International Convention Centre Hotel (ICC Hotel)

Level 4 Pool Area, Noise Impact Assessment

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1 INTRODUCTION

This report presents an assessment of the potential noise impacts associated with the proposed level 4 pool areas within the International Convention Centre Hotel (ICC Hotel).

In this report, we will:

- Identify noise sources associated with the use of the proposed pool area including the use of speakers for background music;
- Assess the potential operational noise impacts associated with the above, based on the projects Conditions of Consent (SSD 6831); and
- If necessary, recommend management controls and building treatments to ensure noise emissions will comply with these guidelines.
- Please note that this report is intended to be read in conjunction with the Wilkinson Murray acoustic report submitted with the SSD 6831.

2 SITE AND PROJECT DESCRIPTION

The proposed pool area is located on level 4 of the International Convention Centre Hotel (ICC Hotel). The site is located within the Darling harbour precinct with Darling Drive to the west and Darling Harbour and the International Convention Centre is located to the south.

The proposed pool area is located on level 4 and there is a desire to include speakers for background music only, which has been assessed in this report.

Refer to Figure 1 below, which is an aerial photo of the subject site. The potentially affected receivers include those detailed in the Figure below.

Figure 1 – Site Description and Noise Measurement Locations

The proposed level 4 pool area is detailed in the figure below and the detailed floor plan is included in Appendix A.

