprint) and OC2 (200 ha footprint) through open pit mining. Refer to **Error! Reference source not found.** for the location of the proposed Weltevreden Mining Project area.

Xivono plans to utilise containers for the mine offices and workshop infrastructure which will occupy a footprint of approximately 0.03 ha (300 m^2). Other surface infrastructure proposed for the site includes pollution control dams, a crushing and screening plant (no washing to take place on site), Run of Mine (ROM) pad, overburden dump, stockpiles, pipelines, weighbridge, diesel storage and lined trenches. The infrastructure is expected to have a footprint of approximately 1 ha.

The proposed Project area is located within the Nkangala District Municipality (NDM), specifically in Ward 1 of the Emakhazeni Local Municipality (ELM). The nearest large settlements to the site are the town of Belfast (8 km) and its township of Siyathuthuka (15 km).

The Prospecting Right includes Portions 28, 29, 30 and 40 of the farm Paardeplaats 380 JT, Portions 2, 3, 10, and a portion of Portions 4, 7, 9, 11, 12, 14 and the Remaining Extent of the farm Weltevreden 381 JT. The Prospecting Right will lapse on 22 August 2021 as authorised by the Department of Mineral Resources (DMR).

Xivono intends to convert the approved Prospecting Right through completing a Mining Right Application (MRA) in terms of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) (MPRDA). Concurrently, Xivono has initiated this Integrated Environmental Authorisation and Integrated Water Use Licence Application (IWULA) process for the MRA to comply with the following legislation:

- National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA);
- National Environmental Management: Waste Act, 2008 (Act No. 56 of 2008) (NEM:WA); and
- National Water Act, 1998 (Act No. 36 of 1998) (NWA).

2 Project Description

Xivono proposes to mine two pits namely OC1 and OC2. OC1 has in excess of 5 million tonnes of in-situ minable tonnes of coal at a depth of approximately 20 m below surface. OC1 will target the 2 Seam which is an average of 2.7 m thick. OC2 will target the Upper 4 Seam, Lower 4 Seam and 2 Seam which reaches a maximum depth of 30 m. OC2 will yield approximately 10 million tonnes of coal. The coal product will be for supply directly to Eskom. Coal from seams 2A, Seam 2D and Seam 2E are used as a blend to improve the inferior qualities coal from Seam 2B, 2C and Seam 4L where the blending ratio is 3:1.

The total proposed quantity of coal to be extracted is approximately 15 million tonnes over a 15-year Life of Mine. Currently, Pit OC2 will be mined first in a west-east direction and Pit OC2 will be mined thereafter in a south-north direction, with an assumed production rate of 150 000

tonnes of coal mined per month for the total pit area. Coal crushing and screening will take place on site and will be trucked directly to Eskom.

3 Terms of Reference

The Terms of Reference (ToR) for Digby Wells as the Environmental Assessment Practitioner (EAP) is to complete the Environmental Assessment (EA) process, and the Environmental Noise Impact Assessment (ENIA) forms part of a suite of specialist studies required to fulfil this process. The ENIA was conducted to comply Section 66(2) of the MPRDA and the Environmental Conservation Act, 1989 (Act No. 73 of 1989), Part VI, Section 24 and 25.

3.1 Scope of Work

This ENIA Scope of Work (SoW) entailed the following tasks:

- Identification of noise sources and potential noise sensitive receptors;
- Estimating the average daily ambient noise levels during day- and night-time by modelling the major sources of noise in the environment of the project;
- Assessment of the anticipated noise impacts associated with the project activities during the construction, operational, decommissioning and post-closure phases; and
- Recommending mitigation and management plans to minimise the expected impact.

The approach used in investigating the noise impacts is based on the guidelines published in SANS 10103.

4 Details of the Specialists

François Malherbe is an Associate with Digby Wells Environmental. He is a registered Professional Engineer with a B.Sc. Eng (Electrical Engineering) and an M.Eng. (Electronic Engineering), specialising in Acoustics. Francois worked as an engineer at the Laboratory for Vibration and Acoustics of the SABS between 1986 and 1999. During this period, he has gained experience in a wide field of acoustics, including environmental noise measurements, specialised measurements in the laboratory and in situ, and the modelling of industrial, road, rail and aircraft noise. In 1999 he started his own consulting firm, François Malherbe Acoustic Consulting cc, and has since then taken part in a large number of major environmental, transport and industrial projects in South Africa, Zimbabwe, Botswana, Lesotho, Namibia, Zambia, the DRC, Republic of Congo, Malawi, Kenya, Uganda, Mozambique, Senegal, Mauritius and Burkina Faso. See Appendix A for the Curriculum Vitae.

5 Assumptions and Limitations

The following assumptions were made:

- The meteorological data supplied on https://www.worldweatheronline.com/belfast-weather-averages/mpumalanga/za.aspx is representative for the purpose of this noise study;
- The mining equipment and operational procedures had to be assumed, based on previous experiences. Therefore, it had to be assumed that the sound power emission levels of equipment and processes used for the calculations are representative of those that will be employed on the Project;

- Traffic flow on the R33 for modelling purposes was based on the information found on the web;
- All the activities during construction and production take place simultaneously at all the locations of the mining operation, therefore no specific sequence of events was modelled;
- During construction all activities take place at ground level;
- Haulage was calculated for an estimated 150 000 tons per month; and
- Communities within the Project boundary will be relocated.

6 Relevant Legislation, Standards and Guidelines

6.1 South African National Standard SANS 10103

South African National Standard (SANS) 10103 is the document that specifies the methodology for measuring and assessing environmental noise in South Africa. Table 2 of the standard provides guidelines of typical ambient noise levels that may be expected in different types of districts and the estimated community reaction to increases in ambient noise levels. SANS 10103 is in line with the 1999 WHO guidelines and conforms to the requirements of the International Standards Organisation (ISO) 1996 Parts 1 and 2. For easy reference Table 2 of SANS 10103 is reproduced in Table 6-1.

Furthermore, SANS 10103 provides estimates of a community's reaction to an increase in ambient noise levels. This is reproduced in Table 6-2.

Table 6-1: Acceptable rating levels for noise in districts (from Table 2 in SANS 10103, 2008)

Type of District	Equivalent continuous rating level ($L_{Reg.T}$) for noise (dBA)					
	Outdoors			Indoors, with open windows		
	Day-night	Day-time	Night-time	Day-night	Day-time	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

Table 6-2: Estimated community reaction to increases in ambient noise levels (from Table 5 in SANS 10103, 2008)

Excess ($\Delta L_{Req,T}$)a dBA	Estimated community or group response	
	Category	Description
0 to 10	Little	Sporadic complaints
5 to 15	Medium	Widespread complaints
10 to 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 $\Delta L_{Req,T}$ 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;

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.

7 Methodology

7.1 Assessment of Baseline Environment

A site visit was undertaken in July 2019 to take baseline noise measurements. Agriculture and coal mining activities are the dominant land uses in the area. The coordinates of the measurement locations are specified in Table 8-1 and shown in Figure 7-1 and Figure 7-2. Measurements obtained will provide an indication of the current soundscape of the Project area.

Long-term measurements were taken over a period of 24 hours at each receptor in accordance with the requirements of SANS 10103:2004. The measurements took into account the daytime and night time noise characteristics. According to the SANS 10103:2008 guidelines, daytime is between 06:00 and 22:00, with measurement taken at a height of 1.5 m above ground level and 3 m from a wall or reflexive surface using a Cirrus, Optimus Green, precision integrating sound level meter. The instrument was field calibrated with a Cirrus, sound level calibrator. Figure 7-1below depicts the sound level meter.

Table 7-1: Noise Measurement Locations

ID	Location	Coordinates		Category of receptor	Weather conditions
N1	Weltevreden (Portion 8/381)	25°45'57.99"S	30° 2'1.04"E	Rural	Wind speed:3m/s Temperature:14° C Humidity:60%

ID	Location	Coordinates		Category of receptor	Weather conditions
N2	Blyvooruitzicht 383	25°47'21.44"S	30° 2'18.65"E	Rural	Wind speed :2m/s Temperature:14.6° C Humidity:40%
N3	Vogelstruispoort (Re/1/384)	25°47'27.22"S	30° 2'45.02"E	Rural	Wind speed:4m/s Temperature:15°C Humidity:41%
N4	RE/1/381	25°44'10.94"S	30° 2'6.86"E	Rural	Wind speed:3.5m/s Temperature:15°C Humidity:50%

Figure 7-1: Measurement location a) N1- Weltevreden (Portion 8/381) and b) N2- Blyvooruitzicht Portion 383

Figure 7-2: Measurement location a) N3 - Vogelstruispoort Portion Re 1/384 and b) N4 - RE/1/381

7.2 Modelling of Noise Measurements

The following section provides the methodology used to model the predicted noise impacts from the mine activities.

7.2.1 Existing Ambient Noise Levels

The pre-development ambient noise levels were estimated by projecting the calculated R33 road traffic noise levels onto a base level for day- and night-time, respectively. These base levels were derived through analysis of the measurement results. The results were used as the reference scenarios to determine the impact of the noise emissions from the proposed Project.

7.2.2 Description of the Modelling Method: Road Traffic Noise

The noise emissions from road traffic on the R33 were modelled in accordance with the procedures specified in SANS 10210. The model took the following into account:

- The predicted sound power noise emission levels of equipment and processes;
- The attenuation of noise as a function of distance due to geometrical spreading;
- The excess attenuation due to the absorption of noise energy by the air and ground; and
- The effect the topography had on the propagation of road traffic noise.

The assumed traffic flow conditions are given in Appendix B.

7.2.3 Description of the Modelling Method: Mining Operation

A three-dimensional model for the calculation of the noise emissions and propagation from the mining operation was developed. The model took account of the following:

- The predicted sound power noise emission levels of equipment and processes;
- The attenuation of noise as a function of distance due to geometrical spreading;
- The excess attenuation due to the absorption of noise energy by the air and ground;
- The effect that meteorological conditions and other atmospheric factors have on the propagation of noise;
- The screening against the propagation provided by the pit walls; and
- The key operational parameters of the mining activities during construction and operation, for example the number of haul truck movements per hour and the physical location of equipment and their work factors.

The propagation of noise was calculated in accordance with the CONCAWE method as specified in SANS 10357. This method is an internationally accepted procedure for the calculation of noise propagation over long distances.

A list of the sound power noise emission levels of the equipment and processes and the assumed meteorological conditions used in the calculations are given in Appendix B of this report.

7.2.4 Modelled Phases of the Mining Project

The phases of the mining project that were modelled are summarised in Table 7-2.

Table 7-2: Modelled Phases of the Mining Operation

Phase	Description	Activities	Noise sources
1	Construction	▪ All activities at ground level and taking place at all the locations; ▪ Clearing of vegetation; ▪ Earthworks; ▪ Dumping; ▪ Grading and rolling of roads; and ▪ Construction of infrastructure, process platforms; ▪ No acoustic screening by pit walls and dumps ▪ Construction during day-time only	▪ Bulldozer D9T; ▪ Grader 140H; ▪ Excavator 390; ▪ Roller CS563C; ▪ FEL 966 ▪ Backhoe 40t ▪ Road transport truck ▪ Bell D40 ADT; and ▪ General construction noise.
2	Operation	▪ All activities simultaneously taking place at all the locations; ▪ Plant fully operational; ▪ Handling of ROM materials; ▪ Acoustic screening provided by the pit walls; ▪ Hauling of coal to the ROM ▪ Hauling of topsoil, hard and soft materials to dumps ▪ Transport of product on the R33; and ▪ 24/7 operations.	▪ Material handling ▪ Crushing and screening circuit; ▪ Load bin; ▪ FEL 966; ▪ Road transport truck 40t; ▪ Bulldozer D9T; and ▪ General noise

Phase	Description	Activities	Noise sources
3	Decommissioning	▪ Disassembling of plants and other infrastructure; ▪ Breaking of platforms ▪ Earthworks	▪ Bulldozer D9T; ▪ FEL 996; and ▪ General noise.

7.2.5 Presentation of the Noise Impacts

The noise impacts were presented as contours of the future resulting total ambient noise levels and the increases in existing ambient noise levels, superimposed on a scaled satellite image of the Project area and its environment.

