Appendices

(Total No. of pages including blank pages = 36)

Appendix 1 Noise Bund Assessment

Appendix 2 Site Specific Procedure – Dust Control Version No. 1 January 2014

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Appendix 1

Noise Bund Assessment

prepared by

Noise and Sound Service, December 2014

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Noise and Sound Services

Noise Bund Assessment

At:-

The Caloma Open Cut Pit
Tomingley Gold Project
Tomingley, NSW 2869.

December 2014

Report No. nss22177 – Final – Rev B

Prepared on behalf of:-

Tomingley Gold Operations Pty Ltd
(A wholly owned subsidiary of Alkine Resources Ltd)
Tomingley West Road, Tomingley, NSW 2869

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C O N T E N T S

SUMMARY

An assessment of the proposed increase heights in a barrier (amenity bund) to reduce noise from the Caloma open cut Pit, Tomingley Gold Mine at Tomingley West Road, Tomingley has been carried out. This assessment addresses the predicted noise reduction provided by various height options of the barrier (noise bunds).

The noise reduction achieved will (amongst other factors) depend upon the height of the noise source (mechanical plant) when working within the pit. Therefore three scenarios have been considered. These are the mechanical plant working:-

- at, or close to, the bottom of the pit;
- at, or close to, the top of the pit; and
- at, or close to, the mid-height of the pit.

When the mechanical plant is at, or close to, the bottom of the pit the main noise reduction comes from the barrier effect of the pit itself due to its large depth. The amenity bund is situated at a relatively large distance from the noise source and the receiver; hence the path difference (which is directly related to the noise reduction) is not as great as it would be if the bund could be located closer to either the source or the receiver. Increasing the height of the bund from the existing 2.9 metres (and 2 metres wide) to 6 metres (and 24 metres wide) will provide an approximate 3 dB increase in attenuation. Increasing the height of the barrier from the existing 2.9 metres (and 2 metres wide) to 10 metres (and 24 metres wide) will also provide approximately 4 dB increase in attenuation.

When the mechanical plant is at, or close to, the top of the pit increasing the height of the bund from the existing 2.9 metres to 6 metres (and 24 metres wide) will provide 1 dB increase in attenuation. Increasing the height of the barrier from the existing 2.9 metres to 10 metres (and 24 metres wide) will provide 1 dB to 2 dB increase in attenuation.

When the mechanical plant is at, or close to, the mid-height of the pit increasing the height of the bund from the existing 2.9 metres (and 2 metres wide) to 6 metres (and 24 metres wide) will provide an approximate 2 dB increase in attenuation. Increasing the height of the barrier from the existing 2.9 metres (and 2 metres wide) to 10 metres (and 24 metres wide) will provide approximately 4 dB increase in attenuation. Even if the height of the bund was increased to 15 metres (and 24 metres wide) the attenuation increase will only increase marginally to approximately 3 dB.

Adverse wind conditions or temperature inversion refraction is likely to occur on some occasions and hence reduce the additional predicted noise attenuation further. Therefore, in this case, the resulting attenuation in all the scenarios will be negligible.

The day time construction noise level ($L_{Aeq\ ,\ 15\ minute}$) is predicted to be 11 dB higher at the nearest residence at the start of construction for approximately 2 weeks. This noise level will reduce over the construction period as the outer face of the bund is to be constructed.

1. INTRODUCTION

Noise and Sound Services was requested by RW Corkery & Co Pty Limited of 62 Hill Street, Orange NSW 2800, on behalf of Tomingley Gold Operations Pty Ltd, of Tomingley West Road, Tomingley, NSW 2869, to carry out a assessment of noise reduction predictions provided by various options of noise bunds (earth barrier) heights at the Caloma open cut Pit.

The purpose of this report is to carry out independent and accurate assessments of an increase in the heights of the existing amenity bund to produce noise bunds which will reduce mine noise levels at neighbouring residential dwellings in the most feasible and reasonable method.

2. SITE AND DEVELOPMENT DESCRIPTION

The Tomingley Gold Mine site is located in the central west slopes of NSW, immediately south of Tomingley Township, approximately 15 km north of the town of Peak Hill and approximately 53 km southwest of the town of Dubbo. There are residential dwellings in various locations around the mine site. Compliance assessments have shown that the EPA noise limit has been exceeded at one of the chosen assessments sites i.e. 40 Myall Street. At all other chosen assessments sites exceedences do not occur or only occur irregularly during refraction caused by temperature inversion or adverse wind conditions or when an unusually loud short term event occurs at the mine. Dwellings on Myall Street are heavily affected by on-road truck noise using the Newell Highway and mine noise is only audible during road traffic lulls.

There is an existing amenity bund between the mine site and Myall Street, which has a height of approximately 2.9 metres (and 2 metres wide) as shown in Figure 2 below.

3. CALCULATIONS

3.1 Basis for Calculations

The barrier attenuation has been calculated using formulae given in the International Standard ISO 9613-2 (1996(E)) '*Acoustic – Attenuation of sound during propagation outdoors Part 2 General method of calculation*'. This Standard specifies methods for the description of noise outdoors in community environments.

