NOISE MEASUREMENT SERVICES

Noise Monitoring Report
Brisbane Motorway Services
Clem Jones Tunnel Monitoring

Report 2 – July 2010

Report No 1529 (2) - 30 July 2010

DOCUMENT CONTROL PAGE

NOISE MEASUREMENT SERVICES PTY LTD
18 Lade St, Enoggera, QLD 4051
PO Box 3429
South Brisbane BC, QLD 4101

Telephone: (7) 3217 2850
Facsimile: (7) 3355 7210
E-mail: info@noisemeasurement.com.au

Copy No_____

Revision No	Issue Date	Revision Description	Checked By	Issued By
0	30/07/2010	Second Report Survey July 2010	JD	BT

Copy No(s)	Rev No	Destination
1 pdf	0	Brisbane Motorway Services
2	0	Noise Measurement Services

REPORT FOR **Brisbane Motorway Services pty ltd**

CONTACT **Catherine Paolucci**

Signed

Bob Thorne
(NMS)

DISCLAIMER

This Report by Noise Measurement Services Pty Ltd is prepared for a particular Client and is based on the agreed objective, scope, conditions and limitations as may be stated in the Executive summary. The Report presents only the information that Noise Measurement Services Pty Ltd believes, in its professional opinion, is relevant and necessary to describe the issues involved. The Report should not be used for anything other than the intended purpose and should not be reproduced, presented or reviewed except in full. The intellectual property of this Report remains with Noise Measurement Services Pty Ltd. The Client is authorised, upon payment to Noise Measurement Services Pty Ltd of the agreed Report preparation fee, to provide this Report in full to any third party.

CONTENTS

1.0 INTRODUCTION

This is the second Report prepared for Brisbane Motorways Services in response to a request for the monitoring of road traffic noise levels for the Clem Jones Tunnel (also referred to as CLEM7 tunnel). The purpose of the survey was to present measured noise levels at residential locations near the roading network around the entry and exit points for the Clem Jones Tunnel.

This Report presents the monitoring results from a noise survey conducted from the 19th to the 26th of July 2010. It is intended to be read in conjunction with the first Report number 1529_1 dated 7 July 2010 which contains details of the measurement locations and results from an initial survey conducted in April 2010. A summary of the locations follow:

- ML1: 153 Lambert Street, Kangaroo Point
- ML2: 6 Albert Street, Woolloongabba
- ML3: 6 Tufton Street, Bowen Hills
- ML4: Northey Street, Windsor

A glossary of terms used in this Report is presented in **Appendix A**.

2.0 NOISE CRITERIA AND LIMITS

The assessment criteria are contained in the Noise and Vibration Environmental Management Sub Plan for the CLEM7 O&M Manual which refers to the Environmental Protection (Noise) Policy 1997 and Department of Transport and Main Roads' Code of Practice.

2.1 Environmental Protection (Noise) Policy 1997

In this Report, the Environmental Protection (Noise) Policy 1997 has been addressed. This policy states that the following planning levels for a public road are not to exceed:

- 68 dB(A) L10(18hr) for a State-controlled road
- 60 dB(A) Leq(1hr) between 10pm and 6am
- 80 dB(A) single event maximum sound pressure level

These levels are assessed 1 metre in front of the most exposed part of an affected noise sensitive place.

This Noise Policy was superseded by the Environmental Protection (Noise) Policy 2008 (see below), and is promulgated pursuant to the Environmental Protection Act 1994. That policy (2008) establishes new acoustic quality objectives to protect or enhance stated environmental values (see **2.2** below).

2.2 Environmental Protection (Noise) Policy 2008

The Environmental Protection Noise Policy 2008 establishes new acoustic quality objectives to protect or enhance stated environmental values. The environmental values to be enhanced or protected under the policy are the qualities of the acoustic environment that are conducive to protecting the health and biodiversity of ecosystems; and the qualities of the acoustic environment that are conducive to human health and well-being, including ensuring a suitable acoustic environment for individual's to sleep, study and learn, to be involved in recreation including relaxation and conversation; and the qualities of the acoustic environment that are conducive to protecting the amenity of the community.