The contours calculated for resulting total ambient noise levels were:

- 40 dBA;
- 45 dBA;
- 50 dBA;
- 55 dBA; and
- 60 dBA.

SANS 10103 provides a guideline for estimating community response to an increase in the general ambient noise level caused by an intruding noise. If Δ is the increase in noise level, the following criteria are of relevance:

- Δ ≤ 0 dB: An increase of 0 dB or less will not cause any response from the community;
- Δ = 1 dB: Any increase of less than 1 dB is negligible;
- 0 dB < Δ ≤ 10 dB: An increase of between 0 dB and 10 dB will elicit 'little' community response with 'sporadic complaints'. However, between 5 dB and 10 dB the strength of the response will gradually change to 'medium' with 'widespread complaints';
- Δ = 3 dB: For a person with average hearing acuity an increase of less than 3 dB in the general ambient noise level will not be noticeable. Therefore, 3 dB is a useful 'significance indicator' that will be used in this study to assess whether a noise impact is significant or not;
- 5 dB < Δ ≤ 15 dB: An increase of between 5 dB and 15 dB will elicit a 'medium' community response with 'widespread complaints'. It is also worth noting that an increase of 10 dB is subjectively perceived as a doubling in the loudness of a noise. For an increase of more than 10 dB the community reaction will gradually change to 'strong' with 'threats of community action'; and
- 15 dB < Δ: For an increase in excess of 15 dB the community response will gradually increase in strength to 'very strong' with 'vigorous community action'.

The overlapping ranges of community responses reflect the fact that there is no clear-cut transition from one community response to another. Instead the transition is more gradual and may differ substantially from one scenario to another, depending on many variables. For the purpose of this noise impact study the increase in the ambient noise level was expressed as contours of:

- Δ = 0 dB;
- Δ = 1 dB;
- Δ = 3 dB (significance indicator);
- Δ = 5 dB;
- Δ = 10 dB; and
- Δ = 15 dB.

8 Results

8.1 Baseline Measurement Results

The measurement results for the sampled points as well as the rating limits according to the SANS 10103:2008 guidelines are presented in Table 8-1. The noise level time history graph per noise measurement location is provided from Figure 8-1 to Figure 8-4.

Table 8-1: SANS 10103:2008 Guidelines Compared with Background Measurements

Sample ID	SANS 10103:2008 Guidelines					
	Type of district	Period	Acceptable rating level dBA	L_{Aeq} dBA	Maximum/Minimum dBA	Date
N1	Rural	Daytime	45	64	94/24	02 - 03 Jul
		Night time	35	38	54/26	
N2	Rural	Daytime	45	51	78/27	
		Night time	35	47	80/27	03 - 04 Jul
N3	Rural	Daytime	45	56	82/29	
		Night time	35	50	72/29	04 - 05 Jul
N4	Rural	Daytime	45	60	99/24	
		Night time	35	50	86/22	05-06 Jul
	Indicates current LAeq levels above either the daytime rating limit or the night time rating limit					

