AUSTAR COAL MINE

VIBRATION MONITORING PLAN

Longwall Panels A3, A4 & A5

July 2009

DOCUMENT CONTROL

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CIRCULATION	**Organisation**	**Representative**	**Hard copy**	**Email**
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1 INTRODUCTION

Austar Coal Mine Pty Ltd (Austar) operates Austar Coal Mine, an underground coal mine located approximately 10 kilometres south of Cessnock in the lower Hunter Valley of NSW. The mine is an aggregate of the former Ellalong, Pelton, Cessnock No. 1 and Bellbird South Collieries. These operations, including coal extraction, processing and transport collectively form the Austar Mine Complex.

The underground mining component of the Austar Mine Complex is currently being undertaken within Consolidated Mining Lease 2 (CML2) under development consent DA29/95. The Minister for Urban Affairs and Planning granted development approval to the project in 1996 subject to certain conditions. DA29/95 permits mining in CML2 with a production rate of up to three million tonnes of run of mine (ROM) coal per annum by conventional retreat longwall mining of the Greta seam. The approved extraction height ranges from 3.5 to 4.5 metres. The consent also allows for the processing and transport of coal to the Port of Newcastle. Figure 1 shows the locality of the mine and boundaries of the mining leases.

To allow for the introduction of Longwall Top Coal Caving Technology (LTCC) to panels A1 and A2, a modification under section 96(2) of the Environmental Planning and Assessment Act was sought in 2006. LTCC is an enhanced form of conventional retreat longwall extraction that enables an increase in the height of coal extraction to in excess of 7 metres (rather than 4.5 metres as approved in 1996). The Minister for Planning approved the modification to allow the extraction of up to 6.5 metres of coal in panels LWA1 and LWA2 subject to a number of conditions.

A second modification of DA29/95 was approved by the Minister for Planning on 5 June 2008 to allow the use of LTCC technology in the Stage 2 area. Stage 2 comprises longwalls LWA3 to LWA5.

A major project application was submitted to the Department of Planning in October 2008 seeking a new project approval for longwall mining using LTCC technology in the Stage 3 area. Stage 3 comprises longwalls LWA6 to LWA17.

This vibration monitoring plan has been prepared in accordance with the requirements of DA29/95 as modified under section 96(2) of the EP&A Act. The plan addresses Schedule 3 Condition 16 of the Notice of Modification dated 5 June 2008.