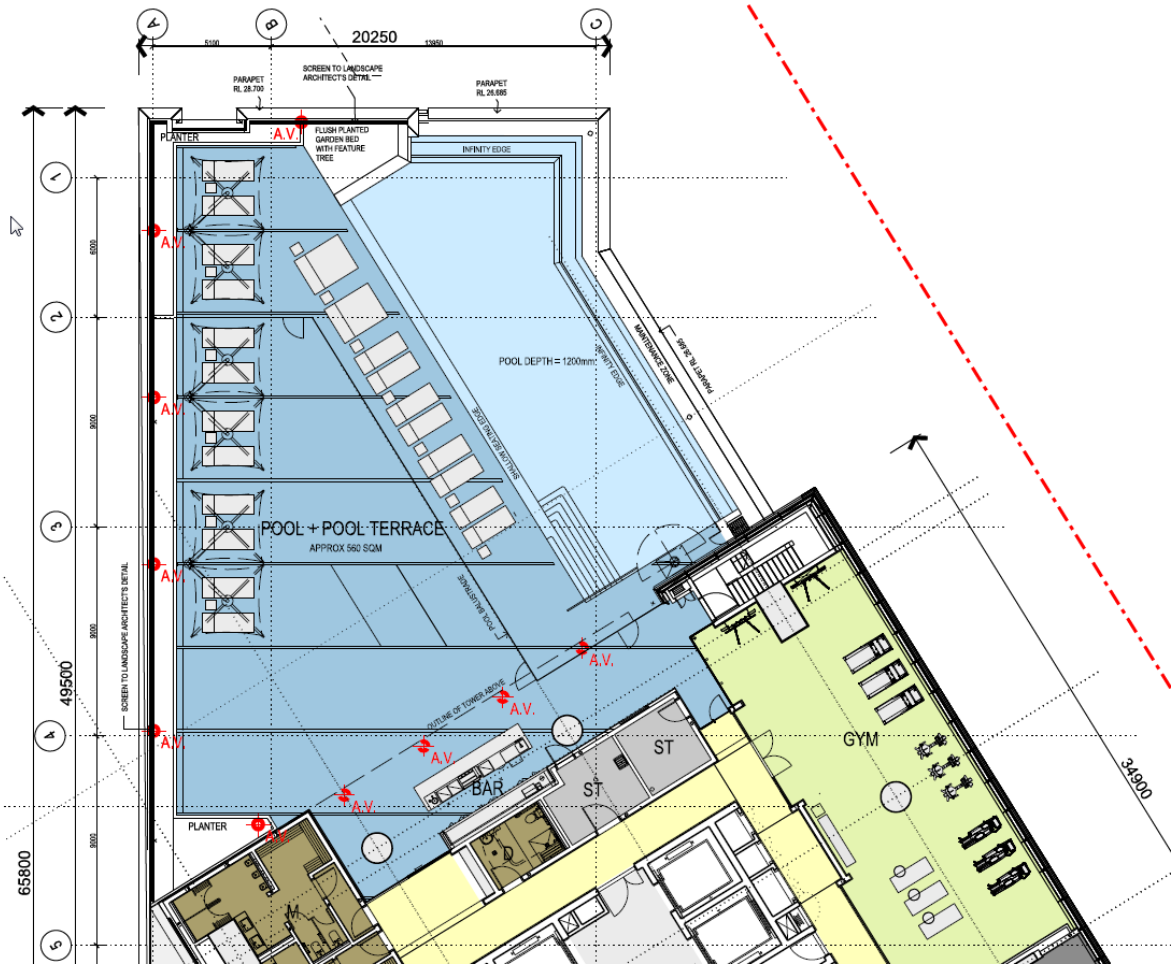


Figure 2: Proposed Level 4 Pool Area and Indicative Speaker Locations

3 NOISE DESCRIPTORS

Environmental noise constantly varies in level, due to fluctuations in local noise sources including noise from nearby road traffic on surrounding roadways. Accordingly, a 15 minute measurement interval is normally utilised. Over this period, noise levels are monitored on a continuous basis and statistical and integrating techniques are used to determine noise description parameters.

In the case of environmental noise three principle measurement parameters are used, namely L_{A10}, L_{A90} and L_{Aeq}.

The L_{A10} and L_{A90} measurement parameters are statistical levels that represent the average maximum and average minimum noise levels respectively, over the measurement intervals.

The L_{A10} parameter is commonly used to measure noise produced by a particular intrusive noise source since it represents the average of the loudest noise levels produced by the source.

Conversely, the L_{A90} level *(which is commonly referred to as the background noise level)* represents the noise level heard in the quieter periods during a measurement interval. The L_{A90} parameter is used to set the allowable noise level for new, potentially intrusive noise sources since the disturbance caused by the new source depends on how audible it is above the pre-existing noise environment, particularly during quiet periods, as represented by the L_{A90} level.

The L_{Aeq} parameter represents the average noise energy during a measurement period. This parameter is derived by integrating the noise levels measured over the measurement period. L_{Aeq} is important in the assessment of traffic noise impacts as it closely corresponds with human perception of a changing noise environment; such is the character of industrial noise.

4 EXISTING BACKGROUND NOISE LEVELS

The acoustic environment surrounding the proposed development is characterised by relatively lively background noise levels associated with traffic noise from surrounding roadways the ICC entertainment precinct and Harbourside shopping centre adjacent and the general hum of the area. Previous noise level measurements and monitoring has been conducted at the site as part of the approvals for the site, which has been used as the basis of this assessment.

Measured background noise levels are presented below based on the noise levels detailed within the Wilkinson Murray, *Sydney International Convention Centre, Exhibition and Entertainment Precinct (SICEEP) Hotel Project Application Noise and Vibration Report*, which was included as part of the project applications process. The Wilkinson Murray report is included in Appendix B.

Table 1 - Measured Background Noise Levels

Location	**Rating Background Noise Level dB(A)$L_{90(period)}$**		
	Daytime (7am – 6pm)	**Evening (6pm – 10pm)**	**Night (10pm – 7am)**
Southern Terrace of Novotel Sydney at Darling Harbour	58	59	52

The relevant background noise spectra from the onsite attended noise measurements are presented in the following table.

Table 2 - Measured Background Noise Spectra

	Frequency (Hz) dB									
Time of Day	31.5Hz	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	A-Weight
Daytime	63	64	60	57	55	53	52	44	36	**58**
Evening	64	65	61	58	56	54	53	45	39	**59**
Night	57	58	54	51	49	47	46	38	30	**52**

5 NOISE EMISSION GUIDELINES AND ASSESSMENT CRITERIA

Noise emissions from the proposed Level 4 outdoor terrace will be assessed to comply with the criteria outlined in:

- The projects Conditions of Consent including SSD 8631

Details of the relevant criteria are included in the sections below.