The acoustic quality objectives do not apply to noise from aircraft movement, noise from the ordinary use of a public road or State-controlled road and noise from the ordinary use of a busway, light rail or rail transport infrastructure. This is a significant variation from the previous (1997) policy as that policy did apply to noise from road and rail.

The ambient observations for this report indicate that the dominant noise character of the environment, apart from wind in trees and residential neighbour activity, is noise from "ordinary" rail / road traffic, distant industrial and commercial uses. Accordingly, the Environmental Protection (Noise) Policy 2008 would not apply to this assessment.

2.3 Department of Transport and Main Roads' Requirements

The Noise and Vibration Environmental Management Sub Plan for the CLEM7 O&M Manual refers to (the "desirable criteria" of) the Department of Transport and Main Roads' *"Road Traffic Noise Management Code of Practice"*. The Code is not a statutory document and has been developed by the Department for its own purposes.

This Sub Plan states that the following levels not to be exceed:

- 68 dB(A) L10(18hr) for a State-controlled road

These levels are assessed 1 metre in front of the most exposed part of an affected noise sensitive place.

This is the same as the "68 dB(A) L10 (18hr) for a State-controlled road" set out in Section **2.1** above. The level is "façade affected'; that is, has a factor of 2.5 dB(A) built in to represent the level of reflected sound measured when recording near to a building. An adjustment is made to "free field" readings to include this factor, where the location is not considered to be façade affected.

3.0 SECOND SURVEY JULY 2010

3.1 Measurement of Noise Levels at 153 Lambert Street, Kangaroo Point (ML1)

The measurement location (ML1) was located in the outdoor courtyard area on ground floor level at 153 Lambert Street, Kangaroo Point. The microphone was positioned four metres from the southern boundary and 1.9 metres above ground level and overlooking Shafston Avenue. The location is not considered to be façade affected, and the values are adjusted accordingly.

The operation of the sound level measuring equipment was field calibrated before and after each measurement session and was found to be within 0.2 dB of the reference signal. All instrumentation used in this assessment hold a current calibration certificate from a certified NATA calibration laboratory. The following instruments were used to measure the ambient noise levels-

- Larson Davis 831 Type 1 Environmental Noise Logger
- Rion NC-73 Calibrator

Ambient sound pressure levels were measured generally in accordance with Australian Standard AS1055.1:1997 - 'Acoustics-Description and measurement of environmental noise - Part 1: General procedures' and AS2702:1984 – 'Acoustics –Methods for the measurement of road traffic noise'. Ambient noise levels were recorded at 15 minute intervals over a seven day period from 19th July to 26th July 2010 (**Figure 9** and **Table 2**).

Noise levels at this site are dominated by road traffic on Shafston Avenue.