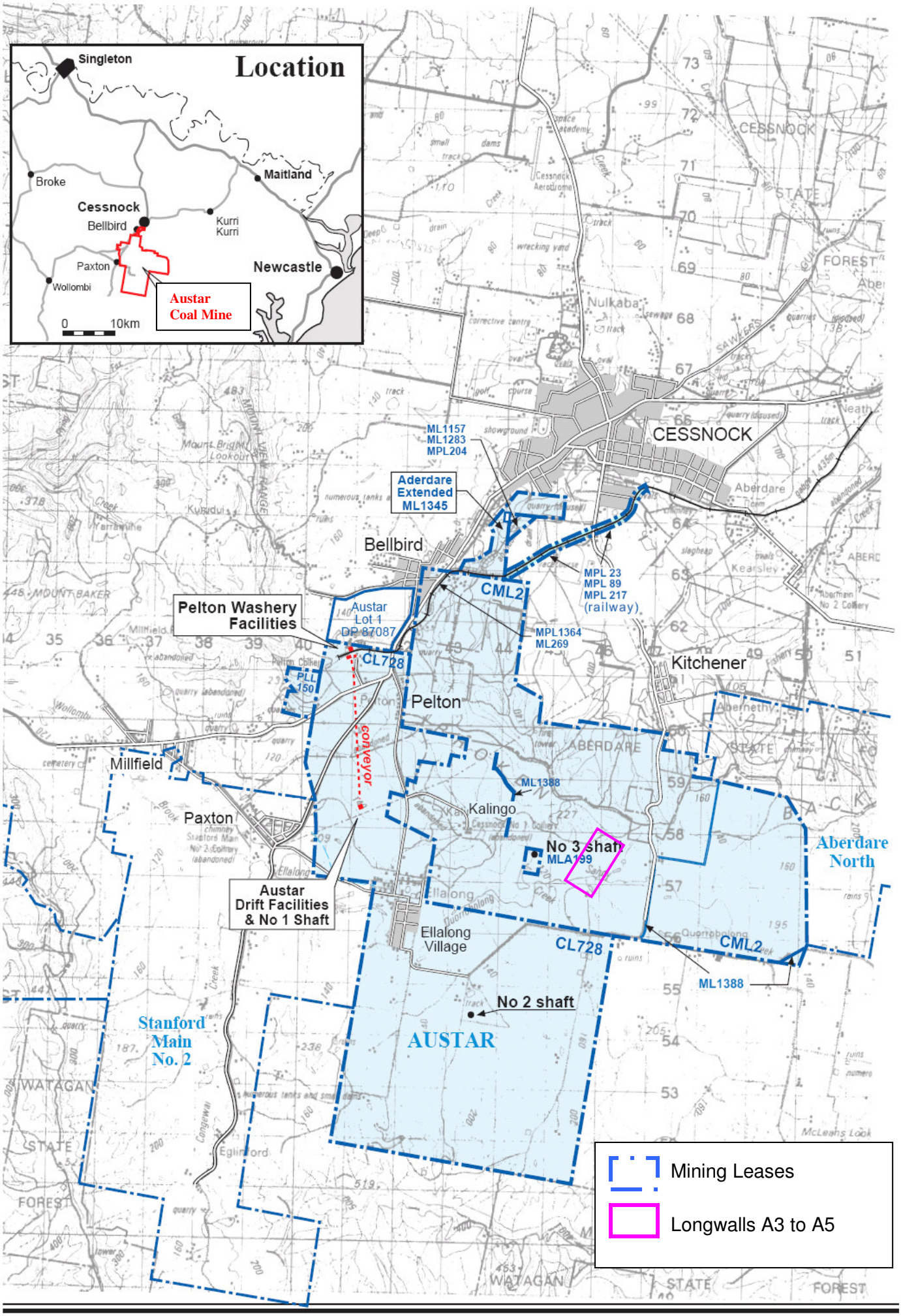

FIGURE 1
Locality Plan

2 RELATIONSHIP WITH OTHER PLANS

The VMP supports the objectives outlined in the Environmental Management Strategy (EMS) for the site and also forms part of the Environmental Monitoring Plan (EMP).

3 DEVELOPMENT CONSENT CONDITIONS

This VMP has been prepared in accordance with the requirements of the Notice of Modification issued 5 June 2008. Condition 16 of Schedule 3 of development consent (DA No. 25/95) for Austar Coal Mine states:

> *The Applicant shall implement the approved Vibration Monitoring Program for the development to the satisfaction of the Director-General. This program must be capable of recording ground vibrations on the surface emanating from underground mining activities.*

4 VIBRATION CRITERIA

There are no vibration criteria provided in development consent conditions DA25/95, therefore vibration monitoring results will be compared against published data on human response and structural damage.

Human Response

The NSW Department of Environment and Climate Change (DECC) document *Assessing Vibration: a technical guideline* (February 2006) provides preferred and maximum vibration values for different receiver types such as residences, offices, workshops, and critical work areas (hospital operating theatres, precision laboratories). Vibration criteria are presented in terms of acceleration, vibration dose value, and peak particle velocity. The guideline indicates that the criteria are non-mandatory: they are goals that should be sought to be achieved through the application of all feasible and reasonable mitigation measures. The guideline then states that where all feasible and reasonable measures have been applied and vibration values still beyond the maximum value, the operator would need to negotiate directly with the negotiated community.

Table 1 provides vibration criteria as extracted from Appendix C of the DECC technical guideline.

Table 1 Criteria for exposure to continuous and impulsive vibration

Place	Time	Assessment criteria: [1]rms acceleration (m/s^2) (& vib. accel. value) (dB re 10^{-6} m/s^2) Preferred	Maximum	[2]rms velocity (mm/s) (& vib. velocity value) (dB re 10^{-9} mm/s) Preferred	Maximum	[2]Peak velocity (mm/s) Preferred	Maximum
Continuous vibration							
Critical working areas (e.g. hospital operating theatres, precision laboratories)	Day- or night-time	0.0050 (74 dB)	0.010 (80 dB)	0.10 (100 dB)	0.20 (106 dB)	0.14	0.28
Residences	Daytime[3]	0.010 (80 dB)	0.020 (86 dB)	0.20 (106 dB)	0.40 (112 dB)	0.28	0.56
	Night-time	0.0070 (77 dB)	0.014 (83 dB)	0.14 (103 dB)	0.28 (109 dB)	0.20	0.40
Offices	Day- or night-time	0.020 (86 dB)	0.040 (92 dB)	0.40 (112 dB)	0.80 (118 dB)	0.56	1.1
Workshops	Day- or night-time	0.040 (92 dB)	0.080 (98 dB)	0.80 (118 dB)	1.6 (124 dB)	1.1	2.2
Impulsive vibration							
Critical working areas (e.g. hospital operating theatres, precision laboratories)	Day- or night-time	0.0050 (74 dB)	0.010 (80 dB)	0.10 (100 dB)	0.20 (106 dB)	0.14	0.28
Residences	Daytime[3]	0.30 (110 dB)	0.60 (113 dB)	6.0 (136 dB)	12.0 (142 dB)	8.6	17.0
	Night-time	0.10 (100 dB)	0.20 (106 dB)	2.0 (126 dB)	4.0 (132 dB)	2.8	5.6
Offices	Day- or night-time	0.64 (116 dB)	1.28 (122 dB)	13.0 (142 dB)	26.0 (148 dB)	18.0	36.0
Workshops	Day- or night-time	0.64 (116 dB)	1.28 (122 dB)	13.0 (142 dB)	26.0 (148 dB)	18.0	36.0

