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Acoustic Peer Review
Wilpinjong Mine Extension Project

REPORT No
5838-1.1R

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Prepared for and instructed by:
Wollar Progress Association
C/- Wollar PO
Wollar NSW 2850

Revision History

Report	Date	Prepared	Checked	Comment
Draft	09/03/2016	Stephen Gauld	William Wang	To client for comment
Final	10/03/2016	Stephen Gauld	William Wang	

Document R\5838-1.1r, 12 pages plus attachments

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EXECUTIVE SUMMARY

1. Day Design Pty Ltd has been engaged by Wollar Progress Association to provide an expert Acoustic Peer Review of the Noise and Blasting Assessment prepared by SLR Consulting dated 23 November 2015 provided as part of the Environmental Assessments for the Wilpinjong Mine Extension.

2. This report will be included in the submission by the Wollar Progress Association to be presented to the Department of Planning and Environment.

3. I have reviewed the Noise and Blasting Assessment for the Wilpinjong Extension Project prepared by SLR Consulting Australia on 23 November 2015.

4. This peer review focuses on the likely acoustic impact to the Wollar residential community due to the proposed extension of the Wilpinjong mine.

5. Given the issues raised in this peer review, it is likely that the extension of the Wilpinjong Coal mine to cover the area contained in Pit 8 will have a significant impact on the acoustic amenity for residents of Wollar to the East of the mine.

6. There is little comfort in the SLR report for the residents of Wollar as the predicted noise levels exceed the Project Specific Noise Level (PSNL) at all but one residential location to the East and South East of the Mine during the night (SLR Report, Table 25).

7. In my opinion, the expected noise impact of the proposal will significantly disturb the amenity of the residents in the Wollar community due to the fact that the ambient noise levels are extremely quiet and the PSNLs are generally exceeded, resulting in a very large emergence of mine noise above the background noise levels.

Recommendations

8. The ambient noise level data measured in 2004 during the day at 900 St Laurence O'Toole Catholic Church should be re-analysed to determine the correct RBL. (Clauses 22 to 34)

9. The data sample taken in December 2012 at St Laurence O'Toole Catholic Church used to determine whether a low frequency modifying factor should be applied, should be re-analysed to determine the C-A difference for each 15 minute set of data, rather than the mean difference. This will allow a more accurate comparison to determine whether a low frequency modifying factor should be applied. (Clauses 53 to 63)

10. The same data sample taken in December 2012 should be re-analysed to determine the $L_{A1(1min)}$ - $L_{A90(15min)}$ for each 15 minute set of data. This will allow a more accurate comparison to determine whether sleep disturbance is likely. (Clauses 64 to 71)

11. The proposed mitigation for Year 2024, should be applied from Year 2018 and the benefit of attenuation to the Pit 8 coal and waste fleets be realised 6 years earlier. If

this were carried out 6 years earlier in 2018, based on SLR calculations, the PSNLs would be met up until 2024. (Clauses 73 to 78)

INTRODUCTION

12. I, Stephen Gauld, Principal Acoustical Engineer and Managing Director of Day Design Pty Ltd, have been engaged by Wollar Progress Association to provide an expert peer review of the Noise and Blasting Assessment prepared by SLR Consulting dated 23 November 2015 provided as part of the Environmental Assessments for the Wilpinjong Mine Extension to be presented to the Department of Planning and Environment.

13. In this report, I provide a critical review of the Noise and Blasting Assessment to assist the Department in their consideration of the matter.

14. I have read the documents provided to me, as listed in Appendix "B".

15. I have not visited Wollar or any other areas surrounding the Wilpinjong mine. My review is limited to a desktop study.

ABOUT THE AUTHOR

16. I, Stephen Gauld, am the Managing Director and Principal Acoustical Engineer at Day Design Pty Ltd, Consulting Acoustical Engineers, of Suite 17, 808 Forest Road, Peakhurst, NSW, 2210.