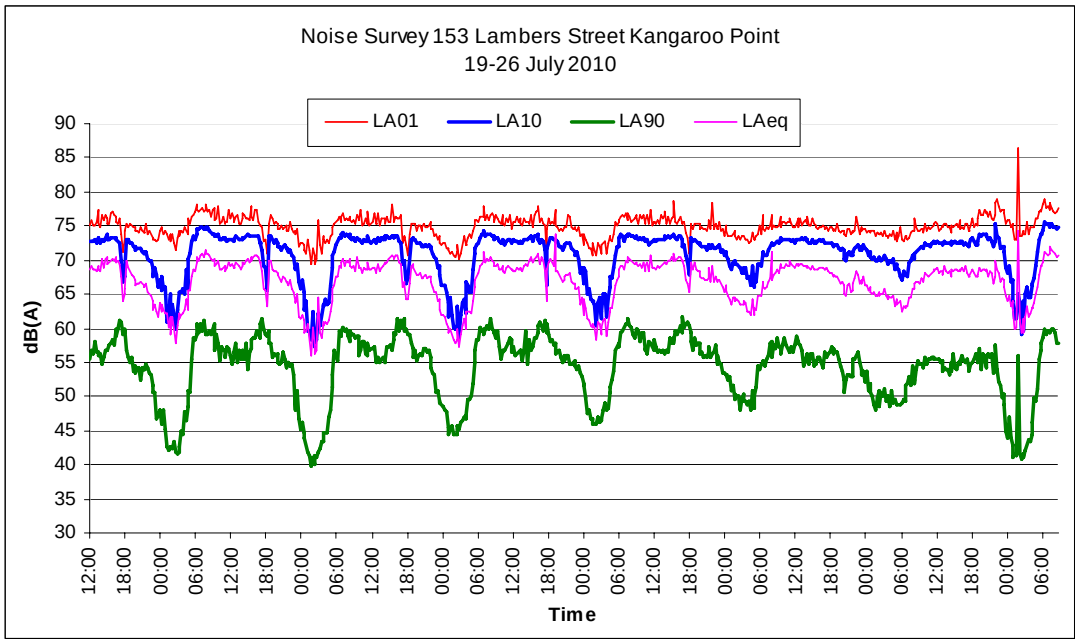

Figure 1: Exterior noise levels at location ML1 (levels free-field)

Table 1: Average ambient and background noise levels recorded at Location ML1 from Monday 19 July to Sunday 25 July (levels dB(A), façade adjusted)

Site	Day	L10(18hr)	LAeq(1hr) Night	Event Maximum	Weather
ML1	Monday	74.7(+)	70.7(+) *	80.1	Light showers until 1am
ML1	Tuesday	75.0(+)	69.6(+) *	80.1	Light showers until 1am
ML1	Wednesday	74.7(+)	68.6(+)	79.3	Fine
ML1	Thursday	74.9(+)	68.8(+)	70.2	Fine
ML1	Friday	75.2(+)	70.5(+)	79.2	Fine
ML1	Saturday	74.7(+)	69.6(+)	78.6	Fine
ML1	Sunday	74.5(+) *	70.0(+)	79.7 *	Showers 7pm

Note to Table 6:

* Rain affected data has been removed

(+) Levels exceed criteria

Monday data is an amalgamation of the 19th and 26th July

3.2 Measurement of Noise Levels at 6 Albert Street Woolloongabba (ML2)

The measurement location (ML2) was located on the first floor balcony at 6 Albert Street Woolloongabba approximately 3.8 metres above ground level. This location overlooks the Ipswich Road underpass of the Pacific Motorway and the CLEM7 tunnel entrance. The measurements at this location are considered to be façade affected.

The operation of the sound level measuring equipment was field calibrated before and after each measurement session and was found to be within 0.1 dB of the reference signal. All instrumentation used in this assessment hold a current calibration certificate from a certified NATA calibration laboratory. The following instruments were used to measure the ambient noise levels-

- Larson Davis 831 Type 1 Sound Level Meter
- Rion NC-73 Calibrator

Ambient sound pressure levels were measured generally in accordance with Australian Standard AS1055.1:1997 - 'Acoustics-Description and measurement of environmental noise - Part 1: General procedures'. Ambient noise levels were recorded at 15 minute intervals over a seven day period from 19th July to 26th July 2010 (**Figure 6** and **Table 7**).

Noise levels at this site are dominated by road traffic on Ipswich Road, Pacific Highway and the distant Clem7 tunnel entrance. Other sources of noise include vehicles and pedestrians on Albert and Dibley Street and occasional birds.