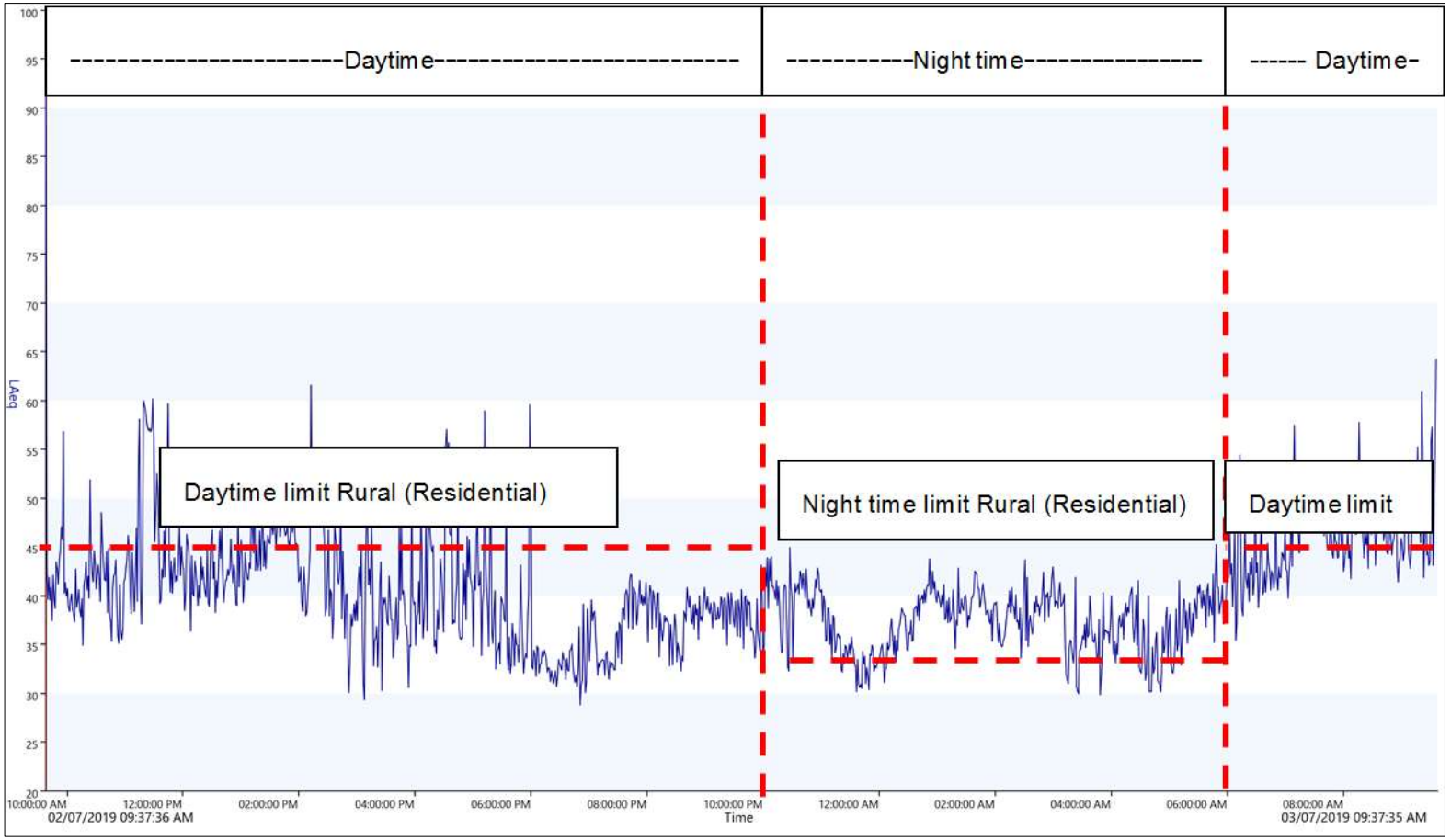

Figure 8-1: Noise time history graph for N1

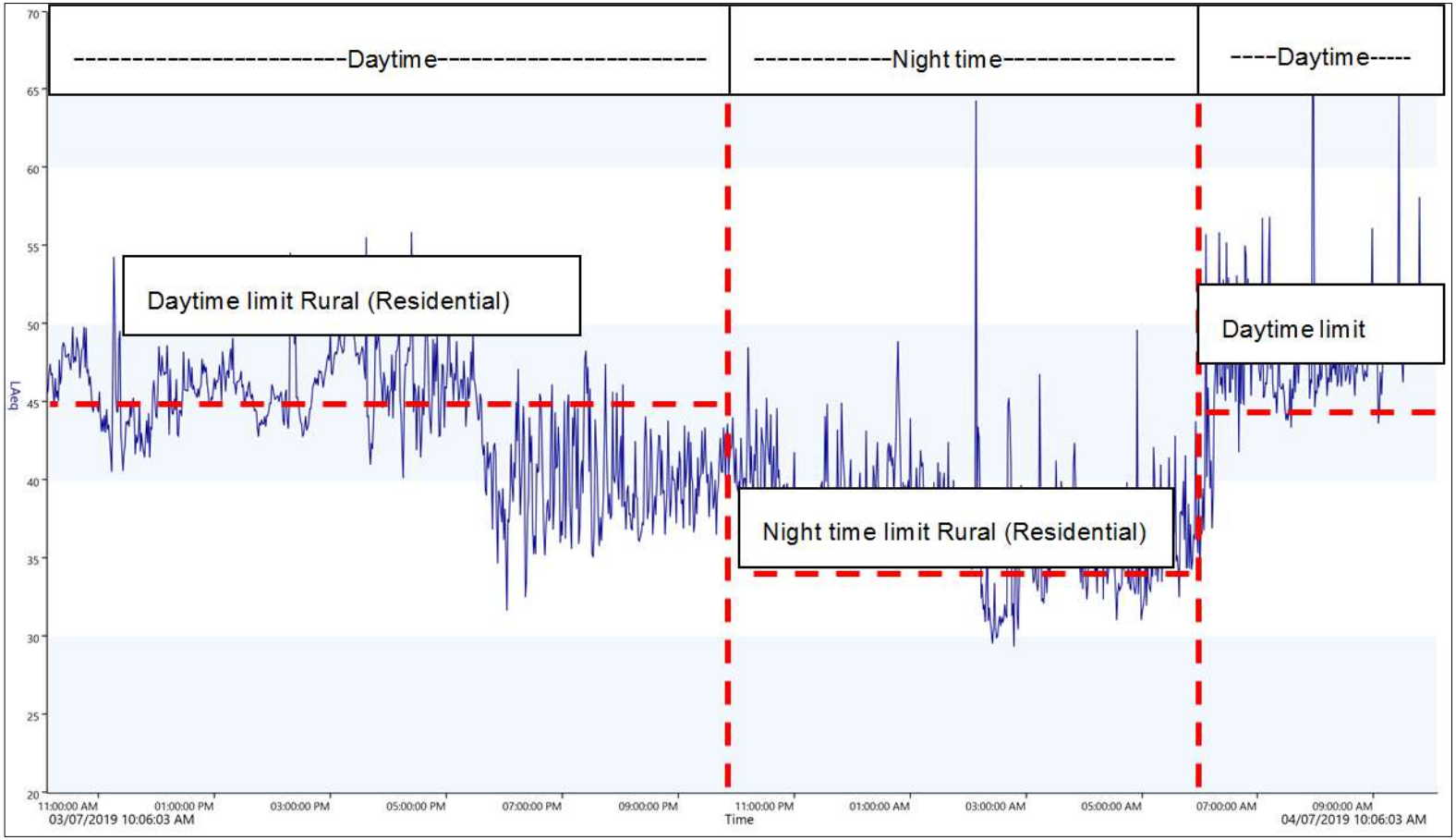

Figure 8-2: Noise time history graph for N2

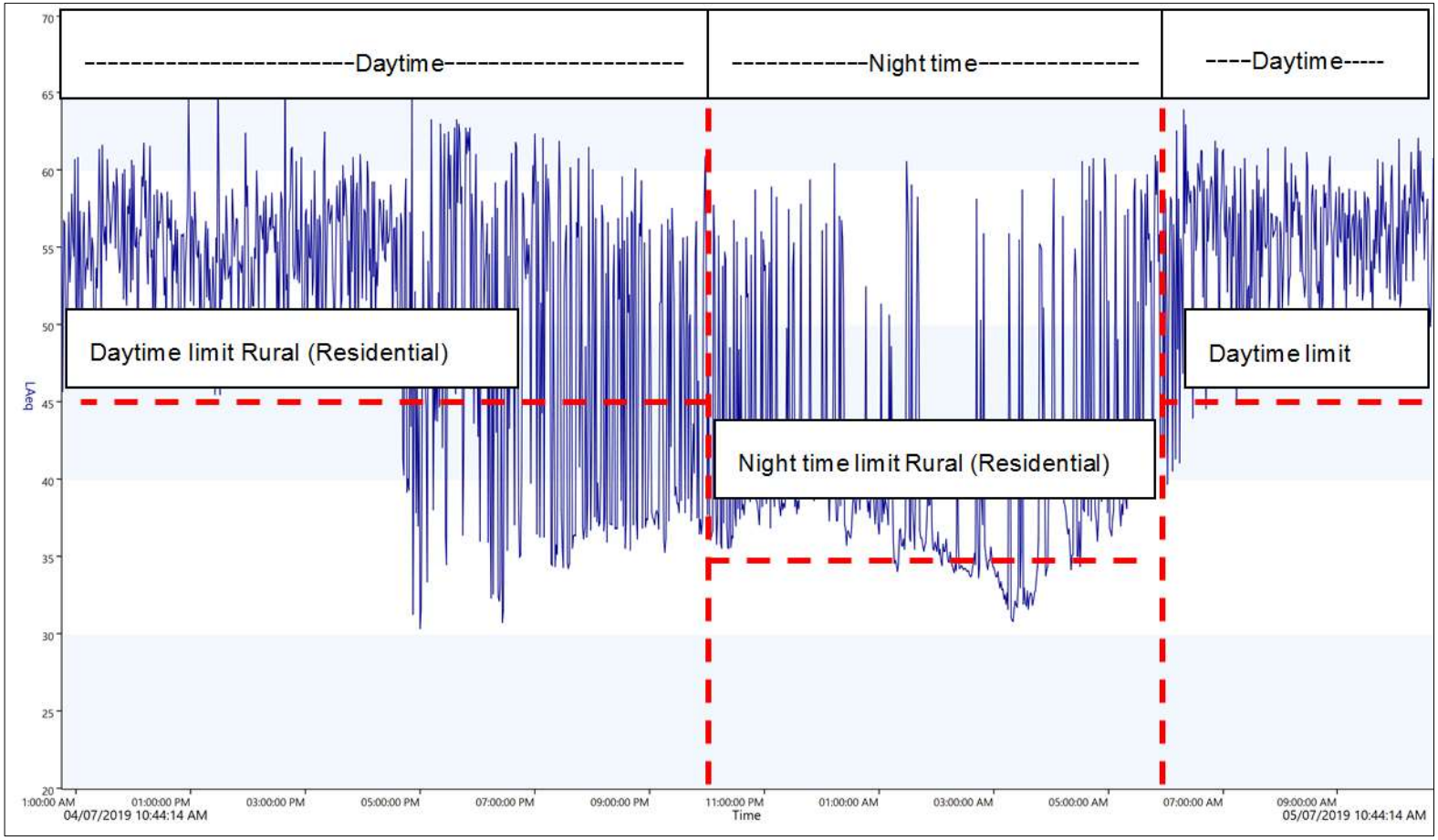

Figure 8-3: Noise time history graph for N3

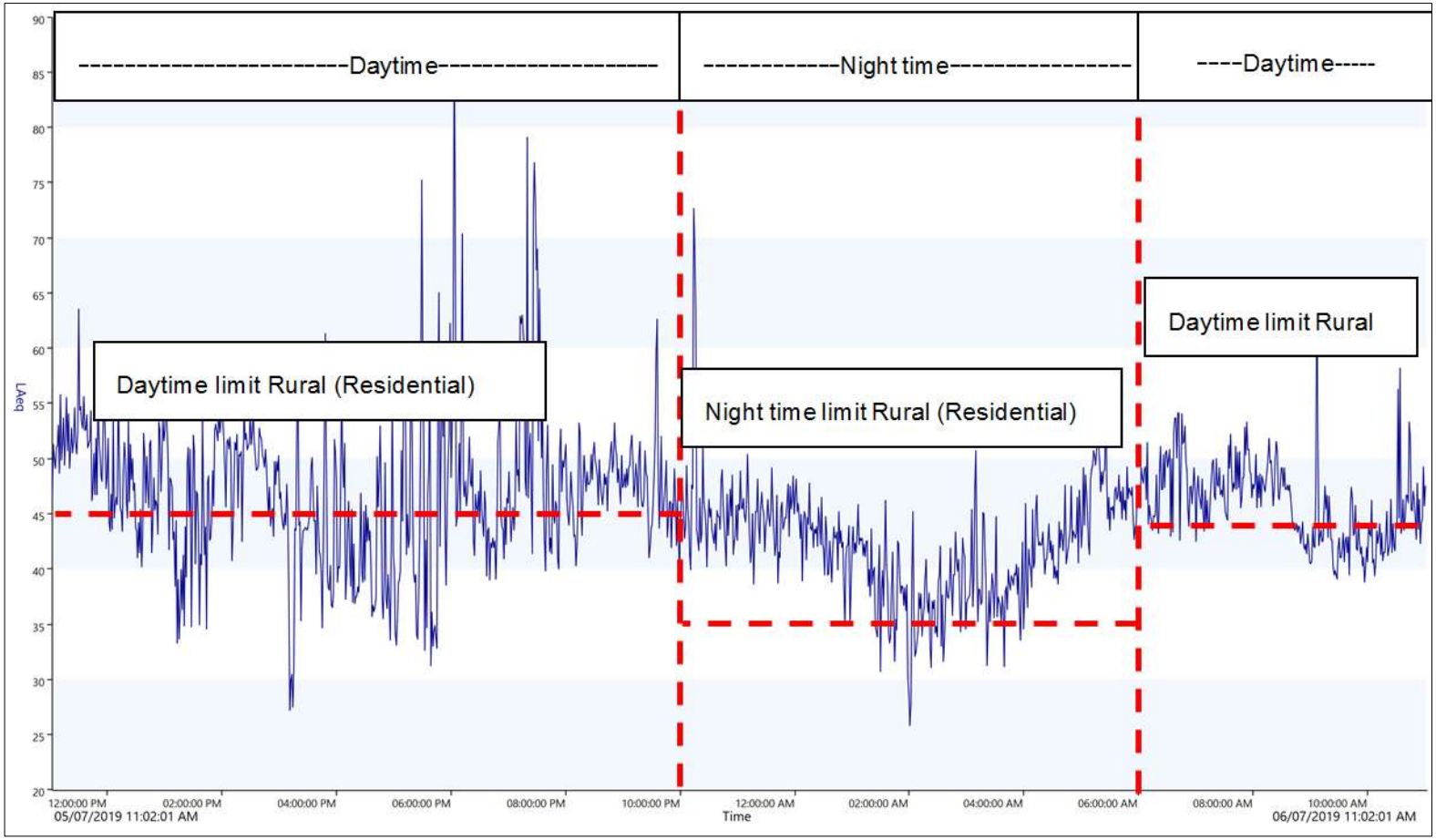

Figure 8-4: Noise time history graph for N4

8.1.1 Discussion: Daytime Results

Measurements at sites N1 to N4 were taken at the following farms: Weltevreden (Portion 8/381), Byvooruitzicht 383, Vogelstruispoort (Re/1/384) and RE/1/381, respectively.

8.1.1.1 Weltevreden (Portion 8/381)

Based on the daytime results, the existing ambient sound levels are above the SANS 10103:2008 guidelines for rural districts (45dBA). The average noise level (L_{Aeq}) measured varied from 51 to 64 dBA (rural districts).

The L_{Aeq} measured at Weltevreden (Portion 8/381) was 64dBA which is above the SANS 10103:2008 guidelines for rural district (45dBA). The main noise sources with high peaks levels impacting on the measurements were trucks transporting coals on the R33, sirens from vehicles operating on the nearby Msovo Mine, vehicles passing on the farms and cattle.

8.1.1.2 Byvooruitzicht (Portion 383)

The L_{Aeq} measured at Byvooruitzicht (Portion 383) was 51 dBA which is above the SANS 10103:2008 guidelines for rural district (45dBA). The main noise sources with high peaks levels impacting on the measurements were trucks transporting coals from the nearby Msovo Mine site towards the R33 road, sirens from vehicles operating on the nearby Msovo Mine, vehicles passing on the farms and cattle on the farm.

8.1.1.3 Vogelstruispoort (Portion Re/1/384)

The L_{Aeq} measured at was 56 dBA which is above the SANS 10103:2008 guidelines for rural district (45dBA). The main noise sources with high peaks levels impacting on the measurements were trucks transporting coals on the R33 and vehicles passing on the same road and wind.

8.1.1.4 Portion RE/1/381

The L_{Aeq} measured at RE/1/381 was 60 dBA which is above the SANS 10103:2008 guidelines for rural district (45dBA). The main noise sources with high peaks levels impacting on the measurements were trucks transporting coals on the R33, vehicles passing on the farms and on the National road (N4).

8.1.2 Night time Results

The night time results of the existing ambient noise levels are above the SANS rating levels for the maximum allowable outdoor night time limit for ambient noise in a rural district (35dBA).

8.1.2.1 Weltevreden (Portion 8/381)

The $_{LAeq}$ measured at Weltevreden (Portion 8/381) was 38 dBA which is above the SANS 10103:2008 guidelines for rural district (35dBA). The main noise sources with high peaks levels impacting on the measurements were trucks transporting coals on the R33, vehicles operating on the nearby Msovo Mine, vehicles passing on the farms and cattle.

8.1.2.2 Byvooruitzicht (Portion 383)

The L_{Aeq} measured at Byvooruitzicht (Portion 383) was 47 dBA which is above the SANS 10103:2008 guidelines for rural district (35dBA). The main noise sources with high peaks levels impacting on the

measurements were trucks transporting coals from the mine site towards the R33 road, sirens from vehicles operating on the nearby Msovo Mine, vehicles passing on the farms and cattle on the farm.

8.1.2.3 Vogelstruispoort (Portion Re/1/384)

The L_{Aeq} measured at was 50 dBA which is above the SANS 10103:2008 guidelines for rural district (45dBA). The main noise sources with high peaks levels impacting on the measurements were trucks transporting coals on the R33 and vehicles passing on the same road and wind.

8.1.2.4 Portion RE/1/381

The L_{Aeq} measured at RE/1/381 was 50 dBA which is above the SANS 10103:2008 guidelines for rural district (45dBA). The main noise sources with high peak levels impacting on the measurements were trucks transporting coals on the R33, vehicles passing on the farms and on the National road (N4).

Based on the night time results, the existing ambient sound levels are above the SANS 10103:2008 guidelines for day-time and night-time at all four rural locations.

8.2 Modelling Results

8.2.1 Noise Baseline Levels

The measurement results illustrated in Figure 8-1 to Figure 8-4 were used to estimate the base levels referred to in this section. These were 42 dBA and 33 dBA for day- and night-time, respectively.

8.2.1.1 Existing ambient noise levels

The modelled existing ambient noise levels are presented in Figure 8-5 and Figure 8-6.