17. I have practiced as a Consulting Acoustical Engineer since December 1997. I was awarded my Bachelor of Engineering (Mechanical) in 1997 and my Masters of Engineering Science (Noise and Vibration) in 2007. My curriculum vitae is attached in Appendix "A".

18. I have read Division 2, Part 31 of the Uniform Civil Procedure Rules 2005 and the Expert Witness Code of Conduct in Schedule 7. This report is prepared in accordance with these documents and I agree to be bound by their terms.

19. My evidence in this statement is within my area of expertise, except where I state that I have relied upon the evidence of another person.

DESCRIPTION OF THE SITE AND SURROUNDING AREA

20. It is assumed that the readers of this review will be familiar with the site and surrounding areas.

21. For a summary please refer to Section 3 in the Noise and Blasting Assessment prepared by SLR Consulting Australia on 23 November 2015

ACOUSTIC PEER REVIEW

Long Term Ambient Noise Levels - 2004

22. Unattended background noise levels were measured prior to the construction of the existing Wilpinjong mine during the day, evening and night periods. This data is contained in Table 12 of the SLR report. An extract of that data is shown in Table 1.

Table 1 – Unattended Noise Monitoring 2004

Location	RBL, dB(A)			L_{Aeq}, dB(A)		
	Day	Evening	Night	Day	Evening	Night
900 St Laurence O'Toole Catholic Church, Wollar	31	26	27	64	42	50

23. The raw data, contained in Appendix C2 and C3 of the Richard Heggie Associates (RHA) Report 30-1313-R1 shows long periods of very high noise levels, each for a full 24 hour period on Friday 6 August 2004, Thursday 12 August 2004 and Wednesday 18 August 2004. The measured noise levels on each of these days are almost identical, but not explained in the Report.

24. My calculations show that these periods of unexplained high noise levels increase the calculated RBL at Wollar.

25. Further attended monitoring was undertaken in Wollar at the same location on 5 and 19 August 2004. The short term results were 29 dBA in the daytime (2:08pm), 26 dBA in the evening (9:45pm) and 26 dBA at night (10:45pm).

26. It is interesting to note that the three operator attended measurements were equal to or lower than the unattended measurements.

27. In addition, every other location where ambient noise levels were measured during the period in August and September 2004 returned an RBL less than 30 dBA (Table 12, SLR November Report).

28. It is my opinion that the long term monitoring at St Laurence O'Toole Catholic Church, Wollar has been unduly affected and the correct RBL for Wollar should be 30 dBA in accordance with the INP.

Long/Short Term Ambient Noise Levels - 2012

29. Two weeks of unattended noise logging was conducted at the same location (and three others outside of Wollar) to supplement the previous ambient noise surveys carried out in 2004. The dates of these supplementary noise surveys were in December 2012.

30. The results of the surveys conducted in December 2012 (Table 14 of the SLR Report) are extracted and shown in Table 2 below.

Table 2 – Unattended Noise Monitoring 2012

Location	RBL, dB(A)			L_{Aeq}, dB(A)		
	Day	Evening	Night	Day	Evening	Night
160 Smiles/Smiles-Schmidt, Wollar	13	23	12	57	56	46

31. The measured background noise levels in 2012 are significantly lower than that measured in 2004. This data sheds further doubt on the measured 31 dBA during the day in Table 1 above.

32. Noise monitoring in 2012 demonstrates that the RBL is actually much lower at 13 dBA.

33. The calculated 31 dBA RBL from the 2004 data is carried through to impact the Noise Limits for the mine, see Condition L5 in Appendix A4 of the SLR Report.

34. It is my opinion that the RBL, measured during the day at 900 St Laurence O'Toole Catholic Church was falsely elevated and the RBL, in accordance with the INP should be 30 dBA.

Industrial Noise Policy

35. I accept that the NSW Industrial Noise Policy (INP) requires the RBL to be set at 30 dBA if the measured RBL is less than 30 dBA in the day, evening or at night.