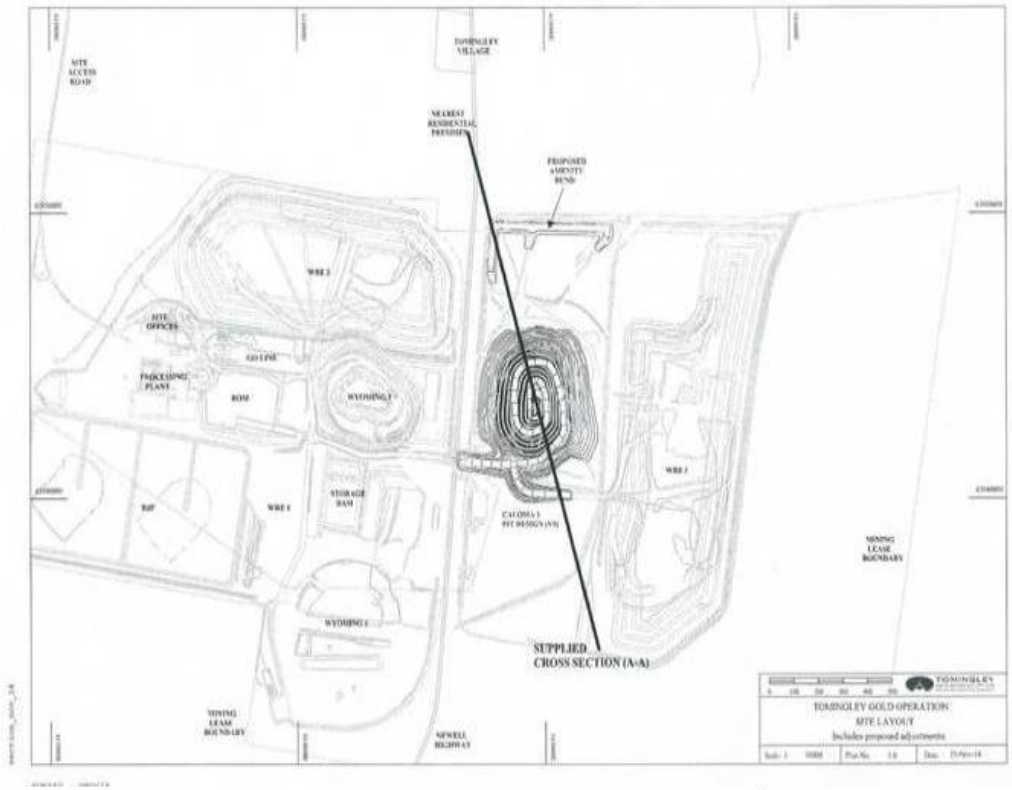

Figure 1. Site Layout. Source: Tomingley Gold Operation.

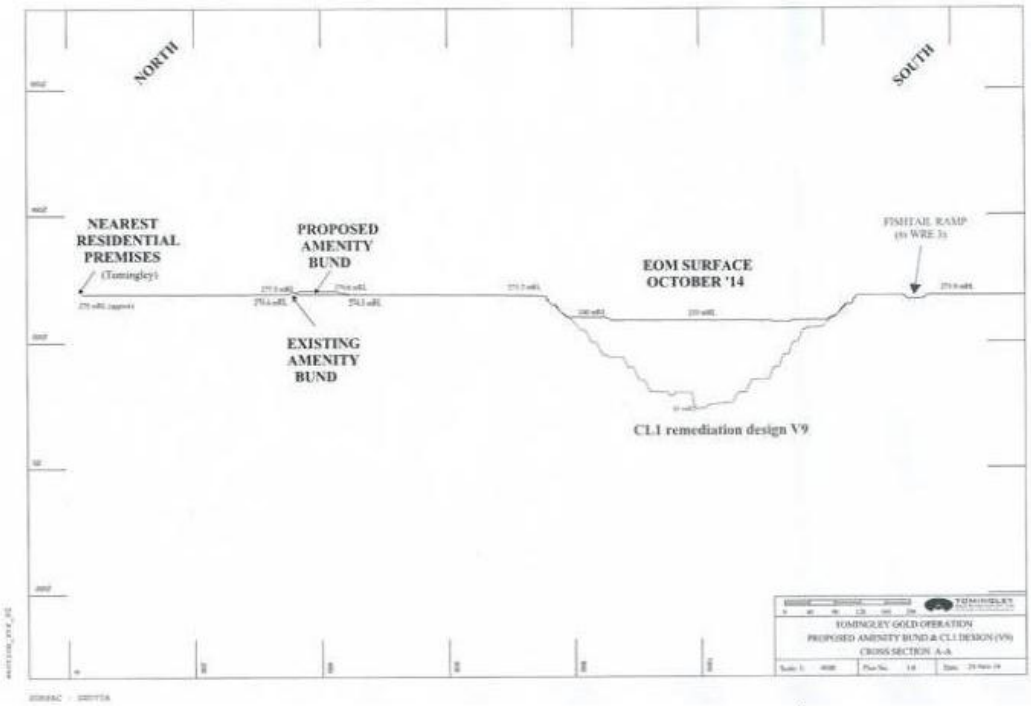

Figure 2. Cross Section A-A. Source: Tomingley Gold Operation

The barrier attenuation assessments have been calculated using site layout and cross-section plans as provided by Tomingley Gold Operation drawings dated 25-Nov-14 and shown in Figures 1 and 2 above.

3.2 Scenarios

Fixed data applies to the distance from the nearest residential property to the subject earth bund and the location of the mine. These are given in Figures 1 and 2 above. Variables are the height of the proposed noise bund, the location of plant within the mine and weather conditions (affecting sound refraction). It is assumed that any noise bund will be of significant length to render diffraction of sound at the edges negligible (see Appendix A below for a glossary of technical terms).

3.2.1 Scenario 1 - Plant Working On, or close to, the Bottom of the Pit

3.2.1.1 Barrier Height 2.9 metres

Based on the current amenity bund (2.9 metres high and 2 metres wide) and plant working on, or close to, the bottom of the pit, the following data and attenuation (Attn.) is found. Due to the low frequency nature of most plant the overall reduction in the 'A' frequency weighted level is approximately 11 dB.

Source to barrier (m)	660
Receiver to barrier (m)	330
Screen Height RL (m)	277.5
Source Height RL + 5 (m)	100
Receiver Height RL + 2 (m)	277
Barrier Width (m)	2

Freq. (Hz)	63	125	250	500	1000	2000	4000	8000
Attn. (dB)	9	11	13	16	20	25	29	32

3.2.1.2 Barrier Height 6 metres

Based on a noise bund raised to 6 metres in height and 24 metres in width and plant working on, or close to, the bottom of the pit, the following data and attenuation is found. Due to the low frequency nature of most plant the overall reduction in the 'A' frequency weighted level would be approximately 14 dB. Hence an increase in attenuation of approximately 3 dB is found from the 2.9 metre high amenity bund.

Source to barrier (m)	660
Receiver to barrier (m)	330
Screen Height RL (m)	279.6
Source Height RL + 5 (m)	100
Receiver Height RL + 2 (m)	277
Barrier Width (m)	24

Freq. (Hz)	63	125	250	500	1000	2000	4000	8000
Attn. (dB)	10	14	17	21	24	27	30	33

3.2.1.3 Barrier Height 10 metres

Based on a noise bund raised to 10 metres in height and 24 metres in width and plant working on, or close to, the bottom of the pit, the following data and attenuation is found. Due to the low frequency nature of most plant the overall reduction in the 'A' frequency weighted level would be approximately 15 dB. Hence an increase in attenuation of approximately 4 dB from the 2.9 metre high barrier is found.

Source to barrier (m)	660
Receiver to barrier (m)	330
Screen Height RL (m)	283.9
Source Height RL + 5 (m)	100
Receiver Height RL + 2 (m)	277
Barrier Width (m)	24

Freq. (Hz)	63	125	250	500	1000	2000	4000	8000
Attn. (dB)	11	15	18	22	25	28	31	34

3.2.2 Scenario 2 - Plant Working On, or close to, the Top of the Pit

3.2.2.1 Barrier Height 2.9 metres

Based on the current amenity bund (2.9 metres high and 2 metres wide), plant working on, or close to, the top of the pit (240m RL) the following data and attenuation is found. Due to the low frequency nature of most of the plant the overall reduction in the 'A' frequency weighted noise level is approximately 5 dB.

