Monthly Noise Monitoring Assessment

Tomingley Gold Mine, March 2018

Prepared for: Tomingley Gold Operations Pty Limited
April 2018
MAC160270RP20

Muller Acoustic Consulting

Document Information

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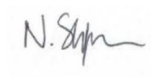
MAC160270RP20	Final	9 April 2018	Nicholas Shipman		Oliver Muller	

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1 Introduction

Muller Acoustic Consulting Pty Ltd (MAC) has been commissioned by Tomingley Gold Operations Pty Ltd (TGO) to complete a Noise Monitoring Assessment (NMA) for Tomingley Gold Mine ('the mine').

The NMA involved quantifying the noise contribution of the mine by direct attended measurements to determine mining noise emissions so that effective management and controls can be implemented where required. The monitoring has been conducted in accordance with the TGO Noise Management Plan and in general accordance with Conditions L4.2 to L4.7 of the EPL at six representative receiver locations. It is noted that this assessment has been completed as part of an internal noise management initiative and does not form part of the annual noise monitoring program to address conditions of the Environmental Protection License (EPL).

The assessment has been conducted in accordance with the following documents:

- NSW Environment Protection Authority (EPA), Noise Policy for Industry (NPI) 2017;
- Environment Protection Licence EPL 20169 (EPL); and
- Standards Australia AS 1055.1:1997 - Acoustics - Description and measurement of environmental noise - General Procedures.

A glossary of terms, definitions and abbreviations used in this report is provided in **Appendix A**.

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2 Environmental Protection License Noise Limits

Historic assessments for the mine categorise receivers into Noise Assessment Groups (NAGs). The NAGs were derived based on ambient noise data that controlled receiver RBLs.

Table 1 reproduces the operational and sleep disturbance noise limits for assessed receivers referenced from the EPL that have been adopted for this NMA and are consistent with historic EPL monitoring locations.

Table 1 Noise Limits, dBA

Noise Assessment Group	Receivers	Day	Evening	Night	
		$L_{Aeq(15\text{-}min)}$	$L_{Aeq(15\text{-}min)}$	$L_{Aeq(15\text{-}min)}$	$L_{A1(1\text{-}min)}$
NAG A	R6, R4	36	36	36	45
	R5	37	37	37	45
NAG B	R2	36	36	36	45
NAG C	R3	49	40	40	45
	R29	48	40	40	45
NAG D	R23	43	39	39	46

Note: Refer to figure in Appendix 4 of Project Approval 09-0155 for noise locations. However, these criteria do not apply if the Proponent has an agreement with the relevant owner(s) of these residences / land to generate higher noise levels, and the Proponent has advised the Department of Planning and Infrastructure and EPA in writing of the terms of this agreement.

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3 Methodology

3.1 Locality

TGO is located to the south of the village of Tomingley, NSW. Receivers in the locality surrounding the mine are primarily rural/residential and for consistency the naming conventions for each receiver has been retained from historic noise assessments. The monitoring locations with respect to the mine are presented in the locality plan shown in **Figure 1.**

3.2 Assessment Methodology

The attended noise survey was conducted in general accordance with the procedures described in Australian Standard AS 1055-1997, "Acoustics - Description and Measurement of Environmental Noise" and the EPL. Measurements were carried out using Svantek Type 1, 971 noise analyser from Tuesday 13 March 2018 to Thursday 15 March 2018. The acoustic instrumentation used carries current NATA calibration and complies with AS IEC 61672.1-2004-Electroacoustics - Sound level meters - Specifications. Calibration of all instrumentation was checked prior to and following measurements. Drift in calibration did not exceed ±0.5dBA.

Both evening and night measurements were of 15 minutes duration. Where possible, throughout each survey the operator quantified the contribution of each significant noise source. Extraneous noise sources were excluded from the analysis to calculate the $LA_{eq(15\text{-}min)}$ mine noise contribution for comparison against the relevant EPL limit.