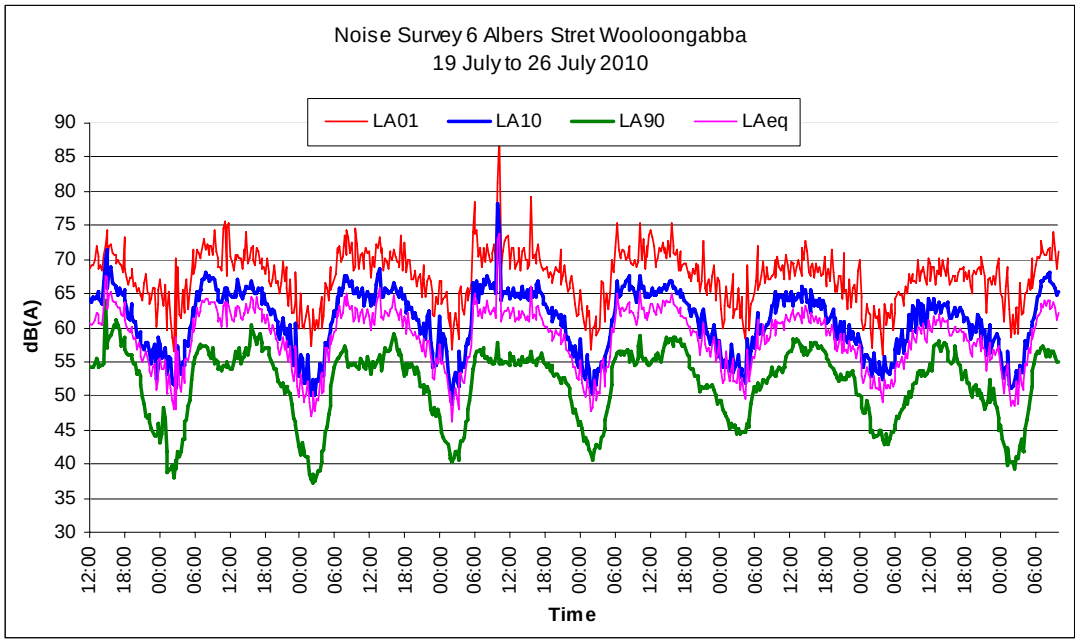

Figure 2: Exterior noise levels at location ML2 (façade affected)

Table 2: Average ambient and background noise levels recorded at Location ML2 (levels dB(A), façade affected)

Site	Day	L10(18hr)	LAeq(1hr) Night	Event Maximum	Weather
ML2	Monday	63.3	58.6*	72.1	Light showers until 1am
ML2	Tuesday	63.6	59.2*	74.2	Light showers until 1am
ML2	Wednesday	63.5	58.6	73.2	Fine
ML2	Thursday	63.4	61.9 (+)	73.0	Fine
ML2	Friday	63.8	59.0	73.4	Fine
ML2	Saturday	62.0	57.3	67.7	Fine
ML2	Sunday	60.9 *	57.3	69.6	Showers 7pm

Note to Table 7:

* Rain affected data has been removed

(+) Levels exceed criteria

Monday data is an amalgamation of the 19th and 26th July

Some extraneous data was removed from Thursday for the purposes of calculations. The exceedance of criteria may not be from road traffic

3.3 Measurement of Noise Levels at 6 Tufton Street, Bowen Hills (ML3)

The measurement location (ML3) was located in the car park at 6 Tufton Street, Bowen Hills. The microphone was located 2.7 metres from the northern boundary and 2.4 metres above ground level. The location is not considered to be façade affected, and the values are adjusted accordingly. This location overlooks an adjacent rail line. The CLEM7 road network and Inner City Bypass are visible from this location.

The operation of the sound level measuring equipment was field calibrated before and after each measurement session and was found to be within 0.1 dB of the reference signal. All instrumentation used in this assessment hold a current calibration certificate from a certified NATA calibration laboratory. The following instruments were used to measure the ambient noise levels-

- Larson Davis 831 Type 1 Sound Level Meter
- Rion NC-73 Calibrator

Ambient sound pressure levels were measured generally in accordance with Australian Standard AS1055.1:1997 - 'Acoustics-Description and measurement of environmental noise - Part 1: General procedures'. Ambient noise levels were recorded at 15 minute intervals over a 24 hour period from 19th to 26th July 2010 (**Figure 7** and **Table 8**).

Noise levels at this site are dominated by frequent train pass-bys on the adjacent rail line. Other sources of noise at this site include distant construction noise and sounds from the residence on the site (including television, vehicle movement, voices and other domestic noises etc…).