Source to barrier (m)	424
Receiver to barrier (m)	330
Screen Height RL (m)	274.6
Source Height RL (m) + 5 (m)	245
Receiver Height RL + 2 (m)	277
Barrier Width (m)	2

Freq. (Hz)	63	125	250	500	1000	2000	4000	8000
Attn. (dB)	5	5	5	5	5	5	6	6

3.2.2.2 Barrier Height 6 metres

Based on a noise bund raised to 6 metres and 24 metres in width and plant working on, or close to the top of the pit, the following data and attenuation is found. Due to the low frequency nature of most plant the overall reduction in the 'A' frequency weighted level would be approximately 6 dB, hence a difference of 1 dB from the 2.9 metre high amenity bund is found.

Source to barrier (m)	424
Receiver to barrier (m)	330
Screen Height RL (m)	279.6
Source Height RL (m) + 5 (m)	245
Receiver Height RL + 2 (m)	277
Barrier Width (m)	24

Freq. (Hz)	63	125	250	500	1000	2000	4000	8000
Attn. (dB)	5	5	6	8	10	12	15	17

3.2.2.3 Barrier Height 10 metres

Based on a noise bund raised to 10 metres and 24 metres in width and plant working on, or close to the top of the pit, the following data and attenuation is found. Due to the low frequency nature of most plant the overall reduction in the 'A' frequency weighted level would also be approximately 6 dB to 7 dB, hence only a difference of 1 dB to 2 dB from the 2.9 metre high amenity bund is found.

Source to barrier (m)	424
Receiver to barrier (m)	330
Screen Height RL (m)	283.9
Source Height RL (m) + 5 (m)	245
Receiver Height RL + 2 (m)	277
Barrier Width (m)	24

Freq. (Hz)	63	125	250	500	1000	2000	4000	8000
Attn. (dB)	5	6	8	10	12	15	18	21

3.2.3 Scenario 3 - Plant Working On, or close to, the Mid-height of the Pit

3.2.3.1 Barrier Height 2.9 metres

Based on the current amenity bund (2.9 metres high and 2 metres wide) and plant working on, or close to, the midway point (180m RL) of the pit, the following data and attenuation is found. Due to the low frequency nature of most of the plant the overall reduction in the 'A' frequency weighted level is approximately 8 dB.

Source to barrier (m)	500
Receiver to barrier (m)	330
Screen Height RL (m)	277.5
Source Height RL (m) + 5 (m)	185
Receiver Height RL + 2 (m)	277
Barrier Width (m)	2

Freq. (Hz)	63	125	250	500	1000	2000	4000	8000
Attn. (dB)	6	7	9	12	16	20	24	27

3.2.3.2 Barrier Height 6 metres

Based on a noise bund raised to 6 metres and 24 metres in width and plant working on, or close to, the mid-height of the pit, the following data and attenuation is found. Due to the low frequency nature of most plant the overall reduction in the 'A' frequency weighted level would be approximately 10 dB. Hence an increase of 2 dB in attenuation from the 2.9 metre high amenity bund is found.

Source to barrier (m)	500
Receiver to barrier (m)	330
Screen Height RL (m)	279.6
Source Height RL (m) + 5 (m)	185
Receiver Height RL + 2 (m)	277
Barrier Width (m)	24

Freq. (Hz)	63	125	250	500	1000	2000	4000	8000
Attn. (dB)	8	10	14	17	20	23	26	29

3.2.3.3 Barrier Height 10 metres

Based on a noise bund raised to 10 metres and 24 metres in width and plant working on, or close to the mid-height the pit, the following data and attenuation is found. Due to the low frequency nature of most plant the overall reduction in the 'A' frequency weighted level would be approximately 12 dB. Hence an increase in attenuation of approximately 4 dB from the 2.9 metre high amenity bund is found.

Source to barrier (m)	500
Receiver to barrier (m)	330
Screen Height RL (m)	283.9
Source Height RL (m) + 5 (m)	185
Receiver Height RL + 2 (m)	277
Barrier Width (m)	24

Freq. (Hz)	63	125	250	500	1000	2000	4000	8000
Attn. (dB)	8	12	15	18	21	24	27	30

3.3 Barrier Height of 15 metres

Based on a noise bund raised in height to 15 metres and 24 metres in width and plant working on, or close to the bottom of the pit, the following data and attenuation is found. Due to the low frequency nature of most of the plant the overall reduction in the 'A' frequency weighted level would be approximately 13 dB. Hence this scenario achieves an increase in attenuation of approximately 5 dB from the existing 2.9 metre amenity bund.

Source to barrier (m)	500
Receiver to barrier (m)	330
Screen Height RL (m)	289.6
Source Height RL (m) + 5 (m)	185
Receiver Height RL + 2 (m)	277
Barrier Width (m)	24

Freq. (Hz)	63	125	250	500	1000	2000	4000	8000
Attn. (dB)	10	13	17	20	23	26	29	32

4. CONSTRUCTION NOISE

4.1 Assumptions

Construction noise calculations are based the flowing data:-

A CAT D10 dozer and two CAT 777F trucks each with a sound power level of 118 dBA with a sound power level as shown in the table below.

Octave Band Centre Frequency (Hz)								
31	63	125	250	500	1000	2000	4000	8000
Sound Power Level (dB)								
110	114	123	118	117	111	109	98	90

- Bund construction operation: D10 and 1 truck at highest point (on 6 metre bund) – 280 metres Australian Height Datum (AHD). One truck on approach to bund – 272 metre AHD at approximately 370 metres from the nearest residence;
- WRE (Waste Rock Emplacement) 3 existing operation: D10 and 1 truck on top of first lift – 290 metres AHD. 1 truck on approach to WRE 3 – 280 metres AHD at approximately 1000 metres from the nearest residence;
- Nearest residence is at 275 metres AHD.

4.2 Noise Modelling Specifications

The source noise has been modelled using the International Standard ISO 9613-2 (1996(E)) *'Acoustic – Attenuation of sound during propagation outdoors Part 2 General method of calculation'*. This Standard specifies methods for the description of noise outdoors in community environments. The method described in the Standard is general in the sense that it may be applied to a wide variety of noise sources, and covers the major mechanism of attenuation. The method allows for downwind propagation conditions namely:-

- wind direction within an angle of ± 45° of the direction connecting the centre of the dominant sound source and the centre of the specified receiver region with the wind blowing from source to receiver, and
- wind speed between approximately 1 m/s and 5 m/s measured at a height of 3 m to 11 m above the ground.