Prevailing meteorological conditions for the monitoring period were sourced from TGO's meteorological station and analysed in accordance with Appendix E4 of the NPI to determine the stability category present at the time of each measured sample. This was undertaken to determine applicability of results in accordance with Condition L4.3 of the EPL. Results obtained during non-prevailing meteorological conditions (ie F Class Stability in conjunction with a 2m/s drainage wind or a G Class Stability) are considered not applicable against the EPL criteria.

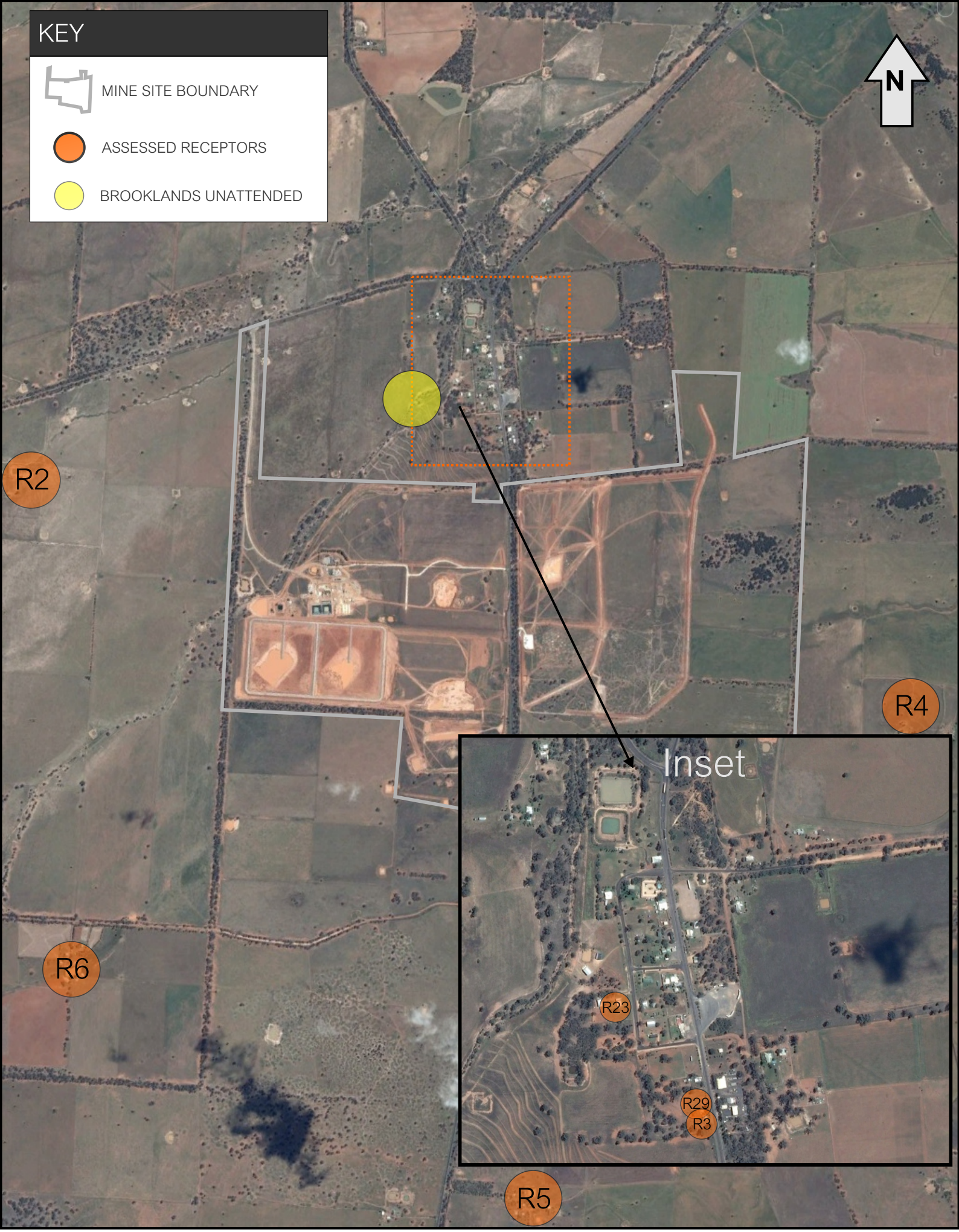

FIGURE 1 - LOCALITY PLAN AND ASSESSMENT LOCATIONS

TOMINGLEY GOLD MINE EPL NOISE MONITORING

REF: MAC160270

0 1000m

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4 Results

The monitoring and assessment results are presented in individual tables for each assessment location.

