Environmental Noise Level Study for Proposed Rail Link (Missing Link) from North Goonyella Colliery to Newlands Colliery, Queensland

conducted for

GHD Pty Ltd

Report No: R05156/D1402/Rev.0/18.09.05

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Our reference:	R05156/D1402/Rev.0/18.09.05

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INTRODUCTION

It is proposed to establish a rail link (missing link) between the North Goonyella Colliery and Newlands Colliery, Queensland, linking two existing railway lines. This proposed rail link is approximately 72 kilometres in length and passes within close proximity to two residences – the residences associated with the properties known as Denham Park and Wollamai.

To assess the current ambient noise levels adjacent to these two residences noise loggers were set up on Saturday 3 September 2005, for a one-week period. Both noise loggers were located within approximately 15 metres of the residences and the measured noise levels would be representative of the ambient noise levels at these residences.

Rail noise level measurements were attempted on the railway line north of the Newlands Colliery, for a 4-hour period on Friday 9 September 2005, with the noise measurement equipment located at 25 metres, 50 metres, 100 metres and 150 metres from the railway line, with clear line of sight from the measurement equipment to the railway line. During this 4-hour period no trains passed the monitoring locations.

On Saturday 10 September 2005 further rail noise level measurements were attempted, but this time adjacent the electrified section of railway approximately 5 kilometres east of Duaringa, where the highway is set back from the railway approximately 4 or 5 kilometres but there is an unsealed road along the railway. The noise measurement equipment was set up at the following distances from the railway line, which was elevated approximately 2 metres above natural ground level:

- 50 metres;
- 100 metres;
- 200 metres; and
- 300 metres.

A different set of equipment was used at each of these locations and set to sample at 10 second intervals. The purpose of these noise level measurements was to assess passing train noise levels as well as distance noise reduction from the railway line. Between the railway line and the monitoring locations was bare earth, compacted for the first 50 metres then ploughed for the remaining distance out to 300 metres and beyond – a cultivated field being prepared for planting a crop. The landowner's permission was gained for access to this property.

This report details the results of the ambient noise level study, noise limits, source noise levels, noise level impact at the closest residences to the proposed rail link and state of compliance with the noise limits.

CRITERIA

Noise Level Measurements

All noise level measurements were conducted in accordance with the following:

- general requirements of the Queensland environmental protection legislation;
- Environmental Protection (Noise) Policy 1997;
- *Noise Measurement Manual*, Queensland Government – Environmental Protection Agency, 3rd Edition, March 2000;
- Australian Standard AS 1055.1-1997, *Acoustics – Description and Measurement of Environmental Noise,* Part 1, *General Procedures.*

Noise Limits

In accordance with the Environmental Protection (Noise) Policy 1997, rail noise limits are as follows:

> *"… Schedule 1*
> *Planning Levels*
>
> *… Railways*
>
> 3. *The planning levels for a railway are the following noise levels, assessed 1 m in front of the most exposed part of an affected noise sensitive place –*
>
> a) *65 dB(A), assessed as the 24-hour average equivalent continuous A-weighted sound pressure level;*
>
> b) *87 dB(A), assessed as a single event maximum sound pressure level. …"*

The noise limits for Queensland Rail are the same as the above.

AMBIENT NOISE LEVELS

Table 1 details the results of the ambient noise level measurements, whilst Figure 1 is a graphical presentation of the key parameters, for Denham Park. Refer Appendix A for details of measurement equipment, equipment settings, calibration, monitoring location and atmospheric conditions.

Table 1
Results of Ambient Noise Level Measurements, Monitoring Location A (Denham Park)
Saturday 3 to Friday 9 September 2005