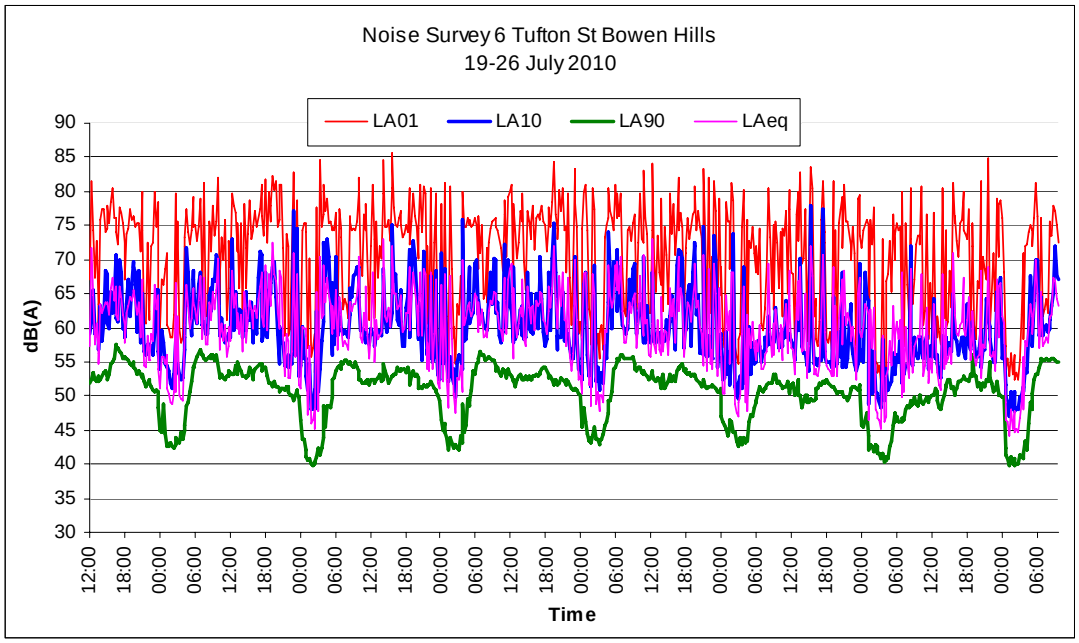

Figure 3: Exterior noise levels at location ML3 (free field)

Table 3: Average ambient and background noise levels recorded at Location ML3 (levels dB(A), façade adjusted)

Site	Day	L10(18hr)^	LAeq(1hr) Night^	Event Maximum^	Weather
ML3	Monday	64.7	68.0 (+) *	80.2 (+)	Light showers until 1am and showers from 8:30 to10am
ML3	Tuesday	64.7	66.4 (+) *	84.2 (+)	Rain from midnight to 1am
ML3	Wednesday	64.4	70.1(+)	83.2 (+)	Fine
ML3	Thursday	64.7	68.1(+)	82.8 (+)	Fine
ML3	Friday	64.7	68.5 (+)	83.8 (+)	Fine
ML3	Saturday	60.8	68.5 (+)	82.8 (+)	Fine
ML3	Sunday	60.3 *	66.5 (+) *	82.4 (+)	Rain from 7pm

Note to Table 4:

^ LAeq, Average Maximum Levels, and to a lesser extent, L10 (18hr) levels are elevated due to frequent train passes

* Rain affected data has been removed

(+) levels exceed criteria

Monday data is an amalgamation of the 19th and 26th July

3.4 Measurement of Noise Levels at Northey Street, Windsor (ML4)

The measurement location (ML4) was located on an existing air quality monitoring station in the middle of a vacant site on Northey Street. The location is not considered to be façade affected, and the values are adjusted accordingly. The microphone was positioned approximately 5.3 metres above ground level. Photographs of the measurement location are presented in **Appendix A**.

The operation of the sound level measuring equipment was field calibrated before and after each measurement session and was found to be within 0.2 dB of the reference signal. All instrumentation used in this assessment hold a current calibration certificate from a certified NATA calibration laboratory. The following instruments were used to measure the ambient noise levels-

- Larson Davis 831 Type 1 Environmental Noise Logger
- Rion NC-73 Calibrator

Ambient sound pressure levels were measured generally in accordance with Australian Standard AS1055.1:1997 - 'Acoustics-Description and measurement of environmental noise - Part 1: General procedures'. Ambient noise levels were recorded at 15 minute intervals over a 24 hour period from 19th to 26th July 2010 (**Figure 8** and **Table 9**).

This location is exposed to distant road traffic noise, local neighbourhood noise, birds and insects. The background noise level at this site is affected by a compressor, air conditioner or other motor attached to the permanent air quality monitoring station.