1 Values derived from z-axis critical frequency range 4–8 Hz. Where required, a more detailed analysis can be conducted as per BS 6472–1992.
2 Values given for the most critical frequency range >8 Hz assuming sinusoidal motion. Where required, a more detailed analysis can be conducted as per AS 2670.2–1990. Sufficient justification should accompany the use of a peak velocity approach if used in an assessment.
3 Specific values depend on social and cultural factors, psychological attitudes and expected degree of intrusion.

The nature of vibration generated from underground mining is considered to be event based in nature, where strata failures from material overlying the mining area subside, possibly generating seismic activity at the surface. As such it is proposed to use the impulsive criteria for comparison of monitoring data.

Residences will be the most sensitive receptor type in the LWA3 to LWA5 mining areas. As such, the preferred and maximum criteria for impulsive vibration at residences will be used for comparison with monitoring data.

Sructural Damage

For building damage, Australian Standard AS 2187: Part 2-2006 “Explosives - Storage and Use - Part 2: Use of Explosives” recommends the frequency dependant guideline values and assessment methods given in BS 7385 Part 2-1993 “Evaluation and Measurement for Vibration in Buildings Part” as they are “applicable to Australian conditions”.

The British Standard sets guideline values for building vibration based on the lowest vibration levels above which damage has been credibly demonstrated. These levels are judged to give a minimum risk of vibration-induced damage, where minimal risk for a named effect is usually taken as a 95% probability of no effect.

The recommended limits (guide values) for transient vibration to ensure minimal risk of cosmetic damage to residential and industrial buildings are presented in Table 2.

Table 2 Transient Vibration Guide Values - Minimal Risk of Cosmetic Damage

Type of Building	**Peak Component Particle Velocity in Frequency Range of Predominant Pulse**	
	4 Hz to 15 Hz	**15 Hz and Above**
Reinforced or framed structures Industrial and heavy commercial buildings	50 mm/s at 4 Hz and above	-
Unreinforced or light framed structures Residential or light commercial type buildings	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz	20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above

The Standard states that the guide values in Table 2 relate predominantly to transient vibration which does not give rise to resonant responses in structures and low-rise buildings. Any measurable vibration generated as the longwalls are mined and the strata subsides is considered to be transient in nature, so the values of Table 2 will be used for comparison as structural damage criteria.

5 VIBRATION MONITORS

Instantel Minimate Plus vibration monitors with external triaxial geophones shall be used. The external transducers are directly attached to concrete pads buried in the ground.

The external transducers have a 2 to 300Hz frequency response and measure transverse, vertical and longitudinal ground vibrations. Both units shall be set to monitor vibrations, continuously storing the relevant peaks for each one minute interval. The monitor is able to generate and store a vibration waveform if vibration levels exceed a trigger level. The trigger level to record a waveform of both monitors is set at 1 mm/s.

Plate 1 Instantel Minimate Plus and geophone (typical arrangement within a secure shed)

6 MONITORING PROGRAM

Two vibration monitors will be installed in Austar owned property along Nash Lane, Quorrobolong, NSW. The initial monitor locations have been selected to monitor vibration during the mining of LWA3 and LWA4. The two initial monitoring locations (V4 and V5) are shown in Figure 2. An additional location for LWA6 has also been chosen, with the intention being to move monitoring location V4 to location V6 during the mining period of LWA4.

The data shall be downloaded on a monthly basis and regular checks made to ensure the monitors are functioning correctly. The monitors also perform a self check on a daily basis to ensure that it is operating correctly.