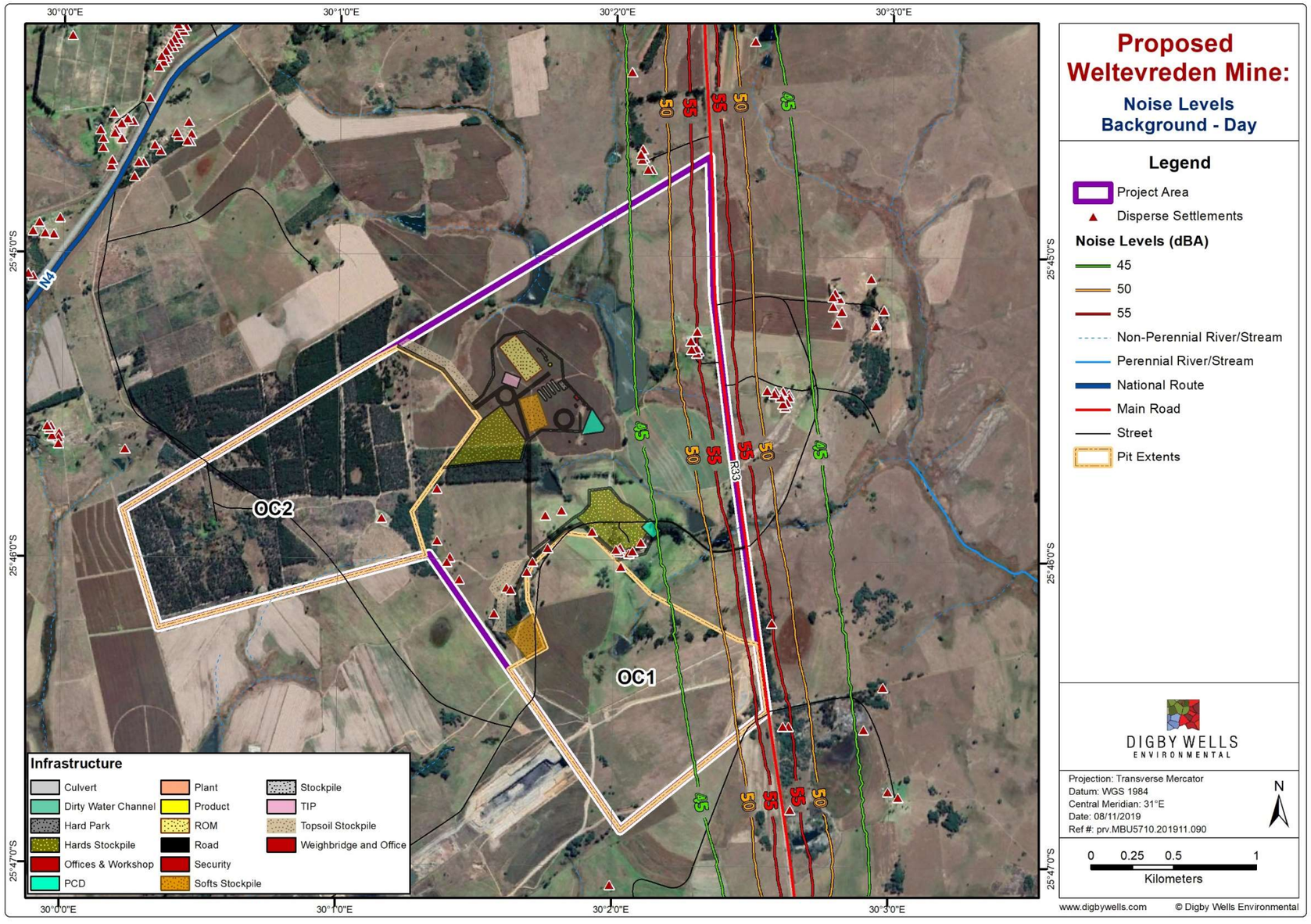

Figure 8-5: Modelled existing ambient noise levels during day-time due to traffic along R33

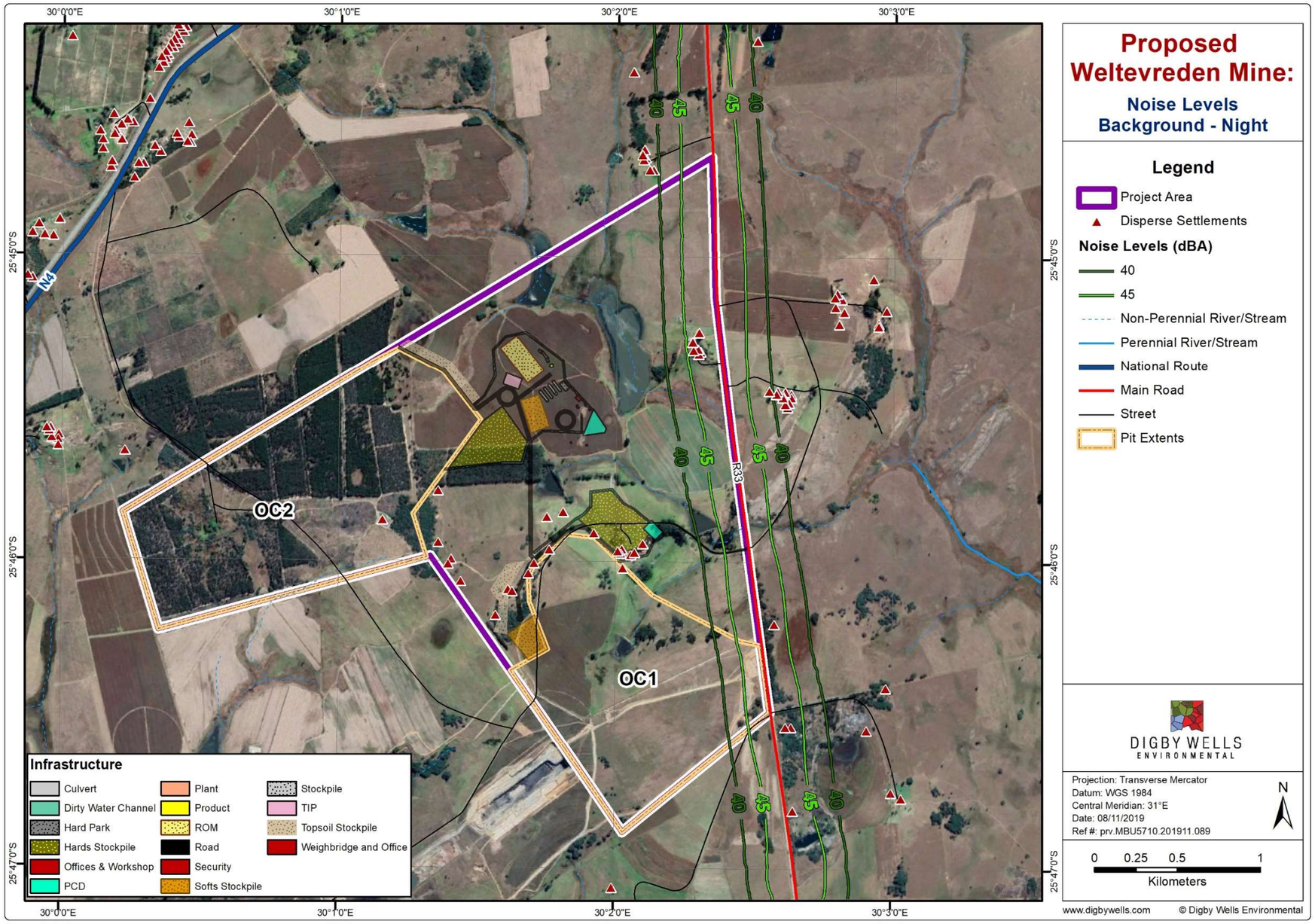

Figure 8-6: Modelled existing ambient noise levels during night-time due to traffic along R33

8.3 Construction Phase

The noise impact contours generated for the background and construction phase are given in and Figure 8-7 and Figure 8-8.

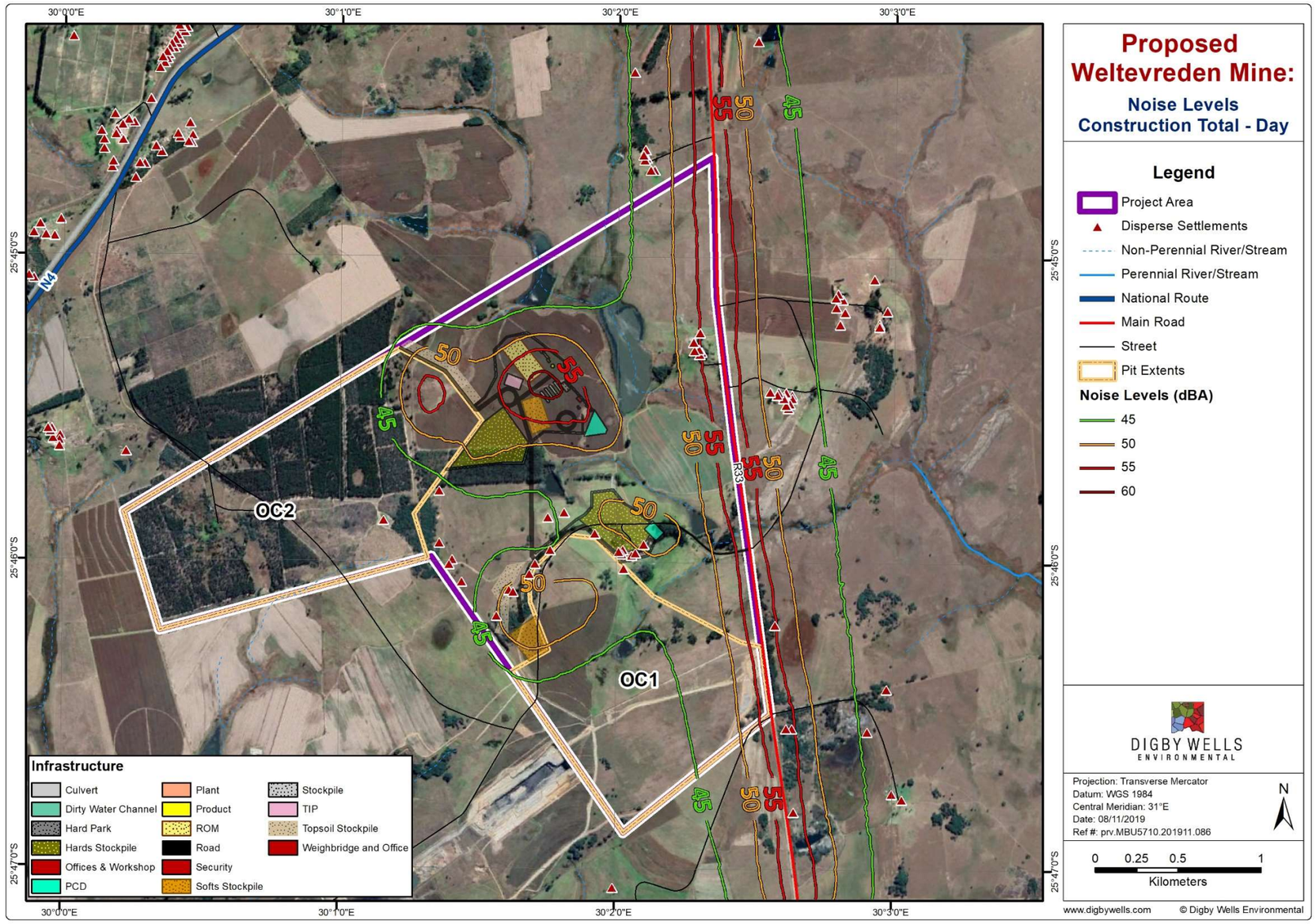

Figure 8-7: Construction: Noise impact expressed as the resulting total ambient noise levels during day-time

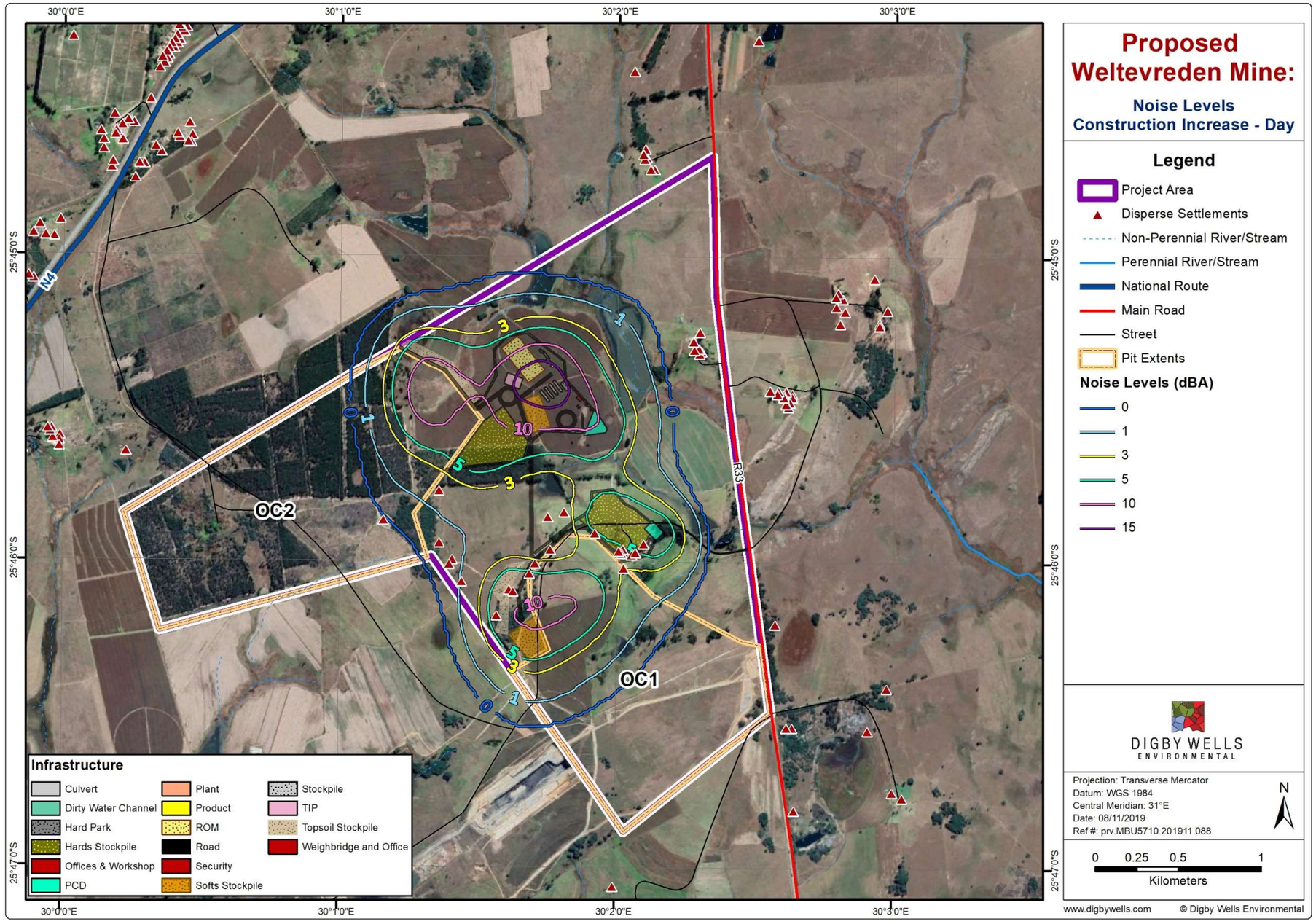

Figure 8-8: Construction: Noise impact expressed as increase in ambient noise level during day-time