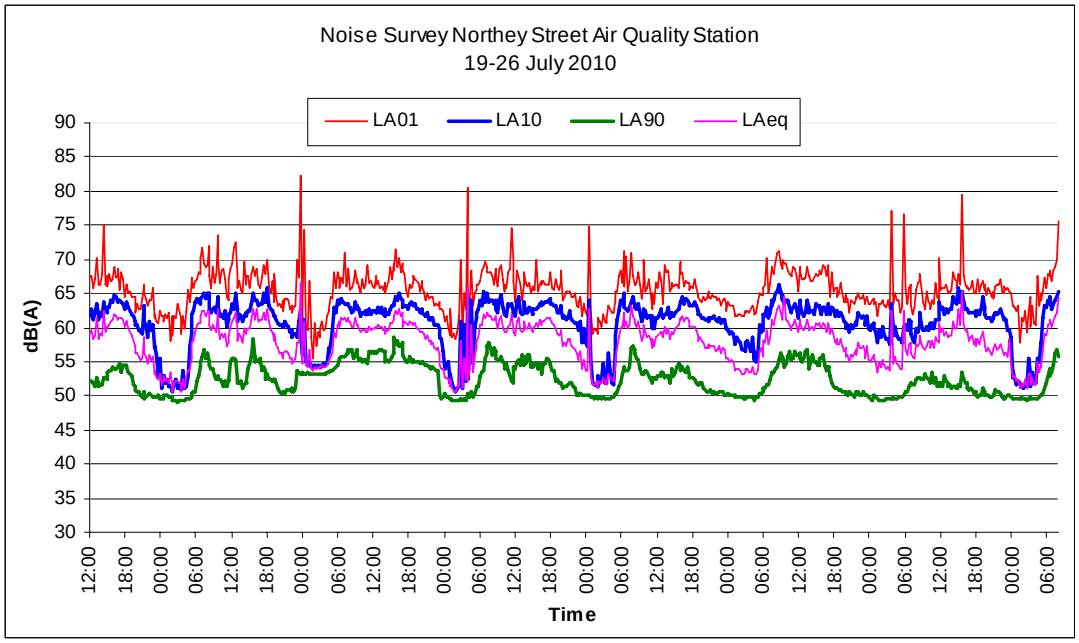

Figure 4: Exterior noise levels at location ML4 (levels free-field)

Table 4: Average ambient and background noise levels recorded at Location ML4 (levels dB(A), façade adjusted)

Site	Day	L10(18hr)	LAeq(1hr) Night	Event Maximum	Weather
ML4	Monday	64.6	60.0 *	73.5	Light showers to 1am and showers 8 to 10am
ML4	Tuesday	64.7	60.4 *	73.2	Light showers to 1am
ML4	Wednesday	64.9	64.7 (+)	71.7	Fine
ML4	Thursday	65.1	63.8 (+)	71.6	Fine
ML4	Friday	64.7	60.6 (+)	71.8	Fine
ML4	Saturday	64.9	59.4	72.1	Fine
ML4	Sunday	64.2 *	61.0 (+)	70.1	Showers from 7pm

Note to Table 5:

(+) Levels exceed criteria, possible contribution to LAeq levels from the air quality air conditioner or other motor.

* Rain affected data removed

Appendix A Glossary

Event maximum sound pressure level (LA%,adj,T), L01

The L01 level is calculated as the noise level equalled and exceeded for 1% of the measurement time, for example 9 seconds in any 15 minute interval. L01 is an appropriate level to characterise single events, such as from impulsive or distinctive pass-by noise (example: rail noise). In this Report, the measured L01 levels for day/evening/night are not averaged but are arranged from low to high in the relevant day/evening/night interval and the value that is found at the 90th percentile (L10 of L01 sample) in the interval is recorded as its "L01" level. The level can be adjusted for tonality or impulsiveness.

Average maximum sound pressure level (LA%,adj, T), L10

The "L10" level is an indicator of "steady-state" noise or intrusive noise conditions from traffic, music and other relatively non-impulsive noise sources. The L10 level is calculated as the noise level equalled and exceeded for 10% the measurement time, for example 90 seconds in any 15 minute interval. The measured L10 time-intervals for day/evening/night are arithmetically averaged to present the "average maximum" levels of the environment for day/evening/night. The level can be adjusted for tonality or impulsiveness.