36. Where this is the case, the intrusiveness criterion then is set to 35 dBA.

37. On page 29 of the SLR report the author states that "*the PSNLs are based on preserving the amenity of at least 90% of the population living in the vicinity of industrial noise sources by limiting the adverse effects of noise for at least 90% of the time. Provided the PSNLs are achieved, then most people would consider the resultant noise levels acceptable.*"

38. I accept that the INP puts this case forward. I also accept that it is true where the measured background noise level is 30 dBA or above.

39. In cases such as in the Wollar community, where the measured background noise levels can be 13 dBA in the day time and 12 dBA at night, I cannot accept this statement.

40. Annoyance due to intrusive noise levels are primarily due to the emergence of a noise above the background noise level. In Wollar, the emergence can be 23 dB above a background of 13 dBA during the day, which is significantly greater than 5 dB, which is commonly regarded as acceptable.

41. To provide some understanding of the implication of this large emergence, I refer to Appendix E in AS1055-1973,[1] attached to this report as as Datasheet AC519.

42. Appendix E states that an exceedance of 0-5 dB above the acceptable noise level will have "Marginal" Public reaction.

43. Appendix E states that an exceedance of 10-15 dB above the acceptable noise level will have "Medium" Public reaction and sporadic and widespread complaints to threats of community action.

44. Appendix E states that an exceedance of 15-20 dB above the acceptable noise level will have "Strong" Public reaction and widespread complaints to threats of community action.

45. The emergence of 23 dB above the background noise level is comparable to an exceedance of 18 dB above the acceptable noise level, using a 'background + 5 dB' criteria.

46. It is clear that the Wollar community have a Strong reaction to the noise from Wilpinjong mine and have long been activists to have the mine reduce its overall noise emission.

47. It is my opinion that while the INP allows a noise criteria of 35 dBA in very quiet rural communities, this does not protect the community against noise pollution and certainly does not protect 90% of the people 90% of the time. In my opinion, this is a major failing of the INP.

[1] AS1055 has been updated several times since 1973, however the Table referred to has been removed in later editions. To my knowledge, the information in the Table has not been demonstrated to be incorrect.

Voluntary Land Acquisition and Mitigation Policy

48. Following this argument, in areas with extremely low background noise levels, such as Wollar, I contend that the exceedance of a noise criteria by 0-2 dB above the PSNL is NOT considered negligible as stated in the SLR report.

49. In fact these noise levels can be 23 dB above the background noise level, which is any other situation would be considered totally unacceptable.

50. For the VLAMP to state noise levels of 0-2 dBA are 'not discernible by the average listener and therefore would not warrant receiver based treatments or controls' is absurd given the emergence can be 20+ dB above the background noise level.

51. It is my opinion that for extremely quiet rural communities, special consideration should be given and the PSNL should be achieved through noise mitigation and management measures at all privately owned residences.

52. In locations where the PSNLs cannot be met, treatments to residences or land acquisition should be offered, without allowing up to a further 5 dB above the PSNL before these offers are made.

Low Frequency Noise Criteria

53. Section 5.2.2 of the SLR Report refers to the Warkworth Continuation Project and makes an argument that the Broner Low Frequency Noise Criteria should be applied.

54. The Broner criterion was not endorsed by the Planning Assessment Commission in that process, the Land and Environment Court in the Warkworth Appeal or the EPA in their Draft Industrial Noise Guideline (DING).

55. It is surprising that SLR rely on the Broner criterion when the current INP or the proposed DING does not mention it at all.

56. The SLR low frequency noise assessment should be carried out in accordance with the INP, which requires a C-A difference of greater than 15 dB for the modifying factor to be applied.

57. It is reasonable for the threshold of hearing for low frequency noise to also be considered as drafted in the DING.

58. Section 5.2.3 of the SLR report considered two weeks of unattended noise monitoring targeting low frequency noise from the Wilpinjong Coal mine in December 2012.