It is noted that the occurrence of source to receiver winds as modeled are not 'prevailing' as defined by the INP and not indicative of wind conditions at this time of year (summer) when construction of the outer wall will be undertaken.

4.3 Basic Noise Modelling Equations

The equivalent continuous downwind sound pressure level (L_{Aeq}) at each receiver point has been calculated for each point source using the equation below:-

$$L_{Aeq} = L_w + D_c - A$$

Where:

L_w is the sound power level of the noise source;
D_c is directivity correction; and
A is the attenuation that occurs during the propagation from source to receiver.

The attenuation term A in the equation above is given by:-

$$A = A_{div} + A_{atm} + A_{gr} + A_{bar} + A_{misc}$$

Where:

A_{div} is the attenuation due to geometric divergence;
A_{atm} is the attenuation due to atmospheric absorption;
A_{gr} is the attenuation due to the ground effects;
A_{bar} is the attenuation due to a barrier; and
A_{misc} is the attenuation due to miscellaneous other effects.

The last term (A_{misc}) generally refers to miscellaneous propagation through foliage, industrial sites and areas of houses. The miscellaneous terms are not regarded as significantly applicable for the site in question and are not applied in this report, therefore a worst-case-scenario is assumed. Even with foliage of 30 metres in depth the extra attenuation in the octave band centred on 125 Hz will be less than 1 dB.

4.4 Construction Noise Results

For the first 2 weeks the construction noise level ($L_{Aeq\ ,\ 15\ minute}$) based on the International Standard ISO 9613-2 (1996(E) specifications is predicted to be 55 dBA at the nearest residence. This would be less with favourable wind conditions. Although this exceeds the EPA licence condition it will be day time only, will be well below the existing highway truck day time noise levels ($L_{Aeq,\ 15\ minute}$) and will be of benefit to the residences in the long term. After the first 2 weeks the construction noise levels will be lower due to the work behind the first part of the construction acting as a noise barrier. It is expected that the construction will be complete in 10 to 12 weeks.

The existing noise levels due to plant operating at the WRE 3 is predicted to be 44 dBA at the nearest residence and this is in line with on-site measurements carried out. Hence a short term increase in noise levels up to 11 dB is predicted.

5. DISCUSSION AND CONCLUSION

It can be seen from the calculations above that the main noise attenuation is achieved by the depth of the pit. The existing amenity bund is too far in distance from the source noise (when working in the pit) to be provide a considerable noise reduction. However the benefit of the noise bund will increase over time as the pit is deepened. Ideally noise bunds should be located close to the noise source (or, in theory located close to the receiver) to be highly effective. In this case positioning the noise bund in either of these locations seems to be impracticable. In addition, adverse wind conditions or temperature inversion refraction is likely to occur on some occasions and hence reduce the additional predicted noise attenuation further. Therefore, under these weather conditions, the resulting attenuation in all the scenarios above will be negligible.

The day time construction noise level ($L_{Aeq\ ,\ 15\ minute}$) is predicted to be 11 dB higher at the nearest residence at the start of construction for approximately 2 weeks. This noise level will reduce over the construction period as the outer face of the bund is too be constructed first allowing plant to operate behind this. Furthermore, over the life of the mine, there is a net acoustic benefit to nearby residence provided by the proposed noise bund.

Status	Date	Prepared by:
Draft	28th November 2014	Ken Scannell MSc MAAS MIOA.
Final	2nd December 2014	Ken Scannell MSc MAAS MIOA.
Final Rev A	3rd December 2014	Ken Scannell MSc MAAS MIOA.
Final Rev B	3rd December 2014	Ken Scannell MSc MAAS MIOA.

Important Note. *All products and materials suggested by 'Noise and Sound Services' are selected for their acoustical properties only. All other properties such as airflow, aesthetics, chemical, corrosion, combustion, construction details, decomposition, expansion, fire rating, grout or tile cracking, loading, shrinkage, ventilation, etc are outside of 'Noise and Sound Services' field of expertise and* ***must be*** *checked with the supplier or suitably qualified specialist before purchase.*

APPENDIX A – GLOSSARY OF TECHNICAL TERMS

'A' Frequency Weighting – The most widely used sound level frequency filter is the A scale, which roughly corresponds to the inverse of the 40 dB (at 1 kHz) equal-loudness curve. Using this filter, the sound level meter is less sensitive to very high and, in particular, very low frequencies. Sound pressure level measurements made with this filter are commonly expressed as **dBA.**

Ambient Sound – The all-encompassing sound associated with that environment being a composite of sounds from many sources, near and far.

Decibel (dB) – The logarithmic ratio of any two quantities and relates to the flow of energy (power). Scale used for acoustic measurement related to power, pressure and intensity. Expressed in dB, relative to standard reference levels.

Diffraction - The distortion of a wave front caused when an incident sound wave encounters an obstacle in the sound field. Depending on the size of the object and the wavelength of the sound, the sound wave bends or diffuses around the object and the diffraction or interference is significant. Similarly when sound waves pass through a gap they spread out depending on the gap size and the wavelength (inverse of frequency).

Energy Average Levels ($L_{Aeq, T}$). The L_{Aeq} level represents the average noise energy during the measurement period (T). This level is used to describe the source noise and when the source noise is not present it is used to describe the 'ambient' noise level.

'Fast' Time Weighting – The root-mean-squared energy averaging of the sound pressure with time. 'Fast' time weighting is 125 milliseconds.

Percentile Levels (L_{AF1}, L_{AF10}, L_{AF90}) - Environmental noise levels can vary considerably with time; therefore it is not adequate to use a single number to fully describe the acoustic environment. The preferred, and now generally accepted, method of recording and presenting noise measurements is based upon a statistical approach. For example, the L_{AF1} noise level is the 'A' frequency weighted and 'fast' time weighted level exceeded for 1% of the measurement time, and is approximately the maximum noise level. The L_{AF10} noise level is the 'A' frequency weighted and 'fast' time weighted level exceeded for 10% of the time, and is approximately the average maximum noise level. The L_{AF90} level is the level that is exceeded for 90% of the time, and is considered to be approximately the average of the minimum noise level recorded. This level is often referred to as the 'background' noise level.

Refraction - the bending of a sound wave from its original path, either because it is passing from one medium to another with different velocities or by changes in the physical properties of the medium, for example, a temperature or wind gradient in the air.

Sound Power - Sound power is the energy rate - the energy of sound per unit of time (J/s, Watts in SI-units) from a sound source.

Sound Power Level (L_W) – Sound power level is a logarithmic measure of the sound power in comparison to a specified reference level (10^{-12} Watts). The unit less decibel term is a measure of the sound emission of a source independent of distance. When 'A' frequency weighted the symbol becomes $\mathbf{L_{WA}}$.