4.1 Assessment Results - Location R2

The results of the attended noise measurements at location R2 for Tuesday 13 March 2018 to Thursday 15 March 2018 are summarised in **Table 2** with the relevant EPL limits, the calculated mining noise contribution and prevailing meteorological conditions at the time of each measurement.

Table 2 Operator-Attended Noise Survey Results – Location R2

Date	Time (hrs)	Descriptor (dBA re 20 µPa)			EPL Limit	Meteorology[1]	Description and SPL, dBA
		L_{Amax}	L_{Aeq}	L_{A90}			
13/03/18	21:32	85	58	31	36	Dir: N 0.5 m/s Stab Class: F	Wind in trees 28-40 Local traffic 34-83
		TGO Site $L_{Aeq(15\text{-}min)}$ Contribution					TGO Inaudible
13/03/18	22:00	72	39	31	36	Dir: N 0.5 m/s Stab Class: D	Wind in trees 32-46
		TGO Site $L_{Aeq(15\text{-}min)}$ Contribution					TGO Inaudible
14/03/18	21:20	61	32	30	36	Dir: N 0.1 m/s Stab Class: E	Distant traffic 27-33
		TGO Site $L_{Aeq(15\text{-}min)}$ Contribution					TGO Inaudible
14/03/18	22:00	74	48	29	36	Dir: N 0.1 m/s Stab Class: D	Distant traffic 29-31 Local traffic 31-74
		TGO Site $L_{Aeq(15\text{-}min)}$ Contribution					TGO Inaudible
15/03/18	21:29	56	29	26	36	Dir: SW 0.1 m/s Stab Class: E	Insects 26-29 Distant traffic 28-32
		TGO Site $L_{Aeq(15\text{-}min)}$ Contribution					TGO Inaudible
15/03/18	22:00	80	52	27	36	Dir: SW 0.1 m/s Stab Class: E	Insects 26-29 Distant traffic 28-31 Local traffic 30-79
		TGO Site $L_{Aeq(15\text{-}min)}$ Contribution					TGO Inaudible

Note 1: Meteorological data obtained from TGO's on-site weather station or by direct measurement by the operator.

4.2 Assessment Results - Location R3/R29

The results of the attended noise measurements at location R3/R29 for Tuesday 13 March 2018 to Thursday 15 March 2018 are summarised in **Table 3** with the relevant EPL limits, the calculated mining noise contribution and prevailing meteorological conditions at the time of each measurement.

Table 3 Operator-Attended Noise Survey Results – Location R3/R29

Date	Time (hrs)	Descriptor (dBA re 20 µPa)			EPL Limit	Meteorology[1]	Description and SPL, dBA
		L_{Amax}	L_{Aeq}	L_{A90}			
13/03/18	20:56	84	63	40	40	Dir: N 0.1 m/s Stab Class: D	Highway traffic 33-80 General mine noise 33-38
		TGO Site $L_{Aeq(15\text{-}min)}$ Contribution					35
13/03/18	22:38	81	64	40	40	Dir: N 1 m/s Stab Class: D	Highway traffic 34-80 Wind in trees 34-41
		TGO Site $L_{Aeq(15\text{-}min)}$ Contribution					TGO Inaudible
14/03/18	20:38	81	63	38	40	Dir: N 1 m/s Stab Class: D	Highway traffic 32-78 Idling highway traffic 50-53
		TGO Site $L_{Aeq(15\text{-}min)}$ Contribution					TGO Inaudible
14/03/18	22:37	87	68	48	40	Dir: N 0.1 m/s Stab Class: D	Highway traffic 42-83 Idling highway traffic 42-46
		TGO Site $L_{Aeq(15\text{-}min)}$ Contribution					TGO Inaudible
15/03/18	20:53	81	63	42	40	Dir: SW 0.5 m/s Stab Class: E	Highway traffic 34-78 Rock crushing 32-40
		TGO Site $L_{Aeq(15\text{-}min)}$ Contribution					35
15/03/18	22:36	88	64	42	40	Dir: SW 0.1 m/s Stab Class: E	Highway traffic 36-81 Rock crushing 36-38
		TGO Site $L_{Aeq(15\text{-}min)}$ Contribution					37

Note 1: Meteorological data obtained from TGO's on-site weather station or by direct measurement by the operator.