Noise from entertainment venues

G21. The $L_{A10,\ 15\ minute}$ noise level emitted from the use must not exceed the background noise level ($L_{A90,\ 15minute}$) in any Octave Band Centre Frequency (31.5 Hz to 8 kHz inclusive) by more than 5dB between 7am and midnight when assessed at the boundary of any affected residence.

G22. The $L_{A10,\ 15\ minute}$ noise level emitted from the use must not exceed the background noise level ($L_{A90,\ 15\ minute}$) in any Octave Band Centre Frequency (31.5 Hz to 8 kHz inclusive) between midnight and 7am when assessed at the boundary of any affected residence.

G23. Notwithstanding compliance with (G21) and (G22) above, noise from the use when assessed as an $L_{A10,\ 15\ minute}$ enters any residential use through an internal to internal transmission path is not to exceed the existing internal $L_{A90,\ 15\ minute}$ (from external sources excluding the use) in any Octave Band Centre Frequency (31.5 Hz to 8 kHz inclusive) when assessed within a habitable room at any affected residential use between 7am and midnight. Where the $L_{A10,\ 15\ minute}$ noise level is below the threshold of hearing, Tf at any Octave Band Centre Frequency as defined in Table 1 of International Standard ISO 226: 2003 - *Normal Equal-Loudness-Level Contours* then the value of Tf corresponding to that Octave Band Centre Frequency shall be used instead.

G24. Notwithstanding compliance with (G21), (G22) and (G23) above, the noise from the use must not be audible within any habitable room in any residential use between midnight and 7am.

G25. The $L_{A10,\ 15\ minute}$ noise level emitted from the use must not exceed the background noise level ($L_{A90,\ 15\ minute}$) in any Octave Band Centre Frequency (31.5 Hz to 8 kHz inclusive) by more than 3dB when assessed indoors at any affected commercial premises.

Note: The $L_{A10,\ 15\ minute}$ noise level emitted from the use is as per the definition in the Australian Standard AS1055-1997 *Acoustics – Description and measurement of environmental noise*. The background noise level $L_{A90,\ 15\ minute}$ is to be determined in the absence of noise emitted by the use and be representative of the noise sensitive receiver. It is to be determined from the assessment L_{A90} / rating L_{A90} methodology in complete accordance with the process listed in the *NSW EPA Industrial Noise Policy* and relevant requirements of AS1055.1997.

General noise

G26. The emission of noise associated with the use of the premises including the cumulative operation of any mechanical plant and equipment, and air conditioning shall comply with the following:

a) The $L_{Aeq,\ 15\ minute}$ noise level emitted from the use must not exceed the project specific noise level for that receiver as determined in accordance with the *NSW EPA Industrial Noise Policy*. Noise must be measured in accordance with the Industrial Noise Policy and relevant requirements of Australian Standard AS 1055-1997 *Acoustics – Description and measurement of environmental noise*.

b) Project specific noise levels shall be determined by establishing the existing environmental noise levels, in complete accordance with the assessment $L_{A90,\ 15\ minute}$ / rating $L_{A90,\ 15\ minute}$ process to be in accordance with the requirements for noise monitoring listed in the *NSW EPA Industrial Noise Policy* and relevant requirements of Australian Standard AS1055-1997 Standard AS 1055-1997 Acoustics – Description and measurement of environmental noise.

c) Modifying factors in Table 4.1 of the *NSW EPA Industrial Noise Policy* are applicable.