Sound Pressure - Sound Pressure is the force (N) of sound on a surface area (m^2) perpendicular to the direction of the sound. The SI-units for the Sound Pressure are N/m^2 or Pa.

Sound Pressure Level (L_p) - Sound pressure level is a logarithmic measure of the square of the sound pressure in comparison to a specified reference level (20 µPa). The unit less decibel term is a measure of the sound immission of a source at a specified distance. When 'A' frequency weighted the symbol becomes $\mathbf{L_{PA}}$.

Appendix 2

Site Specific Procedure – Dust Control Version No. 1 January 2014

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TOMINGLEY GOLD OPERATIONS PTY LTD
(A wholly owned subsidiary of Alkane Resources Ltd)
ABN 53 149 040 371

Dust Management Plan

SSP - Dust Control

1. INTRODUCTION

The Site Specific Procedure – Dust Control is aimed at providing detailed operational guidance specifically related to the management of dust that may be generated during pre-stripping, mining and processing activities. The procedure has been developed to ensure compliance with all statutory approvals and the site Air Quality and Greenhouse Gas Management Plan. The Air Quality and Greenhouse Gas Management Plan forms part of the overarching Environmental Management Strategy for the site.

2. AIM

It is acknowledged that works on site will generate a certain level of dust. It is essential that the dust be managed to ensure it does not cause an environmental nuisance to surrounding properties or a safety hazard to users of the Newell Highway, or employees and contractors working on site.

To manage these issues it is necessary to implement appropriate controls that take into consideration:

- the different work areas and activities across the mine,
- the various weather conditions that can be reasonably expected,
- the proximity of the work activity to Mine Lease boundary, adjacent dwellings and the Newell Highway.

3. LEGISLATIVE REQUIREMENTS

TGP was assessed under Part 3A of the Environmental Planning and Assessment Act 1979 (EP&A Act).

Condition 17 and 18 (Figure 1) of the Project Approval issued by the Department of Planning and Infrastructure prescribes the Air Quality Criteria for the project.

Environmental Protection Licence (EPL 20169) issued by the Environment Protection Authority also prescribes operation standards and exceedances limits for dust emissions. (Figure 20

Figure 2: EPL conditions

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ABN 53 149 040 371

Dust Management Plan

SSP - Dust Control

Figure 1: Project Approval Conditions

Air Quality Criteria

17. The Proponent shall ensure that all reasonable and feasible avoidance and mitigation measures are employed so that particulate matter emissions generated by the project do not exceed the criteria listed in Tables 5, 6 or 7 at any residence on privately-owned land or on more than 25 percent of any privately-owned land.

Table 5: Long term impact assessment criteria for particulate matter

Pollutant	*Averaging Period*	*[d] Criterion*
Total suspended particulate (TSP) matter	Annual	[a] 90 µg/m^3
Particulate matter < 10 µm (PM_{10})	Annual	[a] 30 µg/m^3

Table 6: Short term impact assessment criterion for particulate matter

Pollutant	*Averaging Period*	*[d] Criterion*
Particulate matter < 10 µm (PM_{10})	24 hour	[a] 50 µg/m^3

Table 7: Long term impact assessment criteria for deposited dust

Pollutant	*Averaging Period*	*Maximum increase in deposited dust level*	*Maximum total deposited dust level*
[c] Deposited dust	Annual	[b] 2 g/m^2/month	[a, d] 4 g/m^2/month

Notes to Tables 5-7:
- *[a] Total impact (ie incremental increase in concentrations due to the project plus background concentrations due to all other sources);*
- *[b] Incremental impact (ie incremental increase in concentrations due to the project on its own);*
- *[c] Deposited dust is to be assessed as insoluble solids as defined by Standards Australia, AS/NZS 3580.10.1:2003: Methods for Sampling and Analysis of Ambient Air - Determination of Particulate Matter - Deposited Matter - Gravimetric Method; and*
- *[d] Excludes extraordinary events such as bushfires, prescribed burning, dust storms, sea fog, fire incidents or any other activity agreed by the Director-General.*

Operating Conditions

18. The Proponent shall:
(a) implement best management practice, including all reasonable and feasible measures to minimise the off-site odour, fume and dust emissions from the project;
(b) regularly assess the predictive meteorological forecasting data and real-time air quality monitoring data, and relocate, modify and/or stop operations on site to ensure compliance with the relevant conditions of this approval;
(c) minimise the air quality impacts of the project during adverse meteorological conditions and extraordinary events (see Note d to Tables 5-7);
(d) minimise any visible air pollution generated by the project; and
(e) take all practical measures to minimise dust emissions from the residue storage facility,
to the satisfaction of the Director-General.

Figure 2: EPL conditions

4 Operating Conditions

O1 Activities must be carried out in a competent manner

Environment Protection Authority - NSW Page 13 of 24
Licence version date: 4-Sep-2013

Section 55 Protection of the Environment Operations Act 1997

Environment Protection Licence

Licence - 20169

O1.1 Licensed activities must be carried out in a competent manner.
This includes:
a) the processing, handling, movement and storage of materials and substances used to carry out the activity; and
b) the treatment, storage, processing, reprocessing, transport and disposal of waste generated by the activity.

O2 Maintenance of plant and equipment

O2.1 All plant and equipment installed at the premises or used in connection with the licensed activity:
a) must be maintained in a proper and efficient condition; and
b) must be operated in a proper and efficient manner.

O3 Dust

O3.1 All operations and activities occuring at the premises must be carried out in a manner that will minimise the emission of dust from the premises.

O3.2 All dust control equipment must be operable at all times with the exception of shutdowns required for maintainance.

O3.3 Trucks entering and leaving the premises that are carrying loads must be covered at all times, except during loading and unloading.

4. TARGETS

The table below details the objectives and targets with respect to dust emissions from the site.