4.3 Assessment Results - Location R4

The results of the attended noise measurements at location R4 for Tuesday 13 March 2018 to Thursday 15 March 2018 are summarised in **Table 4** with the relevant EPL limits, the calculated mining noise contribution and prevailing meteorological conditions at the time of each measurement.

Table 4 Operator-Attended Noise Survey Results – Location R4

Date	Time (hrs)	Descriptor (dBA re 20 µPa)			EPL Limit	Meteorology[1]	Description and SPL, dBA
		L_{Amax}	L_{Aeq}	L_{A90}			
13/03/18	20:07	42	30	22	36	Dir: NW 0.5 m/s Stab Class: D	Distant traffic 19-25 Livestock 18-24
		TGO Site $L_{Aeq(15\text{-}min)}$ Contribution					TGO Inaudible
13/03/18	23:23	61	45	38	36	Dir: N 1.5 m/s Stab Class: D	Wind in trees 42-52
		TGO Site $L_{Aeq(15\text{-}min)}$ Contribution					TGO Inaudible
14/03/18	19:51	52	31	26	36	Dir: N 0.1 m/s Stab Class: D	Distant traffic 28-33
		TGO Site $L_{Aeq(15\text{-}min)}$ Contribution					TGO Inaudible
14/03/18	23:23	51	35	29	36	Dir: N 0.1 m/s Stab Class: E	Rock crushing 31-37 Highway traffic 31-36
		TGO Site $L_{Aeq(15\text{-}min)}$ Contribution					35
15/03/18	19:58	59	29	21	36	Dir: SW 0.1 m/s Stab Class: D	Highway traffic 23-34
		TGO Site $L_{Aeq(15\text{-}min)}$ Contribution					TGO Inaudible
15/03/18	23:21	56	29	13	36	Dir: SW 0.1 m/s Stab Class: E	Insects <22 Highway traffic 22-42
		TGO Site $L_{Aeq(15\text{-}min)}$ Contribution					TGO Inaudible

Note 1: Meteorological data obtained from TGO's on-site weather station or by direct measurement by the operator.

4.4 Assessment Results - Location R5

The results of the attended noise measurements at location R5 for Tuesday 13 March 2018 to Thursday 15 March 2018 are summarised in **Table 5** with the relevant EPL limits, the calculated mining noise contribution and prevailing meteorological conditions at the time of each measurement.

Table 5 Operator-Attended Noise Survey Results – Location R5

Date	Time (hrs)	Descriptor (dBA re 20 µPa)			EPL Limit	Meteorology[1]	Description and SPL, dBA
		L_{Amax}	L_{Aeq}	L_{A90}			
13/03/18	19:43	83	64	24	37	Dir: NE 0.1 m/s Stab Class: D	Highway traffic 34-82 Birds 29-36 Dog bark 26-43
		TGO Site $L_{Aeq(15\text{-}min)}$ Contribution					TGO Inaudible
13/03/18	23:44	84	63	39	37	Dir: N 1.5 m/s Stab Class: D	Wind in trees 36-48 Highway traffic 42-82
		TGO Site $L_{Aeq(15\text{-}min)}$ Contribution					TGO Inaudible
14/03/18	19:29	84	63	24	37	Dir: N 0.1 m/s Stab Class: E	Highway traffic 30-80 Birds 32-42
		TGO Site $L_{Aeq(15\text{-}min)}$ Contribution					TGO Inaudible
14/03/18	23:42	82	61	22	37	Dir: N 0.5 m/s Stab Class: F	Highway traffic 31-78
		TGO Site $L_{Aeq(15\text{-}min)}$ Contribution					TGO Inaudible
15/03/18	19:37	85	66	27	37	Dir: SW 0.5 m/s Stab Class: D	Highway traffic 27-81 Birds 25-36 Wind in trees 25-31
		TGO Site $L_{Aeq(15\text{-}min)}$ Contribution					TGO Inaudible
15/03/18	23:41	84	63	23	37	Dir: SW 0.5 m/s Stab Class: E	Highway traffic 24-76
		TGO Site $L_{Aeq(15\text{-}min)}$ Contribution					TGO Inaudible