Background sound pressure level (LA90,T), L90

Commonly called the "L90" or "background" level and is an indicator of the quietest times of day, evening or night. The L90 level is calculated as the noise level equalled and exceeded for 90% the measurement time. The measured L90 time-intervals are arithmetically averaged to present the "average background" levels of the environment for day/evening/night. The level is recorded in the absence of any noise under investigation. The level is not adjusted for tonality or impulsiveness.

Equivalent Continuous or time average sound pressure level (LAeq,T), Leq

Commonly called the "Leq" level it is the logarithmic average noise level from all sources far and near. The maximum 1-hour levels within the day/evening/night time intervals are referenced. The level can be adjusted for tonality.

Façade-affected level

A sound level that is measured at a distance of 1.0 metre from a wall or facade. The level is nominally 2.5 dB higher than the free-field level.

Façade-adjusted level

A sound level that is measured more than 3.5 metres from a reflective façade and adjusted to represent a measurement at a façade (example: side of building) at a distance of 1.0 metre. The level is nominally 2.5 dB higher than the free-field level.

Free-field level

A sound level that is measured at a distance of more than 3.5 metres from a wall or facade.

CLEM7 Quarterly Noise Monitoring Reports, April - July 2010

Address	Location	REASON CHOSEN	DOMINANT NOISE SOURCES IDENTIFIED IN EIS STUDY		Traffic Noise LA10, (18hr dB(A)		Traffic Noise LA10, (18hr dB(A)					
					EPP(Noise) 1997	DTMR Requireme	Pre-Existing		Post-Opening Studies			
			Dominant daytime noise source	Dominant noise sources late at night	68dB(A) L10(18hr) for a State-Controlled road	68dB(A) L10(18hr) for a State-controlled road	Location	Table 10-4 EIS	April Study	July Study	Study 3 TBC	Study 4 TBC
153 Lambert Street, Kangaroo Point (ML1)	Outdoor courtyard area on ground level overlooking Shafston Avenue	Within COG prescribed locations. Limited secure location possibilities and lack of willing participants. Ideal location would be at a greater height to avoid disturbance from Shafston Avenue traffic. Represents a sensitive receptor at the Shafston Avenue portal. Alternative higher sites are being sought.	Shafeston Avenue Traffic	Shafston Avenue Traffic	68	68	Balcony façade, Unit 39 Gardens Building, Vicinity Apartments. This location would be less affected by Shafston avenue noise than current location	74	74.9, 74.6, 74.6, 74.8, 75.7, 74.6, 74.7*	74.7, 75.0, 74.7, 74.9, 75.2, 74.7, 74.5*		
6 Albert Street, Woolloongabba (ML2)	first floor balcony approximately 3.8 meters above ground level overlooking Ipswich Road underpass of the Pacific Motorway and CLEM7 tunnel entrance	Within COG prescribed locations. Represents a close sensitive receptor to the potential traffic noise of motorists entering the CLEM7 tunnel off Ipswich Road	Park St, Ipswich Road and South East Freeway Traffic	Ipswich Road and South East Freeway Traffic	68	68	Front steps, detached dwelling at 181 park St, Woolloongabba. This location is closer to the Freeway but is nolonger an available location	68	63.0, 63.5, 63.2, 63.5, 64.2, 61.7, 60.1	63.3, 63.6, 63.5, 63.4, 63.8, 62.0, 60.9*		
6 Tufton Street, Bowen Hills (ML3)	Back car park overlooking adjacent rail line with CLEM7 road network and Inner City Bypass visible	Within COG prescribed locations. Limited locations available to represent CLEM7 traffic noise compared with railway line, inner city bypass and Bowen Bridge road traffic. Location represents a sensitive receptor in proximity to Bowen Hills portal	Inner City Bypass Traffic, Northern rail line (intermittent)	Inner City Bypass Traffic, Northern rail line, faint mechanical plant	68	68	Front Landing, detached dwelling at 3 Tufton St, Bowen Hills. This location is on the other side of Tufton street and would be less affected by inner city bypass, railway and CLEM7 noise	60	66.6, 66.6, 66.0, 66.6, 65.7, 62.4, 62.0	64.7, 64.7, 64.4, 64.7, 64.7, 60.8, 60.3*		
Northey Street, Windsor (ML4)	Located on CLEM7 Air Quality Monitoring Station (AQMS) in the middle of a vacant site on Northey Street. Approximately 5.3m above ground level.	Within COG prescribed lcoations. Area is subject to floods and the high secured location is preferred. However, the AQMS station houses an air conditioner which affects noise levels. Does not represent a sensitive receptor and alternative sites are being sought	Northey Street & Lutwyche Road Traffic	Northey Street & Lutwyche Road Traffic	68	68	Vacant land at 31 Northey Street, Windsor - level with adjoining detached dwelling facades. Site is located closer to Bowen Bridge Road. Located between two residences at ground level on unsecure site.	63	65.3, 64.9, 64.8, 65.0, 65.9, 65.4, 64.7*	64.6, 64.7, 64.9, 65.1, 64.7, 64.9, 64.2*		