59. In three short paragraphs it is concluded that the existing Wilpinjong Coal Mine does not contain 'dominant low frequency content in accordance with the INP's assessment procedures.'

60. A closer examination of the method shows that the **mean** intrusive L_{Aeq} and L_{Ceq} were calculated. The calculated difference was 13 dB.

61. This large average across two weeks' worth of data could be expected to reduce the peaks and troughs of the L_{Aeq} and L_{Ceq} such that the difference of the means would be less than the difference in each 15 minute period in the two week data sample.

62. The times when the meteorological conditions increased noise from the mine would be averaged down by other times when the meteorological conditions decreased noise from the mine. This method is contrary to the method required by the INP.

63. The same data sample should be re-analysed to determine the C-A difference for each 15 minute set of data. This will allow a more useful comparison to determine whether a low frequency modifying factor should be applied.

Sleep Disturbance Assessment

64. A similar error is made with regards to the sleep disturbance assessment in Section 5.3 of the SLR report.

65. The INP Application Note on Sleep Disturbance is shown in Appendix F of the SLR Report.

66. Table 19 shows the results from $L_{Aeq(15min)}$ and $L_{A1(1min)}$ noise levels measured during the night in December 2012. The mean is shown in each case.

67. Sleep disturbance assessment is not concerned with the mean of a range of data. By definition, peak noise levels will be averaged down and therefore will be compensated by quiet periods when the mine may not be audible. This reduces the effect of the higher L_1 noise levels, contrary to a proper sleep disturbance assessment.

68. The times when the meteorological conditions increased noise from the mine would be averaged down by other times when the meteorological conditions decreased noise from the mine. This method is contrary to the method required by the INP Application Note.

69. Furthermore, the average is calculated across a range of locations, which is absurd, and further reduces the calculated mean difference.

70. The conclusions reached by SLR have no relation to the likelihood of sleep being disturbed at any one location and there is no analysis shown that calculates the likelihood of sleep disturbance as the data has all been averaged out.

71. The same data sample should be re-analysed to determine the $L_{A1(1min)}$ - $L_{A90(15min)}$ for each 15 minute set of data. This will allow a more useful comparison to determine whether sleep disturbance is likely.

Proposed Noise Controls

72. Table 23 of the SLR Report shows the calculated unmitigated noise level across a range of years, together with examples of mitigation and finally the 'Reasonably Achieved Noise Level'.

73. It appears that the target that SLR is aiming for is 37 dBA and not the PSNL of 35 dBA.

74. Year 2024 demonstrates that 4-5 dB can be achieved through "attenuation to Pit 8 coal and waste fleets Plus Shutdown Pit 8 satellite ROM FEL as required and dozer push if running".

75. If this is reasonable mitigation for Year 2024, then it should also be reasonable mitigation for Year 2018 and the benefit of attenuation to the Pit 8 coal and waste fleets be enjoyed 6 years earlier. If this were carried out 6 years earlier in 2018, based on SLR calculations, the PSNLs would be met up until 2024.

76. It is my opinion that the Predicted noise levels should be designed to meet the PSNLs, and then, if during compliance the Measured noise levels fall 1-2 dB above the PSNL, this is considered acceptable in accordance with the INP (INP, Section 11.1.3).

77. It is not acceptable to use the 1-2 dB as 'free' tolerance during the design and then to further exceed the predicted levels during compliance assessments.

Community Reaction

78. The community of Wollar has been very vocal and active in engaging with the Wilpinjong mine in the past.

79. The noise impact of the mine has been a major issue for the residents.

80. The proposal to mine in the location of the Proposed Pit 8, which brings the mine activity significantly closer to the township of Wollar will increase noise levels and reduce acoustic amenity for the residents.