Note 1: Meteorological data obtained from TGO's on-site weather station or by direct measurement by the operator.

4.5 Assessment Results - Location R6

The results of the attended noise measurements at location R6 for Tuesday 13 March 2018 to Thursday 15 March 2018 are summarised in **Table 6** with the relevant EPL limits, the calculated mining noise contribution and prevailing meteorological conditions at the time of each measurement.

Table 6 Operator-Attended Noise Survey Results – Location R6

Date	Time (hrs)	Descriptor (dBA re 20 µPa)			EPL Limit	Meteorology[1]	Description and SPL, dBA
		L_{Amax}	L_{Aeq}	L_{A90}			
13/03/18	20:32	49	32	27	36	Dir: NE 0.1 m/s Stab Class: D	Insects <29 Livestock 29-35
		TGO Site $L_{Aeq(15\text{-}min)}$ Contribution					TGO Inaudible
13/03/18	23:00	57	46	40	36	Dir: N 1 m/s Stab Class: D	Wind in trees 45-52 Highway traffic 36-46
		TGO Site $L_{Aeq(15\text{-}min)}$ Contribution					TGO Inaudible
14/03/18	20:16	48	45	44	36	Dir: N 1 m/s Stab Class: D	Distant traffic 38-45 Rock crushing 34-38 Wind in trees 36-46
		TGO Site $L_{Aeq(15\text{-}min)}$ Contribution					36
14/03/18	22:59	46	40	38	36	Dir: N 1 m/s Stab Class: E	Wind in trees 34-39 General mine noise 35-37
		TGO Site $L_{Aeq(15\text{-}min)}$ Contribution					36
15/03/18	20:20	56	39	35	36	Dir: SW 0.5 m/s Stab Class: E	Distant traffic 38-43
		TGO Site $L_{Aeq(15\text{-}min)}$ Contribution					TGO Inaudible
15/03/18	22:57	60	31	21	36	Dir: SW 0.5 m/s Stab Class: D	Highway traffic 26-31
		TGO Site $L_{Aeq(15\text{-}min)}$ Contribution					TGO Inaudible

Note 1: Meteorological data obtained from TGO's on-site weather station or by direct measurement by the operator.

4.6 Assessment Results - Location R23

The results of the attended noise measurements at location R23 for Tuesday 13 March 2018 to Thursday 15 March 2018 are summarised in **Table 7** with the relevant EPL limits, the calculated mining noise contribution and prevailing meteorological conditions at the time of each measurement.

Table 7 Operator-Attended Noise Survey Results – Location R23

Date	Time (hrs)	Descriptor (dBA re 20 µPa)			EPL Limit	Meteorology[1]	Description and SPL, dBA
		L_{Amax}	L_{Aeq}	L_{A90}			
13/03/18	21:12	61	48	40	39	Dir: N 0.1 m/s Stab Class: D	Idle highway traffic 39-44 Highway traffic 42-58 Birds 43-47
		TGO Site $L_{Aeq(15\text{-}min)}$ Contribution					TGO Inaudible
13/03/18	22:20	63	50	45	39	Dir: N 1 m/s Stab Class: D	Highway traffic 42-59 Wind in trees <42
		TGO Site $L_{Aeq(15\text{-}min)}$ Contribution					TGO Inaudible
14/03/18	20:54	60	45	32	39	Dir: N 0.1 m/s Stab Class: E	Highway traffic 32-40 Idle highway traffic 29-35 Dog bark 41-52
		TGO Site $L_{Aeq(15\text{-}min)}$ Contribution					TGO Inaudible
14/03/18	22:21	68	49	40	39	Dir: N 0.1 m/s Stab Class: E	Highway traffic 42-62 Idle highway traffic 39-45 Livestock 38-42
		TGO Site $L_{Aeq(15\text{-}min)}$ Contribution					TGO Inaudible
15/03/18	21:09	72	48	38	39	Dir: SW 0.1 m/s Stab Class: E	Rock crushing <34 Highway traffic 32-51 Local traffic 41-70
		TGO Site $L_{Aeq(15\text{-}min)}$ Contribution					<34
15/03/18	22:20	60	46	39	39	Dir: SW 0.1 m/s Stab Class: E	Highway traffic 36-50 Insects <36 General mine noise 36-40
		TGO Site $L_{Aeq(15\text{-}min)}$ Contribution					38