Table 1: Objectives and Targets

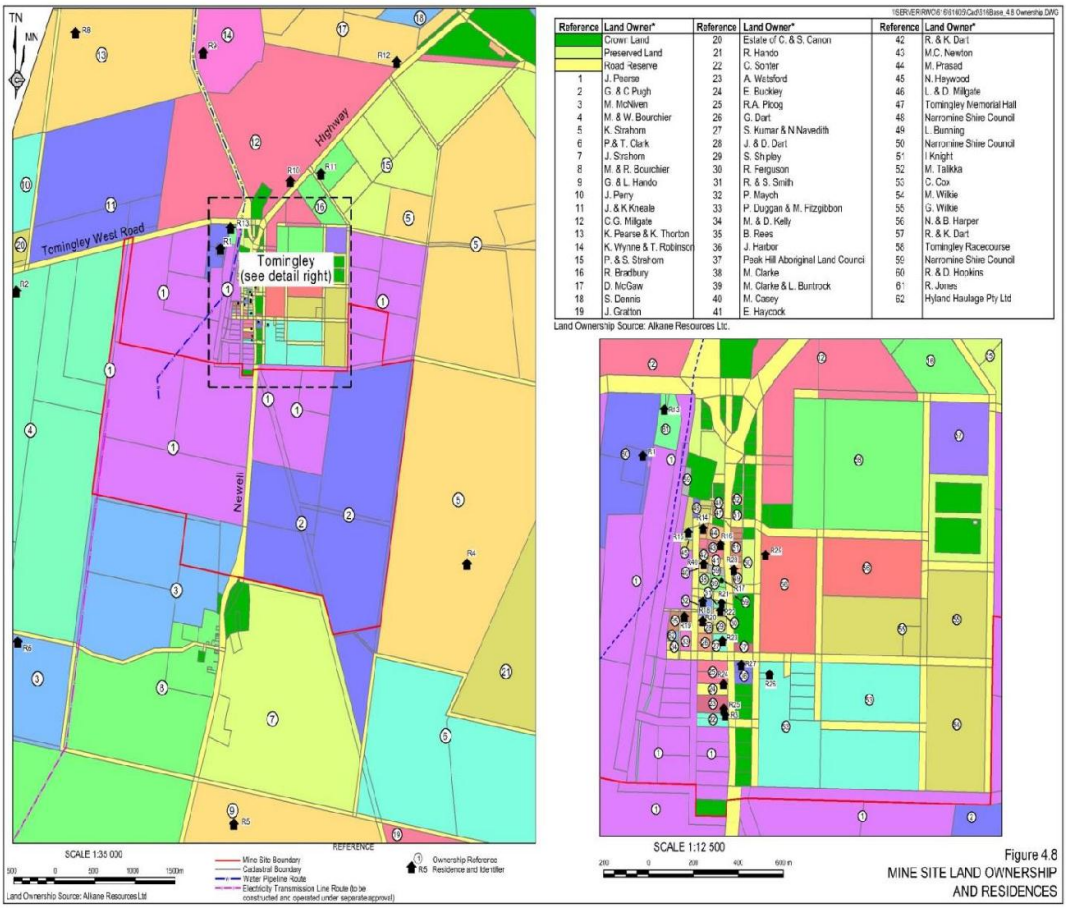
Objectives	Target
Minimise dust nuisance to surrounding residents	Maintain recorded annual average Depositional Dust levels below the nuisance level of 4g/m2/month
No adverse health impacts a result of the project	PM10 levels remain lower than the national guideline of: • 24-hour maximum of 50ug/m3, with 5 allowable exceedances per year.

5. EXISTING ENVIRONMENT

5.1 SURROUNDING RESIDENCES

The Figure 3 below shows the location of residences surrounding the TGP.

Figure 3: Proximity of adjoining dwellings



Reference	Land Owner*	Reference	Land Owner*	Reference	Land Owner*
	Crown Land	20	Estate of C. & S. Cemon	42	R. & K. Dart
	Preserved Land	21	R. Hando	43	M.C. Newton
	Road Reserve	22	C. Sonter	44	M. Prasad
1	J. Pearse	23	A. Welsford	45	N. Heywood
2	G. & C. Pugh	24	E. Buckley	46	L. & D. Millgate
3	M. McNiven	25	R.A. Pilcog	47	Tomingley Memorial Hall
4	M. & W. Bourchier	26	G. Dart	48	Narromine Shire Council
5	K. Strahorn	27	S. Kumar & N Navedith	49	L. Bunning
6	P.& T. Clark	28	J. & D. Dart	50	Narromine Shire Council
7	J. Strahorn	29	S. Shipley	51	I Knight
8	M. & R. Bourchier	30	R. Ferguson	52	M. Talikka
9	G. & L. Hando	31	R. & S. Smith	53	C. Cox
10	J. Perry	32	P. Maych	54	M. Wilkie
11	J. & K Kneale	33	P. Duggan & M. Fitzgibbon	55	G. Wilkie
12	C.G. Millgate	34	M. & D. Kelly	56	N. & B. Harper
13	K. Pearse & K. Thorton	35	B. Rees	57	R. & K. Dart
14	K. Wynne & T. Robinson	36	J. Harbor	58	Tomingley Racecourse
15	P. & S. Strahorn	37	Peak Hill Aboriginal Land Council	59	Narromine Shire Council
16	R. Bradbury	38	M. Clarke	60	R. & D. Hoskins
17	D. McGaw	39	M. Clarke & L. Buntrock	61	R. Jones
18	S. Dennis	40	M. Casey	62	Hyland Haulage Pty Ltd
19	J. Gratton	41	E. Haycock		

5.2 POTENTIAL DUST SOURCES

The following activities have been identified as potentially resulting in emissions of particulate matter during dry conditions.