The following remarks are relevant to the noise impacts during the construction phase:

- The resulting total ambient noise levels (Figure 8-7) show that the contours of higher noise levels, i.e. in excess of 50 dBA, are located either inside the Project boundary or close to them;
- This is confirmed by the resulting increase in ambient noise levels (Figure 8-8) and no existing homesteads outside the Project boundary will be affected;
- According to the SANS 10103, there will be no reaction from farmsteads outside the Project boundary to the expected increase in ambient noise levels during construction; and
- Therefore, the impact that the Project will have on existing ambient noise levels during construction is negligible.

8.4 Operational Phase

The noise impact contours generated for the operational phase of the Project are provided in Figure 8-9 and Figure 8-10 (day-time) and Figure 8-11 and Figure 8-12 (night-time).

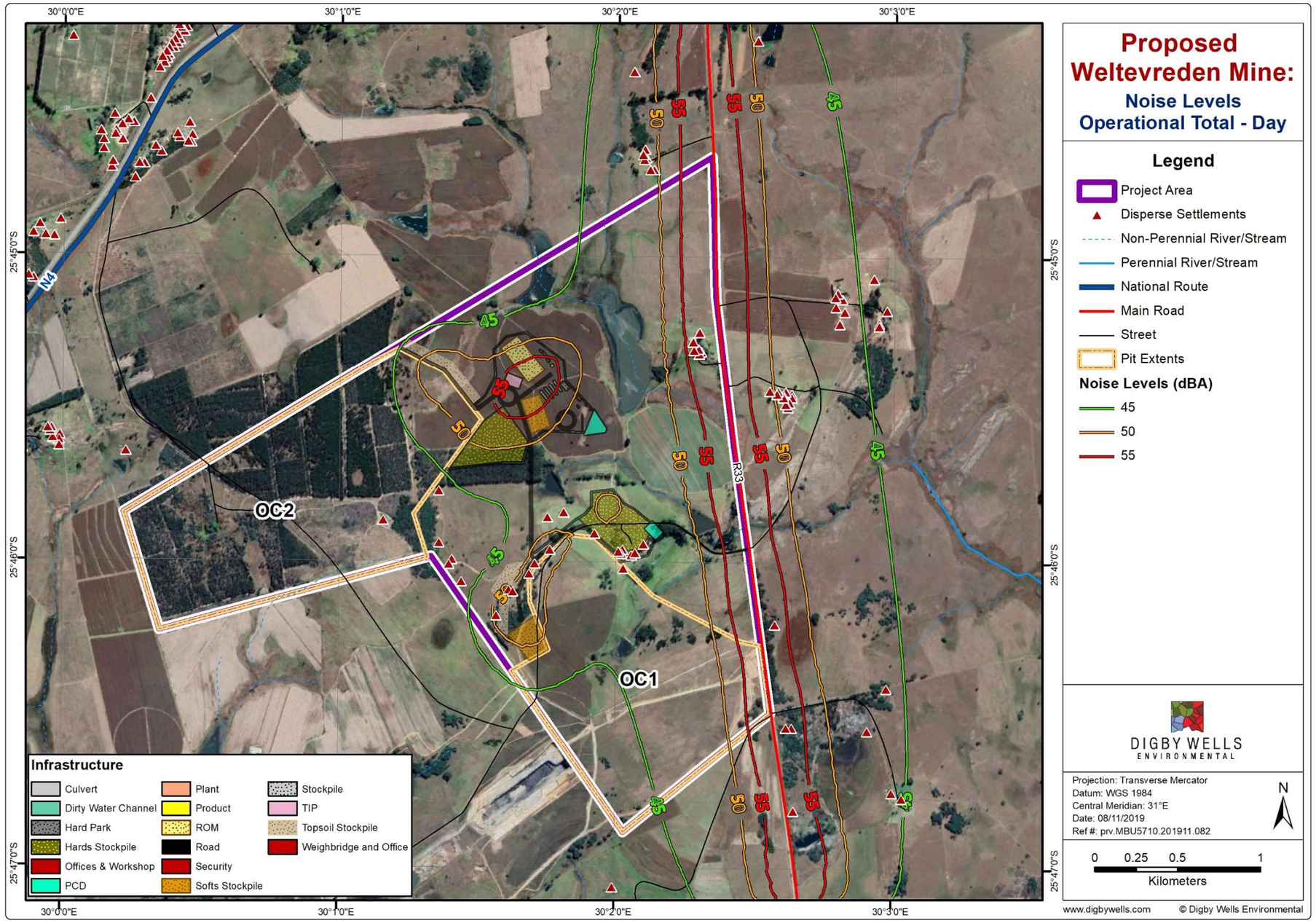

Figure 8-9: Operations: Noise Impact Expressed as the Resulting Total Ambient Noise Levels during day-time

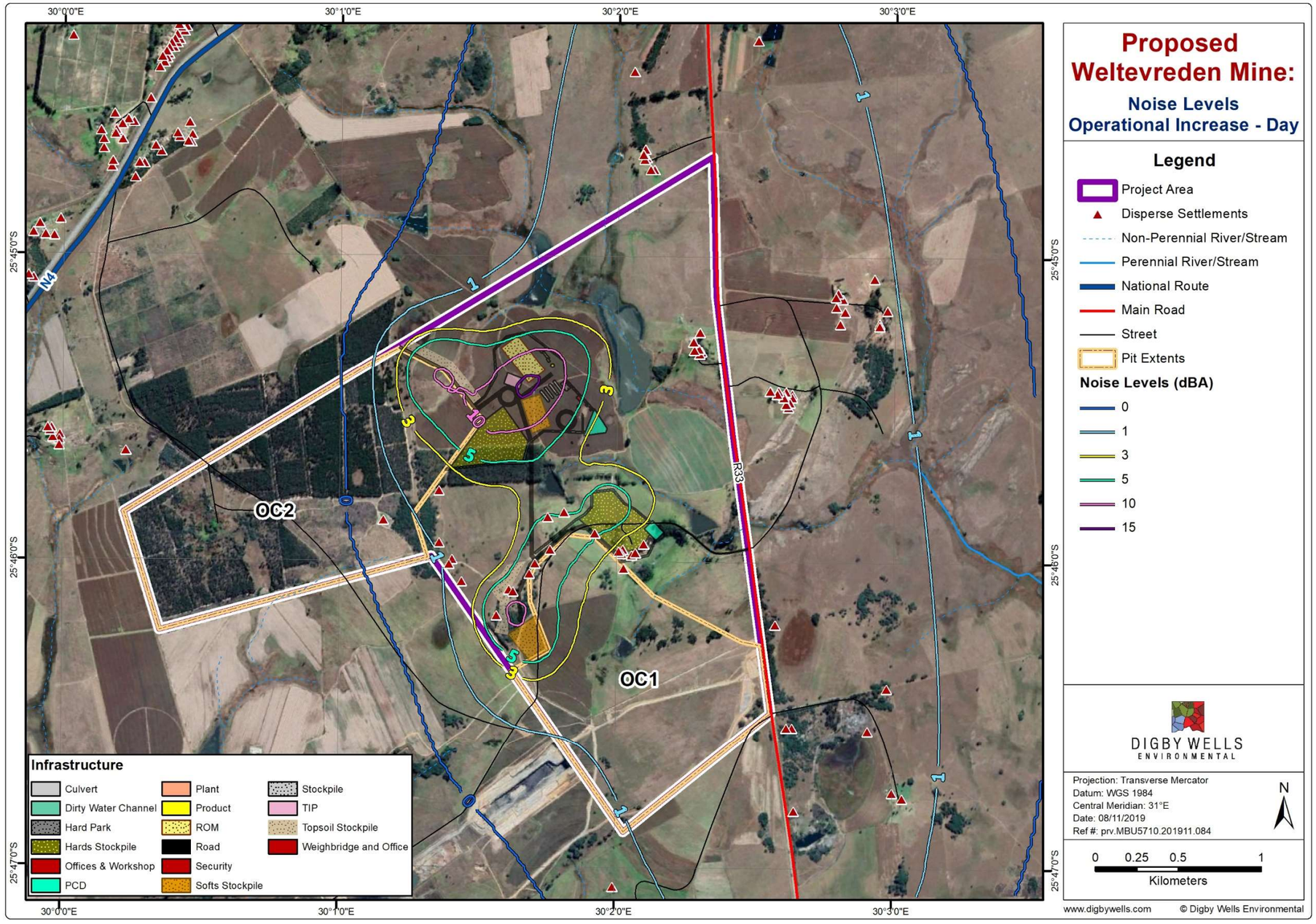

Figure 8-10: Operations: Noise Impact Expressed as the Increase in Ambient Noise Levels during day-time