Note 1: Meteorological data obtained from TGO's on-site weather station or by direct measurement by the operator.

5 Discussion

5.1 Discussion of Results - Location R2

Monitoring between Tuesday 13 March 2018 and Thursday 15 March 2018 identified that TGO mine noise was inaudible for all six occasions. Therefore, the relevant noise limit of 36dBA $LA_{eq(15\text{-}min)}$ was satisfied during this monitoring period. Extraneous sources such as wind in trees, local traffic and distant traffic were audible during the survey periods.

5.2 Discussion of Results - Location R3/R29

Monitoring results for R3/R29 were dominated by highway traffic that was constant for all six measurements conducted for the March 2018 survey. TGO mine noise was audible on three of six occasions. Emissions from the mine ranged between 35dBA and 37dBA, hence satisfied the noise limit of 40dBA $LA_{eq(15\text{-}min)}$. Highway traffic, wind in trees and highway trucks idling were all audible during the measurements at R3/R29.

5.3 Discussion of Results - Location R4

TGO mine noise was audible during one of six measurements conducted from 13 March 2018 to 15 March 2018 at R4. The single contribution was measured at 35dBA during the night period on 14 March 2018. Therefore, the relevant noise limit of 36dBA $LA_{eq(15\text{-}min)}$ was not exceeded during the March 2018 period and therefore satisfied relevant criteria. Distant traffic, livestock, wind in trees and insects were all audible during the measurements at R4.

5.4 Discussion of Results - Location R5

TGO mine noise was inaudible during all six attended noise measurements at R5 for the March 2018 period. The relevant noise limits of 37dBA $LA_{eq(15\text{-}min)}$ were satisfied as TGO mine noise remained inaudible. Highway traffic was the dominant source at this receiver with the other non-mining sources including birds, dog bark and wind in trees.

5.5 Discussion of Results - Location R6

TGO mine noise was audible during two of six occasions throughout the March 2018 monitoring period at R6. Mine contribution was measured at 36dBA during both measurements on 14 March 2018, therefore satisfying the relevant EPL noise limit of 36dBA $LA_{eq(15\text{-}min)}$. Non-mining sources included insects, livestock, wind in trees and highway traffic all audible sources during the attended surveys.

5.6 Discussion of Results - Location R23

TGO mine noise was audible on two of six occasions at this location. During both the evening and night period on 15 March 2018 TGO contribution was measured at <34dBA and 38dBA $LA_{eq(15\text{-}min)}$ and therefore remained in compliance with the relevant EPL criteria of 39dBA $LA_{eq(15\text{-}min)}$. Non-mining sources included idling highway traffic, highway traffic, birds, wind in trees, dog bark, insects and livestock.

6 Comparison of Attended and Unattended Monitoring Results

To address Condition 6 of Schedule 3 of the Project Approval, a program to calibrate and validate the real-time noise monitoring results with the attended monitoring results has been completed.

The validation compares monthly attended monitoring results against the closest assessed unattended monitoring location. Currently, TGO has one unattended real-time monitoring terminal installed at the Brooklands property (nearest to R23). Figure 1 identifies the location of the monitor with respect to the attended monitoring locations. It is noted that the Brooklands unattended monitor is situated 600m west of the attended noise monitoring location R23, therefore, background (LA90) noise levels are significantly lower due to offset distance to highway traffic.