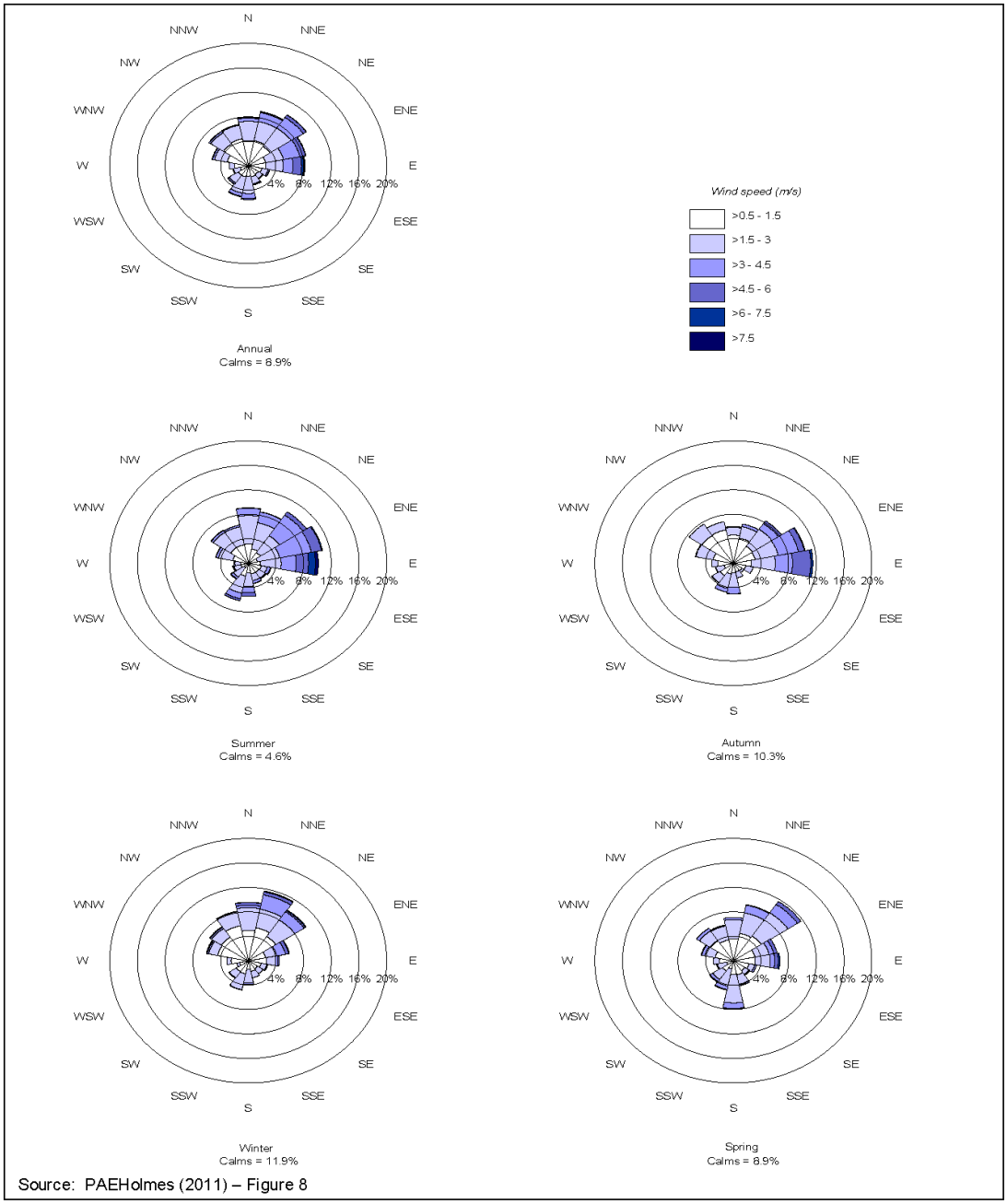
- Vegetation clearing and soil stripping.
- Blasting.
- Excavation of soil, waste rock and ore material and loading of that material into trucks.
- Unloading of material onto the ROM pad.
- Primary and secondary crushing of ore.
- Road and hardstand area construction.
- Wind erosion from disturbed areas.
- General movement of vehicles on unsealed roads within the mine site.
- Dust generated from land outside of the control of the mine.

5.3 PROJECT SITE WIND ENVIRONMENT

Figure 4 presents the annual and seasonal wind roses compiled from TAPM incorporating wind observations from the Peak Hill Gold Mine Meteorological Station for the period of 2003 (PAEHolmes 2011). This data may be summarised as follows;

- On an annual basis, the data show a high frequency of winds from the north-east, east and north-west directions. The annual mean wind speed for the Project is 1.8m/s and the percentage of calms (wind speed less than 0.5m/s) is 8.9%.
- In summer and autumn, the dominant winds are relatively strong winds from the east.
- In winter and spring, the dominant winds are relatively light winds from the north-east and north north-east.

Figure 4: Wind Roses indicating prevailing wind directions



Source: PAEHolmes (2011) – Figure 8

6. OPERATION CONTROL MEASURES

6.1 GENERAL CONTROLS

Whilst various work areas require specific controls given their location, the task being carried out and climatic conditions at the time, there are pre-emptive measures that can be implemented across the site.

Table 2 – Pre-emptive measures for dust control across site

Task/Activity	Pre-Emptive Control Measures and Actions
Induction	All TGO employees and contractors are to be informed of the need to minimise dust generation on site. All employees and contractors should be encouraged to report dust issues to their supervisor immediately so as to avoid the problem developing into a non-compliance issue.
Mine Planning	The local weather forecast is to be considered when programing all works. Alternate work areas and tasks are to be planned to provide a contingency for unfavourable weather conditions.
Weather conditions	Where it is identified that adverse weather conditions maybe experienced during the shift, the Mine Supervisor or Contractor Supervisor is to notify the crews at the Pre-shift Briefing and remind the crews to be vigilant in monitoring and reporting excessive dust. These adverse weather conditions may include: • Still conditions during the early morning and evening. These conditions may cause any dust that is generated to accumulate in the atmosphere above and around the site limiting visibility potentially causing a safety issue on site and for traffic on the Newell Highway. The accumulated dust can also cause an environmental nuisance for adjoining properties. It should be recognised that these conditions can take several hours (or longer) to rectify, hence the need to ensure still conditions are identified as early as possible. • Hot dry conditions during summer in excess of 35°C. Once temperatures reach above 35°C it is difficult to maintain adequate surface moisture to control dust generation. • Windy conditions, with wind speed above 32km/h. Strong winds not only have the potential transport vehicle generated dust off site but cause dust to blown from any disturbed areas.

Dust Management Plan

SSP - Dust Control

Visible Dust Monitoring and management	The Contractor Supervisor and Site Supervisor are to monitor dust on regular basis during dry conditions. Depending on the work area and prevailing wind conditions, visual monitoring is to include the Newell Highway and dwellings on the southern perimeter of Tomingley. Where the supervisor considers dust is leaving the site at an unacceptable level, the task causing the dust generation is to be suspended immediately and the Mine Superintendent (or delegate) is to be notified.
Water Cart Availability	In the circumstance where no water cart is available due to unplanned maintenance, water supply issues or the like, all activities that may generate dust are to be suspended immediately. The Contractor Supervisor or Mine Supervisor (depending on responsibility for activity) is to notify the Mine Superintendent immediately. In accordance with the EPL, works cannot re-commence until dust control measures are reinstated.
Water Application	Water application to is to be carried out in so as not to cause unsafe slippery conditions. Water is a finite resource on site and water wastage is to be avoided. Report any leaks to the Contractor Supervisor or Mine Supervisor. Arrangements for repairs are to be made as quickly as possible.
Pre-watering prior to works commencing during dry conditions.	When it is evident that the road surface or work area may generate dust, the area that is to be utilised during the shift is to be watered prior to works commencing. This includes access roads, haul roads, go-line and work areas.
Watering during operations	The Contractor Supervisor and the Mine Supervisor are to ensure that adequate water cart capacity is maintained onsite at all times so as to ensure all operations and activities occurring at the premises are carried out in a manner that will minimise dust from the premises. When assessing what capacity is adequate, consideration must be given to the following: • Are works being carried out simultaneously on the eastern and western side of the Newell Highway? • Site water balance. • The task to be carried out (e.g. topsoil/subsoil stripping) • Location of the works • Weather and ground conditions. • The need to minimise dust in the processing, admin and site access areas.
End of Shift watering during dry conditions	So as to ensure adequate moisture is retained in the trafficable surface; access roads, haul roads and work areas that are to be utilised by the oncoming shift should be watered at the end of the outgoing shift. This is particularly important for the night shift.