Day	Date	Time Period	Ambient Noise Level, dB(A)					
			L_{Aeq}		L_{A10}		L_{A90}	
			Range	Average	Range	Average	Range	Average
Saturday	3.09.05	daytime	30.3-45.0	37.8	32.2-46.5	39.0	27.7-33.4	30.4
Saturday	3.09.05	evening	29.9-38.6	36.5	21.7-50.5	39.5	18.7-27.9	24.1
Saturday/ Sunday	3/4.09.05	night-time	32.4-52.9	43.7	32.1-52.4	44.8	23.3-37.8	31.3
Sunday	4.09.05	daytime	31.1-42.8	38.1	31.8-46.7	40.9	24.7-35.8	32.0
Sunday	4.09.05	evening	40.2-48.2	43.8	42.1-50.9	46.8	34.9-40.6	38.1
Sunday/ Monday	4/5.09.05	night-time	32.8-61.2	50.4	36.3-58.5	51.3	25.0-48.7	41.1
Monday	5.09.05	daytime	33.0-44.3	39.6	34.0-48.1	41.1	24.9-36.5	32.7
Monday	5.09.05	evening	36.0-50.9	43.2	36.4-51.6	44.9	33.7-41.0	37.2
Monday/ Tuesday	5/6.09.05	night-time	31.7-50.0	43.5	32.4-53.4	45.3	24.2-40.4	31.7
Tuesday	6.09.05	daytime	35.5-45.5	41.0	36.8-48.9	42.5	28.7-39.9	36.6
Tuesday	6.09.05	evening	21.9-49.1	40.7	21.0-53.3	41.3	18.2-34.9	29.2
Tuesday/ Wednesday	6/7.09.05	night-time	36.0-58.4	47.1	37.7-61.5	50.4	24.7-36.7	30.8
Wednesday	7.09.05	daytime	36.3-49.2	42.8	37.1-52.5	45.0	34.1-40.6	38.3
Wednesday	7.09.05	evening	27.6-45.7	37.3	28.6-50.1	40.3	23.3-36.1	28.1

Table 1
Results of Ambient Noise Level Measurements, Monitoring Location A (Denham Park)
Saturday 3 to Friday 9 September 2005

Day	Date	Time Period	Ambient Noise Level, dB(A)					
			L_{Aeq}		L_{A10}		L_{A90}	
			Range	Average	Range	Average	Range	Average
Wednesday/ Thursday	7/8.09.05	night-time	36.2-54.1	45.0	37.3-57.9	47.2	26.1-44.0	36.4
Thursday	8.09.05	daytime	36.6-50.9	44.7	36.9-53.6	47.1	34.2-45.5	40.3
Thursday	8.09.05	evening	27.9-53.6	41.6	27.4-52.1	41.8	22.7-36.8	30.4
Thursday/ Friday	8/9.09.05	night-time	36.7-49.3	45.0	39.9-51.4	47.4	26.2-38.9	33.6
Friday	9.09.05	daytime	30.3-45.0	37.8	32.2-46.5	39.0	27.7-33.4	30.4

From Table 1, the following average ambient noise levels should be noted:

- average L_{Aeq}
  - daytime: 37.8, 43.7, 50.4, 43.5, 47.1, 45.0, 45.0 Average = 44.6 dB(A)
  - evening: 36.5, 38.1, 39.6, 41.0, 42.8, 44.7 Average = 40.5 dB(A)
  - night-time: 43.8, 43.2, 40.7, 37.3, 41.6 Average = 41.3 dB(A)
- average L_{A10}
  - daytime: 39.0, 44.8, 51.3, 45.3, 50.4, 47.2,47.4 Average = 46.5 dB(A)
  - evening: 39.5, 40.9, 41.1, 42.5, 45.0, 47.1 Average = 42.7 dB(A)
  - night-time: 46.8, 44.9, 41.3, 40.3, 41.8 Average = 43.0 dB(A)
- average L_{A90}
  - daytime: 30.4, 31.3, 41.1, 31.7, 30.8, 36.4, 33.6 Average = 33.6 dB(A)
  - evening: 24.1, 32.0, 32.7, 36.6, 38.3, 40.3 Average = 34.0 dB(A)
  - night-time: 38.1, 37.2, 29.2, 28.1, 30.4 Average = 32.6 dB(A)