A comparison of mine noise contributions between attended and unattended noise monitoring demonstrates a general consistency between attended and unattended results. It was noted that highway traffic noise influenced measured noise levels for this assessment. Furthermore, for March 2018, results remained below the relevant criteria for both attended and unattended locations.

Table 8 provides a summary comparison of results between the attended and unattended noise surveys for R23.

Table 8 Comparison of Attended and Unattended Results – R23

Assessment Type	Time (hrs)	Descriptor (dBA re 20 µPa)			Criteria	Mine Noise Contribution	Meteorology[1]	Description and SPL, dBA
		L_{Amax}	L_{Aeq}	L_{A90}				
Tuesday 13 March 2018								
Attended	21:12	61	48	40	39	TGO Inaudible	Dir: N 0.1 m/s Stab Class: D	Idle highway traffic 39-44 Highway traffic 42-58 Birds 43-47
Unattended	21:13	62	43	38	39	TGO Inaudible		Highway traffic Insects
Attended	22:20	63	50	45	39	TGO Inaudible	Dir: N 1 m/s Stab Class: D	Highway traffic 42-59 Wind in trees <42
Unattended	22:28	61	45	36	39	TGO Inaudible		Wind
Wednesday 14 March 2018								
Attended	20:54	60	45	32	39	TGO Inaudible	Dir: N 0.1 m/s Stab Class: E	Highway traffic 32-40 Idle highway traffic 29-35 Dog bark 41-52
Unattended	20:58	52	40	31	39	TGO Inaudible		Insects Highway traffic
Attended	22:21	68	49	40	39	TGO Inaudible	Dir: N 0.1 m/s Stab Class: E	Highway traffic 42-62 Idle highway traffic 39-45 Livestock 38-42
Unattended	22:28	54	41	30	39	TGO Inaudible		Insects Highway traffic
Thursday 15 March 2018								
Attended	21:09	72	48	38	39	<34	Dir: SW 0.1 m/s Stab Class: E	Rock crushing <34 Highway traffic 32-51 Local traffic 41-70
Unattended	21:13	51	40	35	39	TGO Inaudible		Insects Dog bark
Attended	22:20	60	46	39	39	TGO Inaudible	Dir: SW 0.1 m/s Stab Class: E	Highway traffic 36-50 Insects <36 General mine noise 36-40
Unattended	22:28	51	40	35	39	38		Insects Highway traffic

Note 1: Meteorological data obtained from TGO's on-site weather station or by direct measurement by the operator.

7 Conclusion

Muller Acoustic Consulting Pty Ltd (MAC) has completed a Noise Monitoring Assessment on behalf of Tomingley Gold Operations (TGO). The assessment was completed to provide monthly monitoring data so that TGO can actively quantify and manage site noise emissions.

Attended monitoring conducted from 13 March 2018 to 15 March 2018, identified that TGO mine noise was audible on several occasions although did not exceed relevant limits during the March 2018 assessment period.

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Appendix A - Glossary of Terms

Several technical terms have been used in this report and are explained in **Table A1**.