81. There is little comfort in the SLR report for the residents of Wollar as the predicted noise levels exceed the PSNLs at all but one residential location to the East and South East of the Mine (Table 25).

Stephen Gauld, BE (Mech), MEngSc (Noise and Vibration), MIEAust, MAAS
Managing Director and Principal Acoustical Engineer

On behalf of Day Design Pty Ltd

APPENDICES

- **Appendix A** – Stephen Gauld's Curriculum Vitae
- **Appendix B** – List of Documents Supplied and Read
- **Appendix C** – Summary of Acoustic Terminology
- **AC519** – Public Reaction to Noise

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Curriculum Vitae

Stephen Gauld

Stephen Gauld is the Managing Director of Day Design Pty Ltd and works in a technical capacity as the Principal Acoustical Engineer. Stephen provides oversight on all projects and checks the majority of the reports that leave the office. He manages the larger projects and provides training to staff in acoustic measurement and noise control design. Sound level meters and long-term noise monitors are used in the field to measure different types of noise sources and computer software is used to analyse and design noise control.

Qualifications:

Bachelor of Engineering (Mechanical),
University of New South Wales (1997)

Masters of Engineering Science (Noise & Vibration),
University of New South Wales (2007)

Memberships:

Member - Institution of Engineers Australia (2001)

Member - Australian Acoustical Society (2001)

Corporate Member – Association of Australian Acoustical Consultants

Professional Experience:

February 2004 - Present
Managing Director and Principal Acoustical Engineer
Day Design Pty Ltd

October 1998 – February 2004
Consulting Acoustical Engineer
Day Design Pty Ltd

November 1997 – October 1998
Acoustical\Quality Engineer
Acoustic Dynamics Pty Ltd, Glebe, NSW
Consulting Acoustical Engineers

A short overview of the nature of **Mr Gauld's Professional Experience** is provided below:

Churches and Places of Worship:	Thornleigh Uniting Church; Corrimal Uniting Church; Glenmore Park Anglican Church; St Johns Church Kirribilli; Roseville Uniting Church; Lakes Baptist Church; Dapto Anglican Church; Heathcote Gospel Trust; Holy Family; Marayong.
Schools and Child Care Centres:	Schools located at Prestons, Bass Hill, Greenacre, Edensor Park. Childcare Centres located at Kingsgrove, Greenacre, Quakers Hill, Gymea, Kirrawee, Mount Annan and Thornleigh.
Hotels/Clubs	Bangor Tavern; Narellan Hotel; Billabong Hotel; Royal Oak Hotel; Dooleys Lidcombe Catholic Club; Easts Leagues Club; Gymea Hotel; Summer Hill Hotel; St Johns Park Bowling Club; Five Dock RSL Club; Royal Hotel at Richmond; Welcome Inn at Thirlmere; Wentworth Leagues Club.
Hearing Loss Assessments:	Assessment of occupational noise exposure for many and varied occupations including but not limited to, sheet metal workers, printers, labourers, hotel employees and drivers.
Industrial and Mining:	Gulf Conveyor Engineering - Appin Colliery main conveyor; BHP Billiton Illawarra Coal – West Cliff Mine; IE Engineered Products – New Ackland Coal Mine machinery; Hanson Construction Materials – Hanson's Quarry, Seaham.
Legal Assignments:	SHCAG Pty Ltd v the Minister for Planning and Infrastructure & Anor, Berrima Colliery Dewharp Pty Ltd v Sutherland SC, Night Club Noise Impact; Ghassibe v Wingecarribee SC, Dog Breeding Facility; Shelly Bear Pty Ltd v Canterbury CC, Child Care Centre; Martin v Camden Council, Child Care Centre; Robert Creed Architects v Strathfield MC, Residential Development Spiro Houteas v Parramatta CC, Residential Development.
Occupational Noise:	Pilkington Alexandria and Ingleburn; United Group Rail; Franklins; Transfield Services; King Gee Clothing; Tyco Electronics.
Residential:	Building Defect Claims - Sydney Mansions and 'The Rivage'; Collins Street, Kiama; Gymea Bay Rd, Gymea Bay; Chapel Street, Rockdale; Auburn Centre; Main St, Blacktown; Taylor Street, Annandale; Queen Victoria Street, Bexley; Willoughby Rd, Crows Nest; Trelawney Street, Woollahra.
Traffic:	Casula Powerhouse Arts Centre; Davies Road Expansion at Padstow; Lindenwood Development at Kellyville; Residential Units at McEvoy Street, Alexandria; President Avenue, Miranda; Bulwara Road, Ultimo; Soho Apartments, Waterloo.