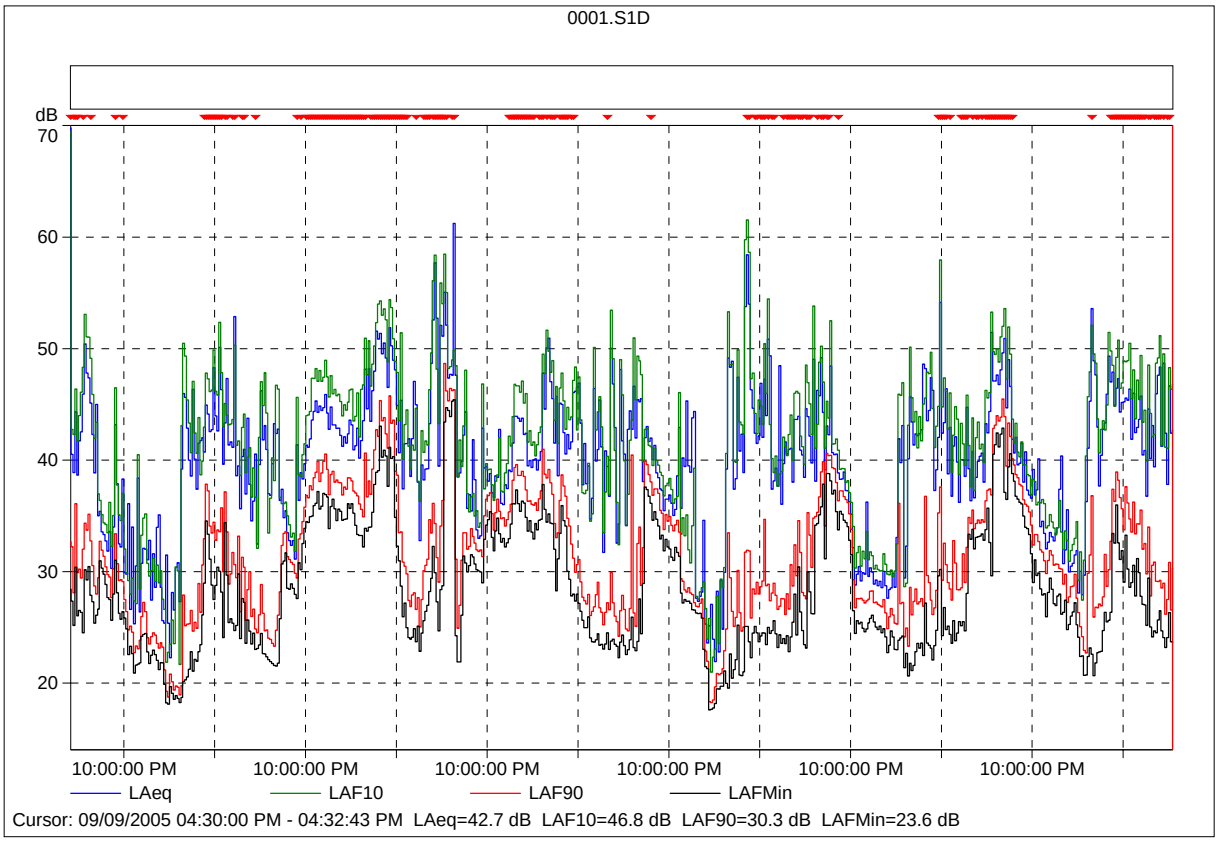

Figure 3
Graphical Presentation of Key Parameter Ambient Noise Levels, Monitoring Location A, Denham Park

Ambient noise level measurements were also obtained from adjacent the residence at Wollamai, from Saturday 3 to Friday 9 September 2005. This ambient noise data was stored on the sound level meter at site, but when this data was to be downloaded onto the computer in the consultant's office the data was no longer stored on the sound level meter. Therefore, whilst the ambient noise level measurements were conducted at Wollamai, the saved data was lost and cannot be presented in this report. However, based on the consultant's experience in conducting ambient noise level measurements in remote rural areas over the past 20 years, there would be no significant difference between the ambient noise levels at Denham Park and at Wollamai. Therefore the average ambient noise levels at Denham Park have been assumed to be the same at Wollamai.

SOURCE NOISE LEVELS

The consultant attempted to conduct rail source noise level measurements at Kangaroo Creek, approximately 5 kilometres north of Newlands Colliery, from 1030 to 1430 hours on Friday 9 September 2005. This section of railway is non-electrified. For the total time that the consultant was on site no trains passed the monitoring locations.

On Saturday 10 September 2005 the consultant conducted rail noise level measurements from an electrified section of railway approximately 5 kilometres east of Duaringa, well away from highway traffic noise. This assessment was conducted from 1030 to 1230 hours, with a total of four trains passing, three electric and one diesel. The results of these noise level measurements are detailed in Table 2. Refer Appendix B for details of noise measurement equipment, equipment settings, calibration, monitoring locations and atmospheric conditions. The railway line at this location is elevated approximately 2 metres above ground level. Between the railway line and the monitoring locations was bare earth, compacted for the first 50 metres then ploughed for the remaining distance out to 300 metres and beyond – a cultivated field being prepared for planting a crop.