Table A1 Glossary of Terms

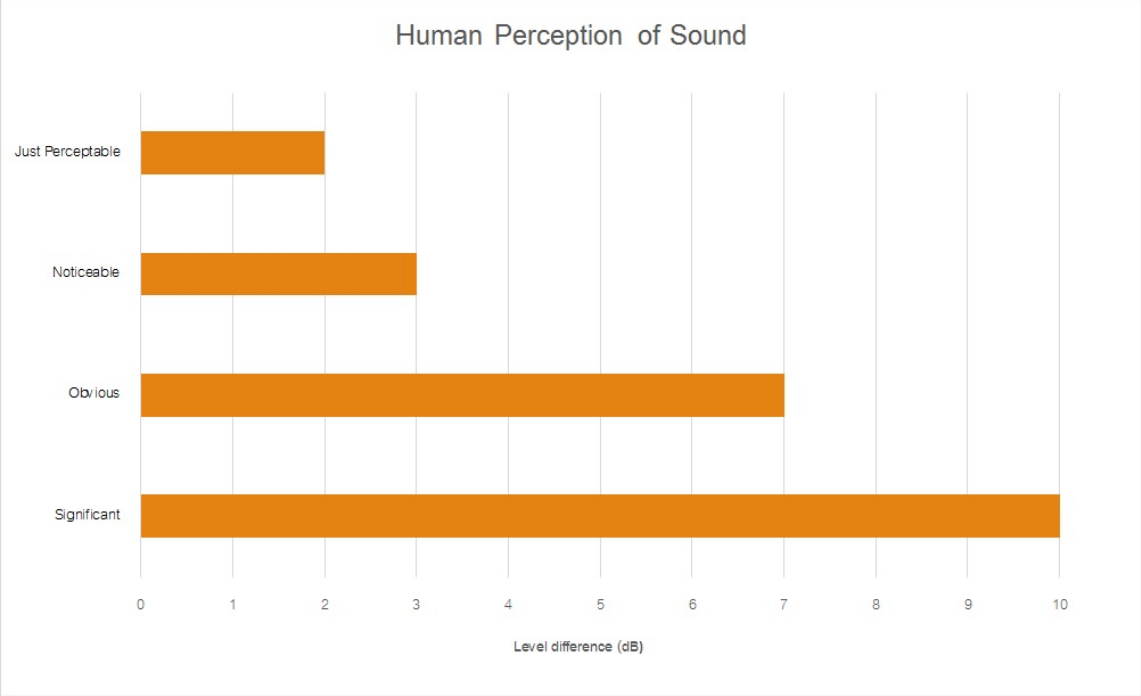
Term	Description
1/3 Octave	Single octave bands divided into three parts
Octave	A division of the frequency range into bands, the upper frequency limit of each band being twice the lower frequency limit.
ABL	Assessment Background Level (ABL) is defined in the NPI as a single figure background level for each assessment period (day, evening and night). It is the tenth percentile of the measured L90 statistical noise levels.
Ambient Noise	The noise associated with a given environment. Typically a composite of sounds from many sources located both near and far where no particular sound is dominant.
A Weighting	A standard weighting of the audible frequencies designed to reflect the response of the human ear to noise.
dBA	Noise is measured in units called decibels (dB). There are several scales for describing noise, the most common being the 'A-weighted' scale. This attempts to closely approximate the frequency response of the human ear.
dB(Z)	Decibels Linear or decibels Z-weighted.
Hertz (Hz)	The measure of frequency of sound wave oscillations per second - 1 oscillation per second equals 1 hertz.
LA10	A noise level which is exceeded 10 % of the time. It is approximately equivalent to the average of maximum noise levels.
LA90	Commonly referred to as the background noise, this is the level exceeded 90 % of the time.
LAeq	The summation of noise over a selected period of time. It is the energy average noise from a source, and is the equivalent continuous sound pressure level over a given period.
LAmax	The maximum root mean squared (rms) sound pressure level received at the microphone during a measuring interval.
RBL	The Rating Background Level (RBL) is an overall single figure background level representing each assessment period over the whole monitoring period. The RBL is used to determine the intrusiveness criteria for noise assessment purposes and is the median of the ABL's.
Sound power level (SWL)	This is a measure of the total power radiated by a source. The sound power of a source is a fundamental location of the source and is independent of the surrounding environment. Or a measure of the energy emitted from a source as sound and is given by : = 10.log10 (W/Wo) Where : W is the sound power in watts and Wo is the sound reference power at 10-12 watts.

Table A2 provides a list of common noise sources and their typical sound level.

Table A2 Common Noise Sources and Their Typical Sound Pressure Levels (SPL), dBA

Source	Typical Sound Level
Threshold of pain	140
Jet engine	130
Hydraulic hammer	120
Chainsaw	110
Industrial workshop	100
Lawn-mower (operator position)	90
Heavy traffic (footpath)	80
Elevated speech	70
Typical conversation	60
Ambient suburban environment	40
Ambient rural environment	30
Bedroom (night with windows closed)	20
Threshold of hearing	0

Figure A1 – Human Perception of Sound



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