Note: Where the road traffic planning noise levels are already exceeded at sensitive locations it may not be reasonable and practicable to achieve compliance with these planning noise levels. In these instances, the "status-quo" noise levels should be maintained (i.e. maintain noise levels anticipated in Y2021, the design year, without the Project) (*Excerpt from Coordinator Generals Conditions*)

KEY
* rain affected data

CLEM7 Quarterly Noise Monitoring Reports, April - July 2010

Maximum Nighttime Laeq (1 hour) dB(A)							Single Event Maximum					Comments
EPP(Noise) 1997	Pre-Existing		Post-Opening Studies				EPP(Noise) 1997	Post-Opening Studies				
60dB(A) Leq(1hr) between 10pm and 6am	Location	Table 10-4 EIS	April Study	July Study	Study 3 TBC	Study 4 TBC	80dB(A) single event maximum sound pressure level	April Study	July Study	Study 3 TBC	Study 4 TBC	
60	Balcony façade, Unit 39 Gardens Building, Vicinity Apartments. This location would be less affected by Shafston avenue noise than current location	71	71.0, 68.8, 68.8, 68.9, 68.8, 69.9, 71.7*	70.7*, 69.6*, 68.6, 68.8, 70.5, 69.6, 70.0			80	80.5, 79.6, 79.4, 79.8, 80.4, 78.2, 79.9	80.1, 80.1, 79.3, 70.2, 79.2, 78.6, 79.7*			The Maximum Nighttime Laeq (1 hour) dB(A) parameter from EIS was not measured by the instrumentation at the location and was inferred from the LA10 parameter using a 3 dBA offset.
60	Front steps, detached dwelling at 181 Park st, woolloongabba. This location is closer to the Freeway but is nolonger an available location	67	58.6, 58.9, 58.7, 58.8, 59.6, 59.5, 57.5	58.6*, 59.2*, 58.6, 61.9, 59.0, 57.3, 57.3			80	72.6, 73.2, 73.0, 73.5, 75.8, 69.8, 70.2	72.1, 74.2, 73.2, 73.0, 73.4, 67.7, 69.6			
60	Front Landing, detached dwelling at 3 Tufton St, Bowen Hills. This location is on the other side of Tufton street and would be less affected by inner city bypass, railway and CLEM7 noise	59	70.0, 69.7, 69.2, 70.6, 72.2, 72.7, 68.2	68.0*, 66.4*, 70.1, 68.1, 68.5, 68.5, 66.5*			80	82.8, 82.8, 84.0, 83.0, 84.0, 85.0, 80.6	80.2, 84.2, 83.2, 82.8, 83.8, 82.8, 82.4			Laeq, Average Maximum Levels, and to a lesser extent, L10 (18hr) levels are elevated due to frequent train passes.
60	Vacant land at 31 Northey Street, Windsor level with adjoining detached dwelling facades. Site is located closer to Bowen Bridge Road. Located between two residences at ground level on unsecure site.	60	61.7, 61.6, 61.6, 61.0, 62.1, 61.1, 62.6*	60.0*, 60.4*, 64.7, 63.8, 60.6, 59.4, 61.0			80	71.8, 71.5, 70.8, 71.4, 71.8, 72.5, 72.3	73.5, 73.2, 71.7, 71.6, 71.8, 72.1, 70.1			Possible contribution to Laeq levels from air quality stations' powered fan.