Table 2
Results of Source Noise Level Measurements from the Security Gate, Tuesday 6 September 2005

Activity	Noise Levels, dB(A)				Duration of Measurement	Train Type
	$L_{Aeq,T}$	$L_{A1,T}$	$L_{A10,T}$	Maximum		
50 metres from railway line						
Electric locomotives and empty coal wagons	76.2	80.9	79.7	81.6	2 min 0 secs	Two locomotives in front, two in the middle
Electric locomotives and full coal wagons	75.0	80.9	79.4	82.1	1 min 50 secs	
Electric locomotives and full coal wagons	73.1	78.6	75.7	79.4	2 min 10 secs	
100 metres from railway line						
Electric locomotives and empty coal wagons	71.9	76.4	75.6	77.0	2 min 10 secs	Two locomotives in front, two in the middle
Electric locomotives and full coal wagons	69.5	74.3	72.6	76.6	1 min 50 secs	
Electric locomotives and full coal wagons	68.0	72.7	70.9	73.3	2 min 10 secs	
Diesel locomotives and freight wagons	72.2	79.7	77.4	80.0	1 min 0 secs	Three locomotives in front
200 metres from railway line						
Electric locomotives and empty coal wagons	65.4	70.2	69.2	71.6	2 min 50 secs	Two locomotives in front, two in the middle
Electric locomotives and full coal wagons	62.3	67.1	65.6	68.9	2 min 10 secs	
Electric locomotives and full coal wagons	61.1	65.9	64.0	69.1	2 min 10 secs	
300 metres from railway line						
Electric locomotives and empty coal wagons	62.2	65.9	65.1	66.6	2 min 30 secs	Two locomotives in front, two in the middle
Electric locomotives and full coal wagons	58.8	62.8	61.7	64.9	2 min 20 secs	
Electric locomotives and full coal wagons	58.8	62.8	61.7	64.9	2 min 20 secs	

The above source noise levels were plotted and the noise reduction determined for the overall train passby noise ($L_{Aeq,T}$) and the maximum train noise. From approximately 300 metres from the railway line the L_{Aeq} noise level reduces by approximately 3 dB(A) per doubling of distance, and the maximum noise level by approximately 6 dB(A) per doubling of distance. This is the noise attenuation for distance that has been applied in this report.

If it is assumed that the duration of the passing train is 2 minutes 50 seconds (longest of the above measurement durations) and there are 20 trains per day, then the total duration of the train passing will be 56 minutes and 40 seconds per day (0.9445 hours). The noise level of the passing electric trains is 61 dB(A) L_{Aeq} at 300 metres. The overall average ambient noise level is 42.1 dB(A), $L_{Aeq,24h}$, which would be the noise level for 23.0555 hours. If it is further assumed that all of the trains on the proposed missing link are diesel and the noise level of the diesel is 3 dB(A) greater than that of the electric, then the $L_{Aeq,24h}$ will be 48.1 + 3 = 51.1 dB(A) $L_{Aeq,24h}$ at 300 metres. The maximum electric

train noise level at 300 metres was 66.6 dB(A), whilst the difference between electric and diesel train noise was 6.7 dB(A) maximum. Therefore, at 300 metres, the maximum noise level of a passing diesel train would be 66.6 + 6.7 = 73.3 dB(A).

NOISE LEVEL IMPACT

Based on the measured train noise levels the noise of 20 diesel coal trains per 24-hour day would be 51.1 dB(A) $L_{Aeq,24h}$ and 73.3 dB(A) maximum, at a separation distance of 300 metres. These train noise levels easily comply with the noise limits, with these noise levels being 14 dB(A) less than the respective noise limits.