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Scraper Operations	• The Contractor Supervisor must ensure that machines are of a size approved by TGO for use on site to maximise soil movements whilst minimise vehicle movements. • Whilst stripping topsoil and subsoil the Contractor Supervisor must ensure that the scraper bowl is not filled to a point where spillage causes dust generation. • The Contractor Supervisor is to ensure that the closure mechanism on the scraper bowl is maintained to within OEM standards so as to minimise soil leakage that may create dust during tramming. • During scraper operations in dry conditions, water carts are to be run at a ratio of one pass on the stockpile or access road per 2 scraper movements (unless conditions become slippery and unsafe)
Blasting	Appropriate controls will be included in the Blast Management Plan to minimise dust emissions from blasting, this may include pre-treatment of the blast area with dust suppression and the monitoring of wind direction prior to the blast being carried out to ensure the blast is carried when wind speed and direction is favourable.
ROM Pad Management	Due to its elevation, operations on the ROM pad have the potential to spread dust across the site. This elevation also makes the ROM pad visible from outside the site. During the unloading of ore onto the ROM pad, pushing up of stockpiles and loading of ore into the crusher, suitable arrangements are to made to minimise dust generation. This may include the use of water cart, dust suppression additives and/or fixed water spray systems.

Dust Management Plan

SSP - Dust Control

Personnel Health Management	Risk management principles are used by TGO to manage occupational health, with the aim of ensuring workers are not exposed to health hazards at levels likely to result in adverse health effects. This involves recognition, assessment and control of all potentially hazardous agents and factors that workers at TGO may be exposed to at work (e.g. chemicals, solvents, gases, airborne particulates, fibres, manual tasks, radiation, noise, vibration or extremes of temperature). Exposure monitoring will be conducted at TGO, dusts such as silica and other airborne dusts will be monitored using: • AS2895-2004 Workplace Atmospheres – Method for Sampling and Gravimetric Determination of Respirable Dust • AS3640 – 1989 Workplace Atmospheres – Method for Sampling TGO will implement the following to control generation of and limit worker exposure to dust: • watering of roads • proper ventilation of working places • wetting stockpiles when moving broken rock, loading trucks or dumping into bins or stockpiles; • use of clear water for sprays and mists; and • use of water sprays in crushing and screening plants • use of dust extraction and water injection on drill rigs • use of appropriate Personal Protective Equipment in conjunction with the above where required. • and Gravimetric Determination of Inspirable Dust.

6.2 AREA SPECIFIC CONTROLS

As the site is divided by the Newell Highway which creates two separate work areas, it is necessary to put in place location specific control measures and actions based on wind direction, weather conditions and the particular task being carried.

Caloma	When the weather forecast indicates that: • the wind direction maybe from the South, South/East or East. • the temperature is to exceed 35°C • wind direction is to exceed 32km/h or the wind speed falls below 5km/h • conditions are dry Any planned works to occur on the Caloma Topsoil dumps should be rescheduled so as to avoid any concerns with dust impacting on the dwelling to the North of the site, Tomingley Village and the Newell Highway. Should weather conditions change un-expectantly during the day or night to the conditions listed above, Contractor Supervisor or Mine Supervisor is to review operations and contact the Mine Superintendent (or delegate) to notify of the change in weather conditions. Consideration should be given to relocating works to a location that will minimise the risk of unacceptable levels of dust leaving the site given the prevailing conditions.
Wyoming	When the weather forecast indicates that: • the wind direction maybe from the South, South/West or West. • the temperature is to exceed 35°C • wind direction is to exceed 32 km/h or the wind speed falls below 5km/h • conditions are dry Any planned works to occur on the Wyoming Waste Rock Emplacement 2 or Wyoming Topsoil dumps should be rescheduled so as to avoid any concerns with dust impacting on the Tomingley Village and the Newell Highway. Should weather conditions change un-expectantly during the day or night to the conditions listed above, the Contractor Supervisor or Mine Supervisor is to review operations and contact the Mine Superintendent (or delegate) to notify of the change in weather conditions. Consideration should be given to relocating works to a location that will minimise the risk of unacceptable levels of dust leaving the site given the prevailing conditions

6.3 REACTIVE TRIGGERS

Where the routine visual inspections indicate unacceptable levels of dust are present and a possible non-compliance with the Project Approval or Environment Protection Licence conditions may occur, the following actions will be undertaken:

Visual Indicator System has been developed to assist in Managing the Trigger Action Response:

	Normal activities to proceed subject to pre-emptive measures being carried out.
	Hourly condition monitoring and operational review to be carried out.
	• Suspend operations causing dust generation. • Determine the activities that are most likely contributing to the non-compliance; • Review the process and current controls in place for these activities; and • Implement actions outlined in the pre-emptive Measures Table

Dust Management Plan

SSP - Dust Control

Trigger		Responsibility
Climate – • Temperature above 12°C and below 35°C • Wind speed above 5km/h and below 32km/h • Ground conditions are moist following rain		Mine Manager
Climate - • the temperature is to exceed 35°C • Night/morning temperature below 12 degrees • wind speed is to exceed 32km/h • or the wind speed falls below 5km/h • ground conditions are dry Wyoming – • The wind direction maybe from the South, South/West or West. Caloma – • The wind direction is blowing from the South, South/East or East.		Mine Manager
Water Cart not available (with the exception of shutdowns for routine maintenance)		Mine Manager
Contractor Supervisor or Mine Manager (or delegate) considers dust levels leaving the mine lease boundary are unacceptable.		Mine Manager
Contractor Supervisor or Mine Manager (or delegate) considers dust impacting upon the highway within the mine lease boundary may pose a safety hazard to motorists.		Mine Manager
Contractor Supervisor or Mine Manager (or delegate) considers dust accumulating in atmosphere on the mine site is causing unsafe conditions. E.g. poor visibility.		Mine Manager
Contractor Supervisor or Mine Manager (or delegate) identifies excessive dust generation from exposed material emplacement areas or other exposed areas.		Mine Manager

Dust Management Plan

SSP - Dust Control

7. COMPETENCE TRAINING AND AWARENESS

All personnel working on TGP will undergo a project induction. This induction includes information on the management of dust and air quality while working on site.

After completing the induction workers will sign a statement of attendance and records of this will be kept in the site office.

8. REVIEW

This procedure will be reviewed annually from the commencement of pre-stripping and mining activities or sooner should any deficiencies be identified. This will ensure the adequacy of the procedure and allow for opportunities for improvement.