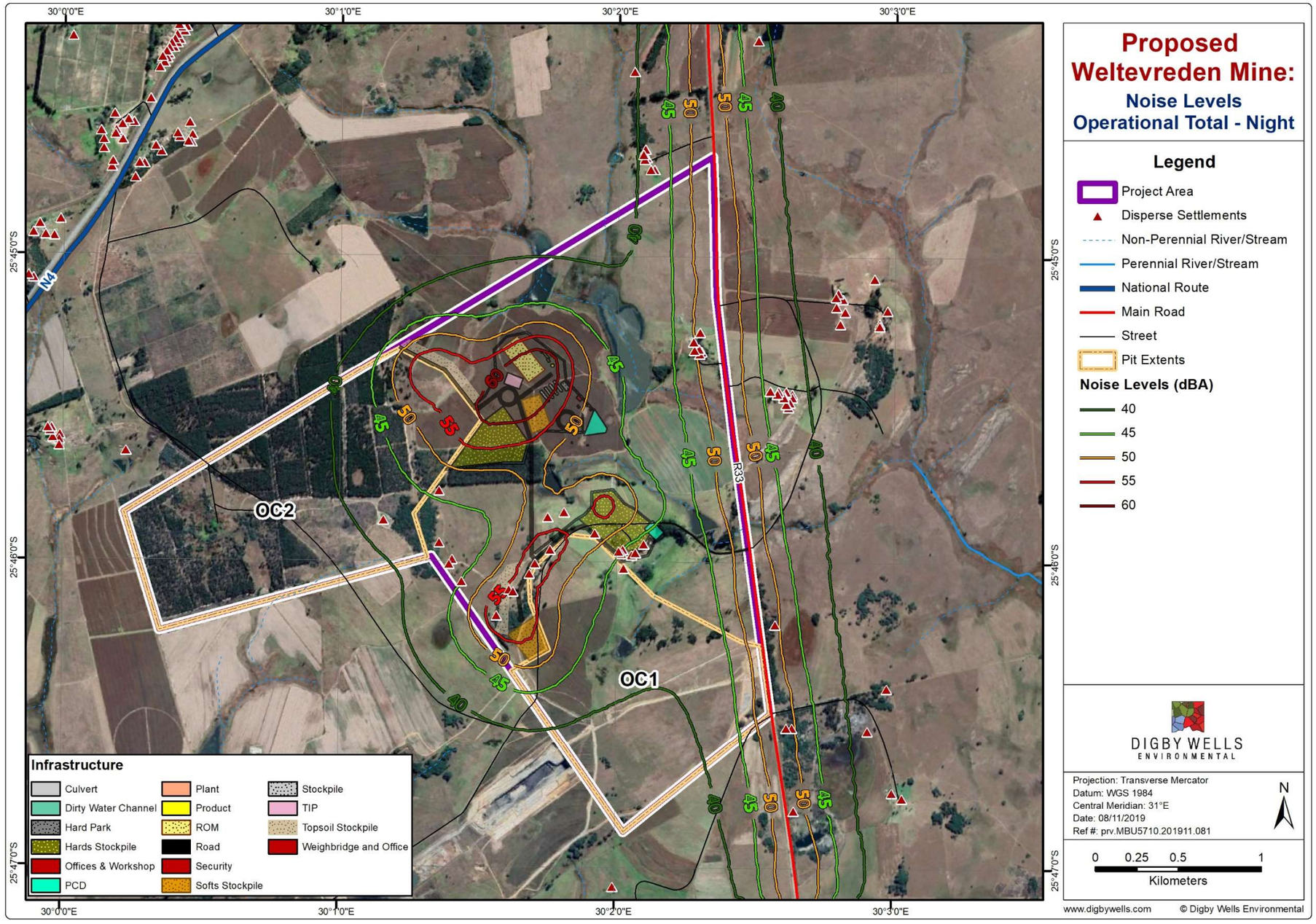

Figure 8-11: Operations: Noise Impact Expressed as the Resulting Total Ambient Noise Levels during night-time

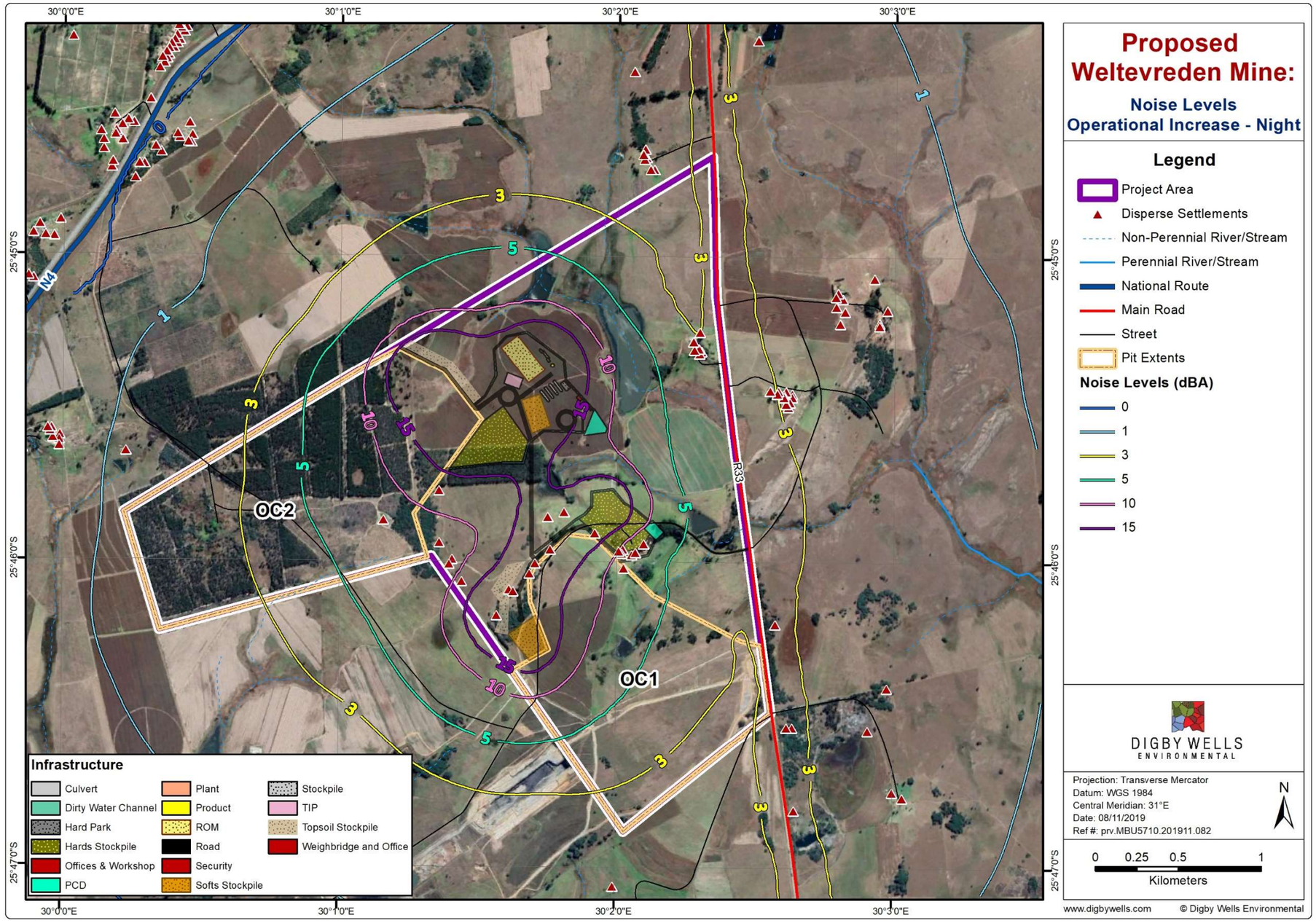

Figure 8-12: Operations: Noise Impact Expressed as the Increase in Ambient Noise Levels during night-time

The following is relevant to the noise impact contours during the operational phase and how these affect sensitive receptors:

- During day-time the resulting total ambient noise levels (Figure 8-9) show that the contours of higher resulting total noise levels, i.e. above 50 dBA, are located entirely inside the Project boundary;
- The resulting increase in ambient noise levels during day-time (Figure 8-10) confirm that no existing farmstead outside the Project boundary will be affected. This is due to the acoustic screening provided by the pit walls and dumps;
- According to SANS 10103, as depicted in Table 6-2, there will be no reaction from farmstead outside the Project boundary to the expected increase in ambient noise levels during day-time operations;
- Therefore, during day-time operations the impact that the Project will have on existing ambient noise levels is negligible;
- During night-time (Figure 8-11) the extent of the noise impact contours is considerably further than during day-time. This is due to the fact that meteorological and other atmospheric conditions favour the propagation of sound over longer distances;
- Again, this is confirmed by the contours indicating the increase in ambient noise levels (Figure 8-12). The 3 dB noise contour now extends significantly further than during day-time;
- According to SANS 10103, the estimated community reaction to the increase in ambient noise levels during night-time will be ‘Little with sporadic complaints’; and
- The sounding of reversing alarms and other mining related noisy single events are likely to be audible at larger distances, particularly during night time. The remarks made in this section show that this was indeed observed at all the measurement points. The audibility of reversing alarms is often identified as the most annoying aspect associated with mining operations.

8.5 Decommissioning

The noise impact contours generated for the Decommissioning phase of the Project are provided in Figure 8-13 and Figure 8-14 below.

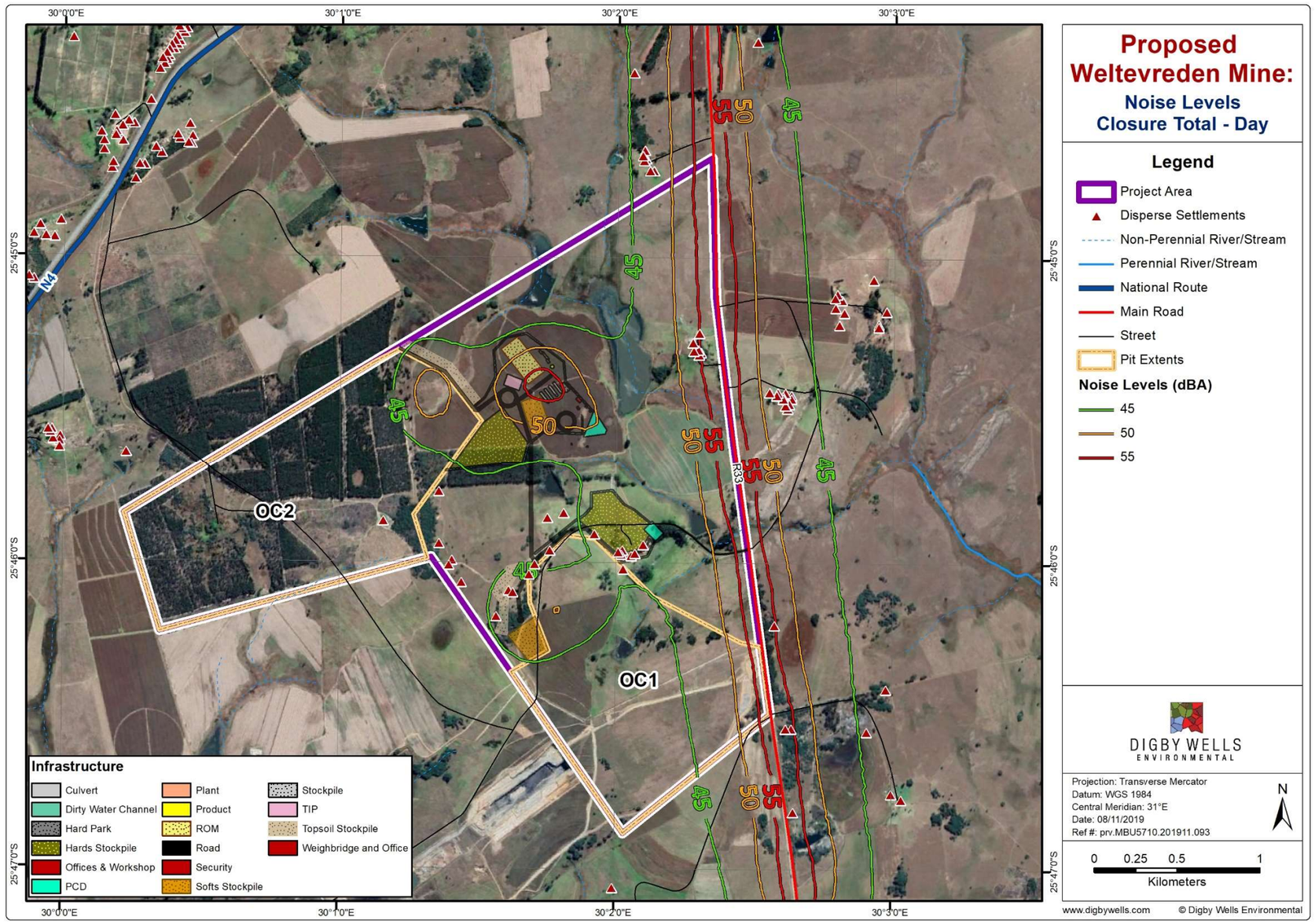

Figure 8-13: Decommissioning: Noise Impact Expressed as the Resulting Total in Ambient Noise Levels