The separation distance of 300 metres is the distance from the railway line that the $L_{Aeq,24h}$ noise level starts to reduce by approximately 3 dB(A) per doubling of distance and the maximum noise level reduce by approximately 6 dB(A) per doubling of distance. From the information provided by GHD Pty Ltd it appears that the proposed railway line will be approximately 1200 metres east or west of Denham Park and approximately 2400 metres east of Wollamai. At these separation distances rail noise levels will be approximately as follows:

- Denham Park:
    - 51.1 – 6 = 45.1 dB(A) $L_{Aeq,24h}$;
    - 73.3 – 12 = 61.3 dB(A) maximum;

- Woolamai:
    - 51.1 – 9 = 42.1 dB(A) $L_{Aeq,24h}$;
    - 73.3 – 18 = 55.3 dB(A) maximum.

These noise levels easily comply with the nominated rail noise limits. The current ambient $L_{Aeq,24h}$ is 42.1 dB(A), which the noise of the passing trains will exceed by approximately 3 dB(A) at Denham Park and equal at Woolamai. The current ambient maximum noise levels are similar to the maximum passing train noise levels.

CONCLUSIONS

It is proposed to establish a rail link (missing link) between the North Goonyella Colliery and Newlands Colliery, Queensland, linking two existing railway lines. This proposed rail link is approximately 72 kilometres in length and passes within close proximity to two residences – the residences associated with the properties known as Denham Park and Wollamai.

To determine current ambient noise levels at these two residences noise loggers were set up adjacent to the residences for a one-week period. The results of the ambient noise level study adjacent to the residence at Denham Park are presented in this report, both as the range and average noise levels for the key parameters, as well as graphically. The results of the noise level measurements adjacent to the residence at Wollamai were saved to the sound level meter at the conclusion of sampling, but the file had inexplicably deleted from this meter when the consultant returned to the office. Based on 20 years experience in conducting ambient noise level measurements in remote areas it is the consultant's opinion that there would be no significant difference between the ambient noise levels at Denham Park and Wollamai. Therefore the ambient noise level measurement results for Denham Park have been accepted as being representative of the ambient noise levels at Wollamai.

Noise level measurements of passing diesel coal trains was attempted on Friday 9 September 2005 for a 4-hour period north of the Newlands Colliery, but no trains passed. On the following day train noise level measurements were obtained at the following separation distances from the railway line approximately 5 kilometres east of Duaringa, in isolation from any traffic noise from the highway:

- 50 metres;
- 100 metres;
- 200 metres; and

- 300 metres.

At this location the railway was approximately 2 metres above ground level. Between the railway line and the monitoring locations was bare earth, compacted for the first 50 metres then ploughed for the remaining distance out to 300 metres and beyond – a cultivated field being prepared for planting a crop.

The results of these passing train noise levels were plotted and the noise reduction determined for the overall train passby noise ($L_{Aeq,T}$) and the maximum train noise. From approximately 300 metres from the railway line the L_{Aeq} noise level reduces by approximately 3 dB(A) per doubling of distance, and the maximum noise level by approximately 6 dB(A) per doubling of distance.

Based on information provided by GHD Pty Ltd the separation distance from the proposed railway line to the residences is as follows:

- Denham Park – 1200 metres to the east or west of the residence; and
- Wollamai – 2400 metres to the east of the residence.

At these separation distances diesel train noise levels will be approximately as follows:

- Denham Park:
  - 51.1 – 6 = 45.1 dB(A) $L_{Aeq,24h}$;
  - 73.3 – 12 = 61.3 dB(A) maximum;

- Woolamai:
  - 51.1 – 9 = 42.1 dB(A) $L_{Aeq,24h}$;
  - 73.3 – 18 = 55.3 dB(A) maximum.

These noise levels easily comply with the nominated rail noise limits, and are not significantly different to the existing ambient noise levels.

RECOMMENDATION

It is recommended that, from an environmental noise perspective, the proposed missing link railway line be approved, with no noise control measures required.

APPENDIX A: AMBIENT NOISE LEVEL MEASUREMENTS, DENHAM PARK

Measurement Equipment

The following equipment was used to conduct the ambient noise level study at Monitoring Location A:

- Bruel and Kjaer Type 2260I Modular Precision Sound Analyzer – Observer – Serial No. 2409371, with Type BZ 7220 Software and Prepolarised free-field ½" microphone, Type 4189, Serial No. 2395445;
- Bruel and Kjaer Type 3592 outdoor microphone kit, including Type UA1404 outdoor microphone;
- Bruel and Kjaer Type AO 0442 ten metre microphone extension cable; and
- Bruel and Kjaer Type 4231 Sound Level Calibrator, Serial No. 2292746.