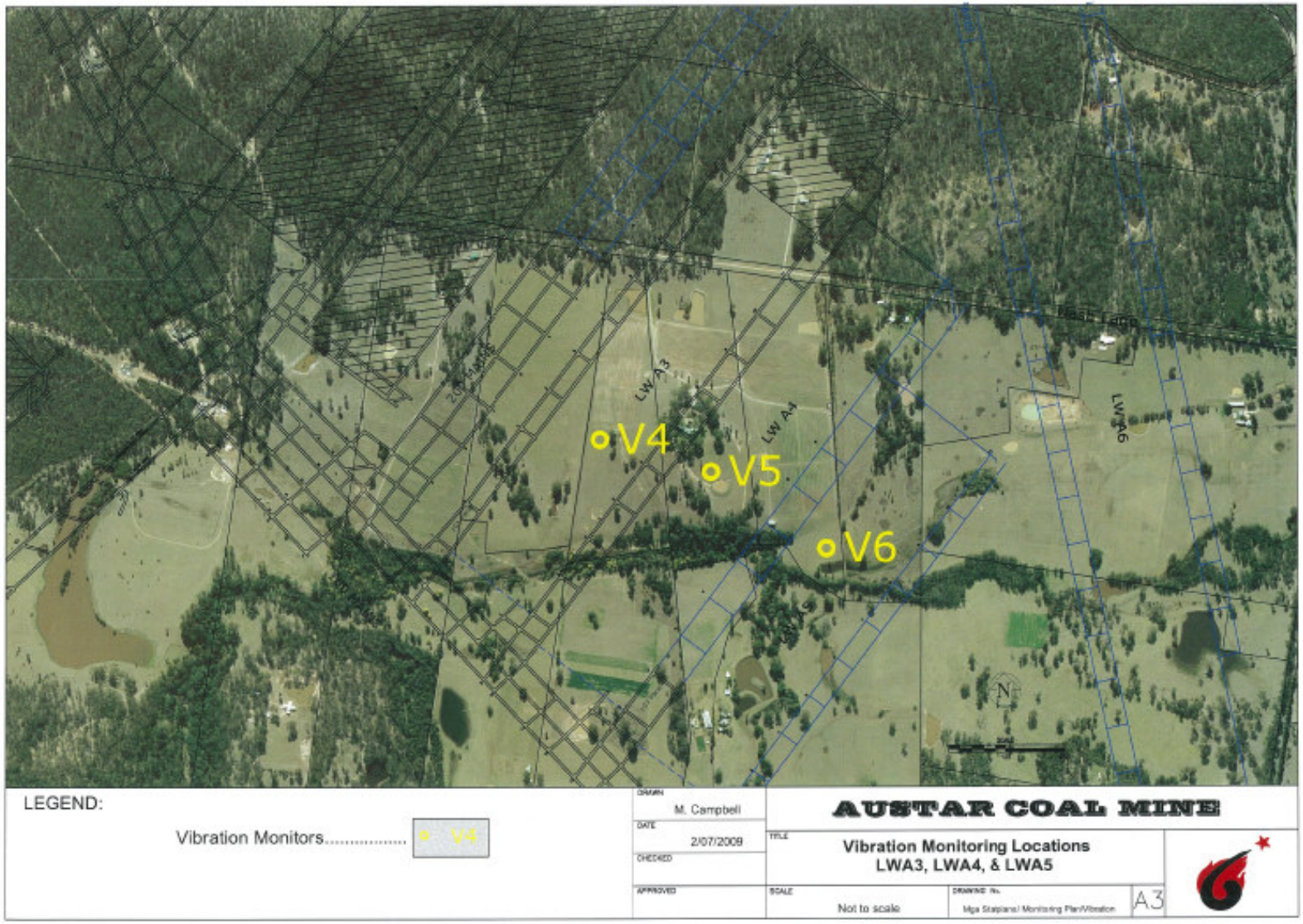

FIGURE 2 VIBRATION MONITORING LOCATIONS

7 REPORTING AND REVIEW

Data from mining in LWA3, LWA4, and LWA5 will be reviewed on a monthly basis. A summary of the results will be included in a report prepared at the completion of each longwall panel.

Vibration monitoring results from previous longwall panels LWA1 and LWA2 have shown vibration measurements at less than 2mm/s. Vibrations of this magnitude, whilst at levels known to be noticeable for humans, are less than the DECC vibration criteria, and are also significantly less than any potential building damage criteria.

It is proposed that should vibration measurements during monitoring of LWA3 provide a similar result, that the need for further monitoring in accordance with this vibration monitoring program shall be reviewed in consultation with the Director-General.