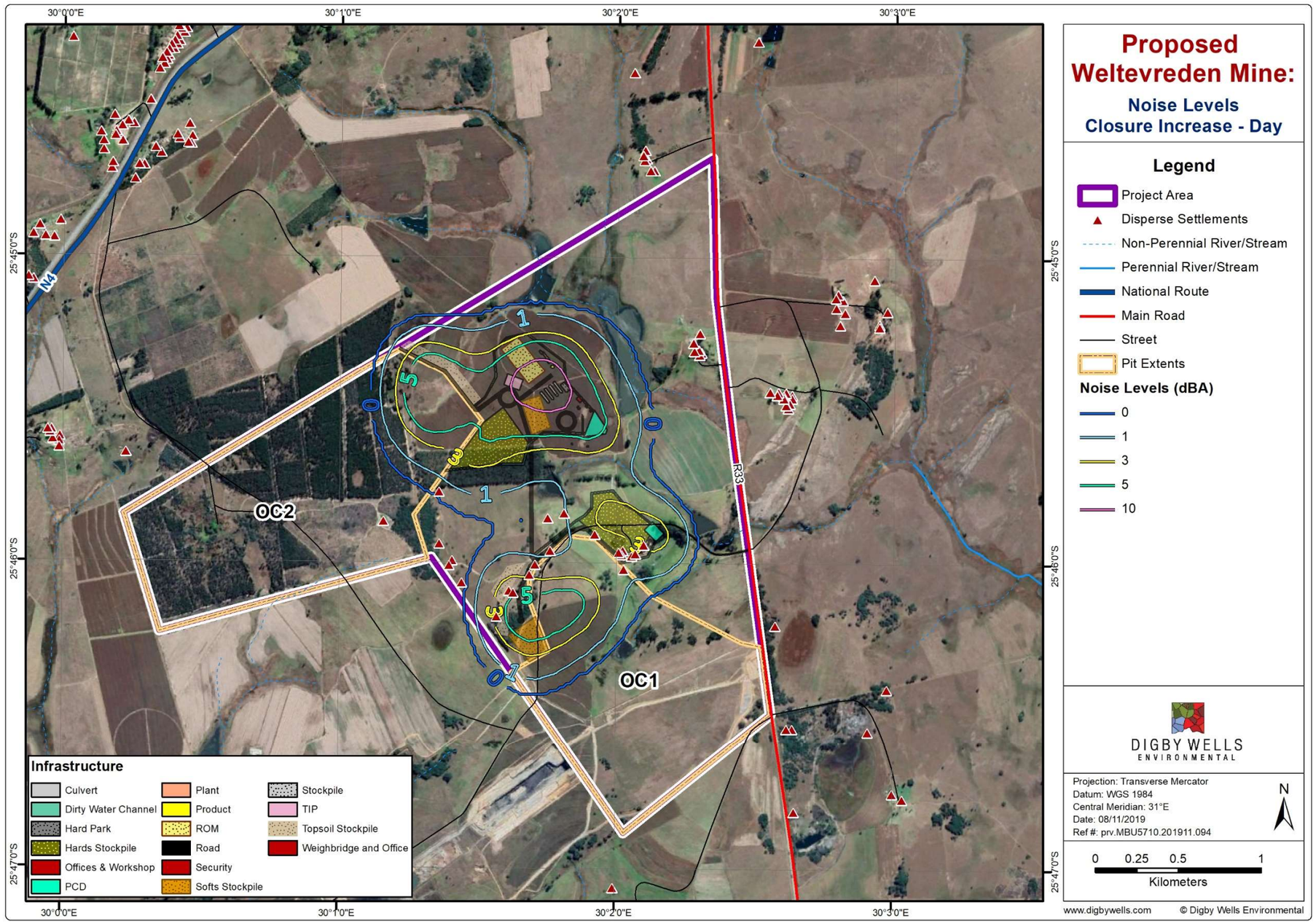

Figure 8-14: Decommissioning: Noise Impact Expressed as the Increase in Ambient Noise Levels

The following is relevant to the noise impact contours during the decommissioning phase and how these affect sensitive receptors:

- The resulting total ambient noise levels (Figure 8-13) show that the noise contours are restricted to the Project boundary;
- The resulting increase in ambient noise levels (Figure 8-14) will not affect any existing homesteads outside the Project boundary;
- According to Table 6-2 of SANS 10103 there will be no community reaction to the expected increase in ambient noise levels during operations; and
- Therefore, the impact that the Project will not affect existing ambient noise levels during decommissioning.

9 Impact Assessment

The expected noise impacts have been assessed as per the methodology in the section below.

9.1 Methodology

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:

Significance = Consequence x Probability x Nature

Where

Consequence = Intensity + Extent + Duration

And

Probability = Likelihood of an impact occurring

And

Nature = Positive (+1) or negative (-1) impact

The matrix calculates the rating out of 147, whereby intensity, extent, duration and probability are each rated out of seven as indicated in Table 9-1. 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 has been applied; post-mitigation is referred to as the residual impact. The significance of an impact is determined and categorised into one of eight categories (Table 9-1). The probability and the description of the significance ratings is presented in Table 9-2 and Table 9-3.

It is important to note that the pre-mitigation rating takes into consideration the activity as proposed, (i.e. there may already be some mitigation included in the engineering design). If the specialist determines the potential impact is still too high, additional mitigation measures are proposed.

Table 9-1: Impact Assessment Parameter Ratings

Rating	Intensity/Replicability		Extent	Duration/Reversibility	Probability
	Negative Impacts (Nature = -1)	**Positive Impacts (Nature = +1)**			
7	Irreplaceable loss or damage to biological or physical resources or highly sensitive environments. Irreplaceable damage to highly sensitive cultural/social resources.	Noticeable, on-going natural and/or social benefits which have improved the overall conditions of the baseline.	International 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 loss or damage to biological or physical resources or moderate to highly sensitive environments. Irreplaceable damage to cultural/social resources of moderate to high sensitivity.	Great improvement to the overall conditions of a large percentage of the baseline.	National 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

Rating	Intensity/Replicability		Extent	Duration/Reversibility	Probability
	Negative Impacts (Nature = -1)	**Positive Impacts (Nature = +1)**			
5	Serious loss and/or damage to biological or physical resources or highly sensitive environments, limiting ecosystem function. Very serious widespread social impacts. Irreparable damage to highly valued items.	On-going and widespread benefits to local communities and natural features of the landscape.	Province/Region Will affect the entire province of 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	Serious loss and/or damage to biological or physical resources or moderately sensitive environments, limiting ecosystem function. On-going serious social issues. Significant damage to structures/items of cultural significance.	Average to intense natural and/or social benefits to some elements of the baseline.	Municipal Area Will affect the whole municipal area.	Long Term 6-15 years and the impact can be reversed with management.	Probable Has occurred here or elsewhere and could therefore occur. < 50% probability

Rating	Intensity/Replicability		Extent	Duration/Reversibility	Probability
	Negative Impacts (Nature = -1)	**Positive Impacts (Nature = +1)**			
3	Moderate loss and/or damage to biological or physical resources or low to moderately sensitive environments, limiting ecosystem function. On-going social issues. Damage to items of cultural significance.	Average, on-going positive benefits, not widespread but felt by some elements of the baseline.	Local Local extending only as far as the development site area.	Medium Term 1-5 years and the 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 loss and/or effects to biological or physical resources or low sensitive environments, not affecting ecosystem functioning. Minor medium term social impacts on local population. Mostly repairable. Cultural functions and processes not affected.	Low positive impacts experienced by a small percentage of the baseline.	Limited 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

Rating	Intensity/Replicability		Extent	Duration/Reversibility	Probability
	Negative Impacts (Nature = -1)	**Positive Impacts (Nature = +1)**			
1	Minimal to no loss and/or effect to biological or physical resources, not affecting ecosystem functioning. Minimal social impacts, low-level repairable damage to common place structures.	Some low-level natural and/or social benefits felt by a very small percentage of the baseline.	Site Specific 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 9-2: 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 9-3: Significance Rating Description

Score	Description	Rating
109 to 147	A very beneficial impact which may be sufficient by itself to justify implementation of the project. The impact may result in permanent positive change.	Major (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	A positive impact. These impacts will usually result in positive medium to long term effects 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 which 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 effects on the natural and/or social environment.	Minor (negative) (-)
-73 to -108	A moderate negative impact which 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.	Moderate (negative) (-)
-109 to -147	A major negative impact which 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.	Major (negative) (-)

9.1.1 Construction Phase

This section specifically discusses the activities included in the construction phase and the significance of their impacts on the ambient noise levels at the nearby receptors.

9.1.1.1 Impact Description

The project activities that have been assessed as part of the construction phase are as follow:

- Site clearing;
- Access and haul road construction;
- Infrastructure construction;
- Topsoil stockpiling; and
- Loading, transport, tipping and spreading of materials.

The construction noise dispersion modelling results indicate that the noise impact caused by the construction activities will be negligible.

9.1.1.2 Impact Ratings

The noise impact during the construction phase of the project compared to the existing baseline has been assessed and is provided in Table 9-4.

Table 9-4: Potential Noise Impacts of the Construction Phase

Activity and Interaction: Site clearing, construction of haul roads and infrastructure, topsoil stockpile, loading, transport, tipping and spreading of material will result in the generation of noise.			
Impact Description: Noise will emanate from the machinery, and vehicles during the site preparation, haul road construction as well as processing plant construction activities and may exceed the South African standard SANS 10103.			
Prior to mitigation/ management			
Dimension	**Rating**	**Motivation**	**Significance**
Duration	Medium term (3)	Noise will be produced for the duration of the construction phase.	Negligible (negative) – 18
Extent	Limited to project footprint and immediate surrounding (2)	It is expected that during construction, noise will be limited to the Project footprint and its immediate surrounding.	
Intensity	Minimal - negative (-1)	It is expected that during construction, noise will increase the ambient noise outside the Project site by less than 3dB, which is insignificant. Outside the Project site it will be less than 1 dB, i.e. negligible.	
Probability	Unlikely (3)	It is unlikely that construction noise will impact on the community.	
Nature	Negative		
Mitigation/ Management actions			
▪ Restrict construction activities to daylight hours (06:00 – 18:00); ▪ Vehicles to 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; and ▪ Switch off equipment when not in use.			

Activity and Interaction: Site clearing, construction of haul roads and infrastructure, topsoil stockpile, loading, transport, tipping and spreading of material will result in the generation of noise.			
Post- mitigation			
Dimension	**Rating**	**Motivation**	**Significance**
Duration	Medium term (3)	Noise will be produced for the duration of the construction phase	Negligible (negative) – 15
Extent	Limited to project footprint (1)	It is expected that during construction, noise will be limited to the Project footprint and its immediate surrounding.	
Intensity	Minimal - negative (-1)	It is expected that during construction, the noise emissions will have a negligible impact on existing ambient noise levels in the project's immediate environment.	
Probability	Unlikely (3)	It is unlikely that noise will impact on any of the existing dwellings.	
Nature	Negative		

9.1.2 Operational phase

This section specifically discusses the activities included in the operational phase and the significance of their impact on the ambient noise levels in the immediate environment of the project.

9.1.2.1 Impact Description

The project activities that have been assessed as part of the operational phase are as follows:

- Blasting;
- Operation of the crushing plant;
- Handling of coal and discard materials including road transport along the access road and the R33;
- Concurrent rehabilitation activities; and
- Acoustic screening provided by the pit walls and dumps.

The results indicate that the expected noise during the operational activities will not cause a noise impact at farmsteads outside the Project boundary as it was assumed that farmsteads with the Project boundary will be relocated. Noise levels will be compliant with the SANS 10103 guidelines.

9.1.2.2 Impact Ratings

The noise impact during the operational phase is rated by comparing the results of the expected operational noise and the existing baseline noise measurements. Table 9-5 summarises the ratings and indicates the final significance of the operational noise impact on the surrounding sensitive receptors.