List of Documents Supplied and Read:

1. Division 2, Part 31 of the *Uniform Civil Procedure Rules 2005*
2. Expert Witness Code of Conduct
3. NSW Industrial Noise Policy – January 2000
4. *A Simple Criterion for Assessment of Low Frequency Noise Emission* by Dr Norm Broner, Acoustics Australia 2011 Vol 39 No 1.
5. Noise and Blasting Assessment prepared for Wilpinjong Coal Pty Ltd by SLR Consulting dated 23 November 2015
6. Appendix C of Wilpinjong Coal Project, Construction, Operation and Transportation Noise and Blasting Impact Assessment (Report 30-1313-R1) prepared for Wilpinjong Coal Pty Ltd by Heggies Pty Ltd dated 2005.

GLOSSARY OF ACOUSTICAL TERMS

AMBIENT NOISE – The ambient noise level at a particular location is the overall environmental noise level caused by all noise sources in the area, both near and far, including road traffic, factories, wind in the trees, birds, insects, animals, etc.

BACKGROUND NOISE LEVEL – Silence does not exist in the natural or the built-environment, only varying degrees of noise. The Background Noise Level is the average minimum dBA level of noise measured in the absence of the noise under investigation and any other short-term noises such as those caused by cicadas, lawnmowers, etc. It is quantified by the L_{A90} or the dBA noise level that is exceeded for 90 % of the measurement period (usually 15 minutes).

- **Assessment Background Level (ABL)** is the single figure background level representing each assessment period – day, evening and night (ie three assessment background levels are determined for each 24hr period of the monitoring period). Determination of the assessment background level is by calculating the tenth percentile (the lowest tenth percent value) of the background levels (L_{A90}) for each period (refer: NSW Industrial Noise Policy, 2000).
- **Rating Background Level (RBL)** as specified by the Environment Protection Authority is the overall single figure (L_{A90}) background noise level representing an assessment period (day, evening or night) over a monitoring period of (normally) three to seven days.

  The RBL for an assessment period is the median of the daily lowest tenth percentile of L_{90} background noise levels.

  If the measured background noise level is less than 30 dBA, then the Rating Background Level (RBL) is considered to be 30 dBA.

dBA – The human ear is less sensitive to low frequency sound than high frequency sound. We are most sensitive to high frequency sounds, such as a child's scream. Sound level meters have an inbuilt weighting network, termed the dBA scale, that approximates the human loudness response at quiet sound levels (roughly approximates the 40 phon equal loudness contour).

However, the dBA sound level provides a poor indication of loudness for sounds that are dominated by low frequency components (below 250 Hz).

dBC – The C-weighting adjustment takes into account the low-frequency component of noise within the audibility range of humans. If the difference between the "C" weighted and the "A" weighted sound level is 15 dB or more, then the NSW Industrial Noise Policy recommends a 5 dB penalty be applied to the measured dBA level.

EQUIVALENT CONTINUOUS NOISE LEVEL, L_{Aeq} – Many noises, such as road traffic or construction noise, vary continually in level over a period of time. More sophisticated sound level meters have an integrating electronic device inbuilt, which average the A weighted sound pressure levels over a period of time and then display the energy average or L_{Aeq} sound level. Because the decibel scale is a logarithmic ratio the higher noise levels have far more sound energy, and therefore the L_{Aeq} level tends to indicate an average which is strongly influenced by short term, high level noise events. Many studies show that human reaction to level-varying sounds tends to relate closely to the L_{Aeq} noise level.