All of the above equipment is Type 1 in accordance with the requirements of Australian Standard AS 1259-1990, *Acoustics – Sound Level Meters*, as required by Australian Standard AS 1055.1-1997.

Measurement Equipment Settings

The above equipment was used with the following settings:

- Detector: RMS
- Time Weighting: FAST
- Frequency Weighting: A
- Sound Incidence: FRONTAL
- Microphone sensitivity: -26.0 dB
- Range: 10-90 dB.

Calibration

The sound level meter was calibrated to the required value of 93.8 dB at 1000 Hz immediately before and after the noise level measurements were conducted. At no time was an adjustment of more than ±0.5 dB required. This complies with the requirements of the Australian Standard.

Monitoring Location

Monitoring Location A was approximately 15 metres in front of the residence at Denham Park, on the fence surrounding the residence. The microphone was elevated 1.8 metres above ground level.

Atmospheric Conditions

Throughout the ambient noise level study, atmospheric conditions are believed to have complied with the requirements of the Australian Standard.

APPENDIX B: SOURCE NOISE LEVEL MEASUREMENT EQUIPMENT, RAIL NOISE

Measurement Equipment

The following equipment was used to conduct the source noise level measurements:

- 50 metres from the railway line:
    - Bruel and Kjaer Type 2260B Modular Precision Sound Level Meter, Serial No. 2305236, fitted with Type 4189 prepolarised free field half-inch condenser microphone, Serial No. 2294375 and windshield;
    - Bruel and Kjaer Type 4231 Sound Level Calibrator, Serial No. 2292736;
- 100 metres from the railway line:
    - Bruel and Kjaer Type 2260I Modular Precision Sound Analyzer – Observer – Serial No. 2409371, with Type BZ 7220 Software and Prepolarised free-field ½" microphone, Type 4189, Serial No. 2395445;
    - Bruel and Kjaer Type 3592 outdoor microphone kit, including Type UA1404 outdoor microphone;
    - Bruel and Kjaer Type AO 0442 ten metre microphone extension cable; and
    - Bruel and Kjaer Type 4231 Sound Level Calibrator, Serial No. 2292746.
- 200 metres from the railway line:
    - Bruel and Kjaer Type 2260I Modular Precision Sound Analyzer – Observer – Serial No. 2409372, with Type BZ 7220 Software and Prepolarised free-field ½" microphone, Type 4189, Serial No. 2395446;
    - Bruel and Kjaer Type 3592 outdoor microphone kit, including Type UA1404 outdoor microphone;
    - Bruel and Kjaer Type AO 0442 ten metre microphone extension cable; and
    - Bruel and Kjaer Type 4231 Sound Level Calibrator, Serial No. 2292747.
- 300 metres from the railway line:
    - Bruel and Kjaer Type 2260I Modular Precision Sound Analyzer – Observer – Serial No. 2409373, with Type BZ 7220 Software and Prepolarised free-field ½" microphone, Type 4189, Serial No. 2395447;
    - Bruel and Kjaer Type 3592 outdoor microphone kit, including Type UA1404 outdoor microphone;
    - Bruel and Kjaer Type AO 0442 ten metre microphone extension cable; and
    - Bruel and Kjaer Type 4231 Sound Level Calibrator, Serial No. 2292736.

This equipment is Type 1 in accordance with the requirements of Australian Standard AS 1259-1990, *Acoustics – Sound Level Meters*.

Measurement Equipment Settings

The above equipment was used with the following settings:

Detector:	RMS
Time Weighting:	FAST
Frequency Spectrum:	OCTAVE
Frequency Range:	16 to 12500 Hz
Frequency Weighting:	LINEAR (Frequency Analysis); A (Overall Sound Pressure)
Sound Incidence:	FRONTAL

Range: 20-100 dB
Microphone Sensitivity: -26.4 dB.

Calibration

All of the above equipment was calibrated to the required value of 93.8 dB @ 1000 Hz, immediately before and after the noise level measurements were conducted. At no time was an adjustment of more than ±0.5 dB required. This complies with the requirements of the Australian Standard.

Atmospheric Conditions

At the time of conducting the source noise level measurements, atmospheric conditions complied with the requirements of the Australian Standard.