Table 9-5: Potential Noise Impacts of the Operational Phase

Activity and Interaction: Mining and Processing of Ore			
Impact Description: Noise will emanate from the crusher, screening and hauling of coal. However, the noise levels will not exceed the SANS 10103 guidelines in the immediate environment of the mining operation boundaries.			
Prior to mitigation/ management			
Dimension	**Rating**	**Motivation**	**Significance**
Duration	Project Life (5)	Noise will be produced for the duration of the operational phase	Negligible (negative) – 24
Extent	Limited to project footprint and immediate surrounding (2)	It is expected that during operations increases in ambient noise levels in excess of 3 dB will only occur in close proximity of the mining property boundary. No dwellings will be affected.	
Intensity	Minimal - negative (-1)	Noise causes a negative impact in accordance with its definition.	
Probability	Unlikely (3)	It is unlikely that noise will have a significant impact on any dwellings in the environment of the mining operation.	
Mitigation/ Management actions			
▪ Restrict concurrent rehabilitation to daylight hours (06:00 – 18:00); ▪ Vehicles re to be serviced to the design requirements to ensure noise suppression mechanisms are effective e.g. installed exhaust mufflers; ▪ Replace the pure tone reversing alarms with ones that emit broadband noise; ▪ Switch off equipment when not in use; ▪ Regulate the speed of vehicles traveling on access and haul roads; The following with regards to blasting operations is recommended: ▪ The use of millisecond delays between rows of blast holes in a given blasting pattern in order to reduce the amount of explosive charge detonated at any given instant is recommended; ▪ Reduction of the powder factor, that is, use of less explosive per cubic yard of overburden; ▪ Restriction of blasting to daylight hours are mitigation measures that should be followed; and ▪ Maintaining good public relations with the surrounding communities i.e. warning the local communities in advance before blasts.			
Post- mitigation			
Dimension	**Rating**	**Motivation**	**Significance**
Duration	Project Life (5)	Noise will be produced for the duration of the operational phase.	Negligible (negative) – 18
Extent	Limited to project footprint and immediate surrounding (2)	It is expected that during operations once mitigation is implemented, noise will be limited to the project footprint and its immediate surrounding.	
Intensity	Minor - negative (-2)	It is expected that during operations, noise will have a minor impact	

Activity and Interaction: Mining and Processing of Ore			
Probability	Improbable (2)	It is improbable that noise will impact in the mining operation's larger environment.	
Nature	Negative		

9.1.3 Decommissioning Phase

The decommissioning activities will mainly involve dismantling of the plant and offices and the rehabilitation of the infrastructure platforms and haul road.

9.1.3.1 Impact Description

It is expected that the decommissioning activities will have a negligible impact due to the limited and less machine intensive activities being undertaken on site compared with the construction and operational phases; therefore, the impact significance is likely to be lower.

Decommissioning activities should be restricted to daylight hours to keep the night-time noise levels to a minimum. Mining related machinery and vehicles should be switched off when not in use.

9.1.3.2 Impact Ratings

Table 9-6 summarises the impact significance of the decommissioning phase of the Project.

Table 9-6: Potential Noise Impacts of the Decommissioning Phase

Activity and Interaction: Removal of infrastructure and surface rehabilitation			
Impact Description: Noise will emanate from the machinery and vehicles undertaking the decommissioning and rehabilitation activities.			
Prior to Mitigation/Management			
Dimension	**Rating**	**Motivation**	**Significance**
Duration	Short term (2)	Noise will be produced for the duration of the decommissioning phase.	Negligible (negative) – 10
Extent	Limited (2)	It is expected that during decommissioning noise will be limited to site and its immediate surroundings.	
Intensity	Minimal - negative (-1)	It is expected that during decommissioning noise will have a minimal impact.	
Probability	Improbable (2)	It is expected that that noise will improbably impact on the surrounding receptors.	
Nature	Negative		
Mitigation/Management Actions			

▪ 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; ▪ Regulate speed limits on access roads; and ▪ Switch off equipment when not in use.			
Post-Mitigation			
Dimension	**Rating**	**Motivation**	**Significance**
Duration	Short term (2)	Noise will be produced for the duration of the decommissioning phase.	Negligible (negative) – 8
Extent	Isolated (1)	It is expected that if recommended management measures are implemented, noise will be limited to certain part of the site.	
Intensity	Minimal - negative (-1)	It is expected that during decommissioning noise will have a minimal impact.	
Probability	Improbable (2)	It is expected that that noise will improbably impact on the surrounding receptors.	
Nature	Negative		

10 Mitigation Measures and Management Plan

The objectives described for the recommended mitigation and/or management measures for each identified impact associated with each activity are presented below in **Error! Reference source not found.**. **Error! Reference source not found.** lists the relevant activities for each phase of the mining operation and provides information pertaining to the legal requirements, recommended actions plans, timing, responsible person and significance after mitigation.

Table 10-1: Mitigation measures and management plan

Activity	Objectives	Mitigation/Management measure	Frequency of mitigation	Legal Requirements	Recommended Action Plans	Timing of implementation	Responsible Person
Construction phase							
Site clearing; Access and haul road construction; Infrastructure construction; Topsoil stockpiling; and Loading, transport, tipping and spreading of materials.	To prevent the noise emanating from the construction machinery from impacting on the sensitive receptors	▪ Mining-related machine and vehicles must be serviced on a regular basis to ensure noise suppression; ▪ Noise suppression mechanisms are effective e.g. installed exhaust mufflers; and ▪ Switching off equipment when not in use.	Vehicles to be service according to service plan. Machinery to be switched off when not in use.	Environmental Conservation Act, 1989 (Act No. 73 of 1989); Noise Control Regulation, in terms of Environmental Conservation Act, 1989 (Act No. 73 of 1989); National Environmental Management Act (Act 107 of 1998)	Regular vehicle inspections.	Construction	Environmental Manager
Operational phase							
Drilling and blasting;	To prevent the noise emanating from the	▪ Mining-related machine and vehicles must be serviced on a regular basis to	Vehicles to be service	Environmental Conservation Act, 1989 (Act	Regular vehicle inspections	Operational phase	Environmental Manager

Activity	Objectives	Mitigation/Management measure	Frequency of mitigation	Legal Requirements	Recommended Action Plans	Timing of implementation	Responsible Person
Vehicle movement on haul roads; and Operation of the crushing plant; Handling of coal and discard materials including road transport along the access road and R33	blasting and mining machinery from impacting on the sensitive receptors	ensure noise suppression; ▪ Noise suppression mechanisms are effective e.g. installed exhaust mufflers; ▪ Switching off equipment when not in use; and ▪ As for the blasting operations it is generally intermittent and should be limited to daylight hours The following with regards to blasting operations is recommended: ▪ The use of millisecond delays between rows of blast holes in a given blasting pattern in order to reduce the amount of explosive charge detonated at any given instant is recommended; ▪ Reduction of the powder factor, that is, use of less explosive	according to service plan; Machinery to be switched off when not in use; and Blasting mitigation measures to be implemented for every occurrence.	No. 73 of 1989); Noise Control Regulation, in terms of Environmental Conservation Act, 1989 (Act No. 73 of 1989); National Environmental Management Act (Act 107 of 1998)	Spot checks to ensure the recommendations are adhered to.		

Activity	Objectives	Mitigation/Management measure	Frequency of mitigation	Legal Requirements	Recommended Action Plans	Timing of implementation	Responsible Person
		per cubic yard of overburden; ▪ Restriction of blasting to daylight hours are mitigation measures that should be followed; and ▪ Maintaining good public relations with the surrounding communities i.e. warning the local communities in advance before blasts.					
Decommissioning phase							
Demolition of infrastructure; and Rehabilitation	To prevent the noise emanating from the machinery from impacting on the sensitive receptors	▪ Mining-related machine and vehicles must be serviced on a regular basis to ensure noise suppression; ▪ Noise suppression mechanisms are effective e.g. installed exhaust mufflers; and ▪ Switching off equipment when not in use.	Vehicles to be service according to service plan. Machinery to be switched off when not in use.	Environmental Conservation Act, 1989 (Act No. 73 of 1989); Noise Control Regulation, in terms of Environmental Conservation Act, 1989 (Act No. 73 of 1989);	Regular vehicle inspections.	Decommissioning phase	Environmental Manager

Activity	Objectives	Mitigation/Management measure	Frequency of mitigation	Legal Requirements	Recommended Action Plans	Timing of implementation	Responsible Person
				National Environmental Management Act (Act 107 of 1998)			

10.1 Monitoring Programme

This section presents the requirements, methodology, frequency and locations for the monitoring of environmental noise (Table 10-1). This will cover aspects that have to do be the baseline, impact monitoring during the construction and operational phases and data will be used to assess compliance.

Table 10-1: Monitoring Programme (Pre-construction and LOM)

Method	Proposed Monitoring Location	Frequency	Target	Reporting
SANS 10103:2004	As indicated in Table 7-1. With time, additional sites will be included.	Monthly	▪ Environmental Conservation Act, 1989 (Act No. 73 of 1989); ▪ Noise Control Regulation, in terms of Environmental Conservation Act, 1989 (Act No. 73 of 1989); ▪ National Environmental Management Act (Act 107 of 1998)	A designated noise specialist to conduct measurement and reporting to regulatory authorities on compliance.

11 Conclusions

The following conclusions are drawn from the results of this noise impact study:

- For both the construction and operational phases the contours indicating higher noise impacts, i.e. 45 dBA/55 dBA (resulting total ambient noise level) and 5 dB (increase in ambient noise level) fall in close proximity to the Project site;
- The future ambient noise levels in the closest farmstead outside the Project boundary will fall within the guideline levels of 55 dBA and 45 dBA. The largest increases in ambient noise levels outside the mine boundary will occur at night time during the operational phase and range between 1 dB and 5 dB;
- Response from farmsteads outside the Project boundary will at most be ‘Little with sporadic complaints’; and
- The severity of the noise impact during both the construction, operational and decommissioning phases of the mine will be negligible.

12 Recommendations

Despite the low severity of the noise impacts predicted, specific noise mitigation measures are recommended and should be implemented. The noise specialist does not object to the Project going ahead from a noise perspective due to the aforementioned.

13 References

Scorpion Mineral Processing South Africa Ltd, Processing Report for the Mbuyelo Coal Project

SANS 10103:2008 'The measurement and rating of environmental noise with respect to annoyance and to speech communication', Edition 6.

Guidelines for Community Noise, World Health Organisation, Geneva, 1999

ISO 1996-1, Acoustics – Description, measurement and assessment of environmental noise – Part 1: Basic quantities and assessment.

ISO 1996-2, Acoustics – Description, measurement and assessment of environmental noise – Part 2: Determination of environmental noise levels.

SANS 10357:2004 'The calculation of sound propagation by the Concawe method'. Edition 1.2.

SANS 10210:2004 'Calculating and predicting road traffic noise', Edition 2.2.

Appendix A: Specialist CV

Appendix B: Modelling Data

The sound power emission levels of the equipment and processes are provided in the following table:

Equipment	Sound power level (dB re 12pW) in octave frequency band, Hz							dBA
	63	125	250	500	1000	2000	4000	
Excavator/Shovel	118	113	107	108	106	103	98	107.7
FEL 966	111.5	107.0	100.8	101.1	96.8	97.0	95.8	101.0
Bulldozer D9	102.7	116.2	109.5	108.6	105.9	102.4	96.2	107.9
Tracked Hydraulic Drilling Rig	113	121	106	107	108	107	104	110.4
Grader 140H	102.2	107.6	108.6	105.8	102.2	98.8	92.8	104.6
Vibrating roller CS563C	105.0	112.1	106.0	102.5	99.9	98.9	96.0	103.3
Haul truck 777	106.7	113.6	115.2	116.1	111.2	107.3	101.4	111.4
Road transport truck 40t	109	107	107	111	112	109	104	110.4
Bell D40	108.2	108.0	106.8	106.9	104.0	101.8	98.7	106.3
Backhoe 40t	102	94	92	92	91	88	87	92.8
Crusher	104.1	107.6	110.5	109.3	105.1	100.1	92.3	110.2
Coal Processing Plant	117.5	107.3	104.3	105.2	105.2	100.5	100.2	109.2
General noise	100.0	103.0	103.0	101.0	98.0	95.0	89.0	103.1

The assumed meteorological conditions are given in the following table:

Parameter	Value	
	Day-time	Night-time
Temperature	20 °C	18 °C
RHD	69%	46%
Static air pressure	83 kPa	83 kPa
Wind direction	NW	N
Wind speed	2.5 m/s	2.5 m/s
Solar irradiation	500 W/m^2	-
Cloud cover	2/8	2/8
Ground conditions	60% soft	

The assumed traffic flow data

Parameter	Value	
	Day-time	Night-time
Q (AAHT)	429 vehicles/hr	79 vehicles/hr
Average speed	80 km/h	80 km/h
% Heavy vehicles	20.4%	20.4%
Road structure	smooth	smooth
Gradient	None	None
Ground conditions	60% soft	60% soft