FREQUENCY – The number of oscillations or cycles of a wave motion per unit time, the SI unit being the Hertz, or one cycle per second.

INTRUSIVE NOISE LEVEL, L_{Aeq} – The level of noise from a factory, place of entertainment, etc. in NSW is assessed on the basis of the average maximum noise level, or the $L_{Aeq\ (15\ min)}$. This is the energy average A weighted noise level measured over any 15 minute period.

MAXIMUM NOISE LEVEL, L_{Amax} – The rms maximum sound pressure level measured on the "A" scale of a sound level meter during a noise survey is the L_{Amax} noise level. It may be measured using either the Fast or Slow response time of the meter. This should be stated.

NOISE – Noise is unwanted sound. Sound is wave motion within matter, be it gaseous, liquid or solid. "Noise includes sound and vibration".

OFFENSIVE NOISE - (Reference: Dictionary of the Protection of the Environment Operations Act 1997). *"Offensive Noise means noise:*

(a) that, by reason of its level, nature, character or quality, or the time at which it is made, or any other circumstances:

(i) is harmful to (or likely to be harmful to) a person who is outside the premise from which it is emitted, or

(ii) interferes unreasonably with (or is likely to interfere unreasonably with) the comfort or repose of a person who is outside the premises from which it is emitted, or

(b) that is of a level, nature, character or quality prescribed by the regulations or that is made at a time, or in other circumstances prescribed by the regulations."

SOUND PRESSURE LEVEL, L_p – The level of sound measured on a sound level meter and expressed in decibels, dB, dBA, dBC, etc. $L_p = 20 \times \log (P/P_o)$ ... dB

where P is the rms sound pressure in Pascal and P_o is a reference sound pressure of 20 µPa. L_p varies with distance from a noise source.

SOUND POWER LEVEL, L_w – The Sound Power Level of a noise source is an absolute that does not vary with distance or with a different acoustic environment.

$L_w = L_p + 10 \log A$ ... dB, re: 1pW,
where A is the measurement noise-emission area in square metres in a free field.

STATISTICAL EXCEEDENCE SOUND LEVELS, L_{A90}, L_{A10}, L_{A1}, etc – Noise which varies in level over a specific period of time (usually 15 minutes) may be quantified in terms of various statistical descriptors:

The L_{A90} is the dBA level exceeded for 90 % of the time. In NSW the L_{A90} is measured over periods of 15 minutes, and is used to describe the average minimum or background noise level.

The L_{A10} is the dBA level that is exceeded for 10 % of the time. In NSW the L_{A10} measured over a period of 10 to 15 minutes. It was until recently used to describe the average maximum noise level, but has largely been replaced by the L_{Aeq} for describing level-varying noise.

The L_{A1} is the dBA level that is exceeded for 1 % of the time. In NSW the L_{A1} may be used for describing short-term noise levels such as could cause sleep arousal during the night.

APPENDIX E

ESTIMATED PUBLIC REACTION TO NOISE WHEN THE ADJUSTED MEASURED NOISE LEVEL EXCEEDS THE ACCEPTED NOISE LEVEL

Amount in dB(A) by which Adjusted Measured Noise Level exceeds the Acceptable Noise Level	Public reaction	Expression of public reactions in a residential situation
0 - 5	Marginal	From no observed reaction to sporadic complaints
5 - 10	Little	From sporadic complaints to widespread complaints
10 - 15	Medium	From sporadic and widespread complaints to threats of community action
15 - 20	Strong	From widespread complaints to threats of community action
20 - 25	Very strong	From threats of community action to vigorous community action
25 and over	Extreme	Immediate direct community and personal action