G27. An $L_{Aeq,15\ minute}$ noise level emitted from the use must not exceed the $L_{A90,\ 15\ minute}$ noise level by more than 3dB in any Octave Band Centre Frequency (31.5 Hz to 8 kHz inclusive) when assessed inside any habitable room of any affected residence or noise sensitive commercial premises provided that:

a) Where the $L_{A90,\ 15\ minute}$ noise level is below the threshold of hearing, Tf at any Octave Band Centre Frequency as defined in Table 1 of International Standard ISO 226: 2003 - *Normal Equal-Loudness-Level Contours* then the value of Tf corresponding to that Octave Band Centre Frequency shall be used instead.

b) The $L_{Aeq,15\ minute}$ noise level and the $L_{A90,15\ minute}$ noise level shall both be measured with all external doors and windows of the affected residence closed.

c) The relevant background noise level ($L_{A90,\ 15\ minute}$) is taken to mean the day, evening or night rating background noise level determined in complete accordance with the methodology outlined in the *NSW EPA Industrial Noise Policy* and Australian Standard AS1055.1997 *Acoustics – Description and measurement of environmental noise*.

d) Background noise shall be established in the absence of all noise emitted from the use but with the ventilation equipment normally servicing the affected residence operating. Background noise measurements are to be representative of the environmental noise levels at the affected location.

e) Modifying factors in Table 4.1 of the *NSW EPA Industrial Noise Policy* are applicable. Internal Noise measurements are not to be corrected for duration.

Music / noise amplification outside

G30. Speakers and/or noise amplification equipment must not be installed and music must not be played in any of the outdoor areas associated with the premises, except at the porte cochere where ambient background music complies with conditions G21 to G25. Speakers located within the premises must not be placed so as to direct the playing of music towards the outdoor areas associated with the premises.

Note this report details a response to condition G30 above and details the suitable operational conditions of the speakers within the pool area providing background music only, which will be acoustically acceptable and compliant within the performance requirements of the Conditions of Consent, including items G21-G27.

6 PROJECT CRITERIA

The corresponding noise emission goals applicable based on the projects conditions of consent requirements are outlined below:

Table 3 – Criteria for Residential Receivers – Acoustic Objectives dB(A)$L_{10(15minutes)}$ (Background + 5dB) – Till Midnight, Externally

Location	Time Period	31.5Hz	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	A-wt
Affected residence	Daytime (7am – 6pm)	68	69	65	62	60	58	57	49	41	**64**
	Evening (6pm – 10pm)	69	70	66	63	61	59	58	50	42	**64**
	Night (10pm – 12am)	62	63	59	56	54	52	51	43	35	**57**
	Night (12am-7am)	57	58	54	51	49	47	46	38	30	**52**

7 NOISE EMISSION ASSESSMENT

Primary noise sources associated with the proposed level 4 pool area with the potential to cause impacts on surrounding sensitive receivers includes the operation of the speakers on the external area. The proposed playing of amplified music or speakers will be for background noise levels only.

7.1 RECOMMENDATIONS FOR DESIGN & MANAGEMENT

The following building and management controls are recommended to ensure compliance with the noise level criterion detailed in this report;

- The playing of noise via the proposed speakers to the pool area is to be limited for background noise levels only such that the sound pressure level from the amplified noise (speech or music) in the absence of patron noise is no greater than 70 dB(A) when measured @ 2m from any speaker as generally detailed in Figure 2 above.

7.2 SAMPLE CALCULATIONS

A sample calculation for the potential noise impact from the proposed background music levels on the pool deck on level 4 the hotel noise receiver to the west of the site has been undertaken and is detailed below for the worst case night time period prior to midnight.

The calculation is based on the expected background music noise levels of Sound Pressure Level of 70 dB(A) at 2m as detailed below.

Item	**Noise Level dB – Frequency(Hz)**									
	31.5	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**	**A-wt**
Sound Pressure Level (SPL) of music @ 2m dBL_{10}	**55**	**55**	**63**	**63**	**69**	**66**	**61**	**52**	**40**	**70**
Percentage of Sound for number of Speakers	8	8	8	8	8	8	8	8	8	
Distance Correction	-39	-39	-39	-39	-39	-39	-39	-39	-39	
Predicted Noise Level at Hotel – dBL_{10}	**24**	**24**	**32**	**32**	**38**	**35**	**30**	**21**	**9**	**39**
Criteria	**62**	**63**	**59**	**56**	**54**	**52**	**51**	**43**	**35**	**57**
Complies	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**

8 CONCLUSION

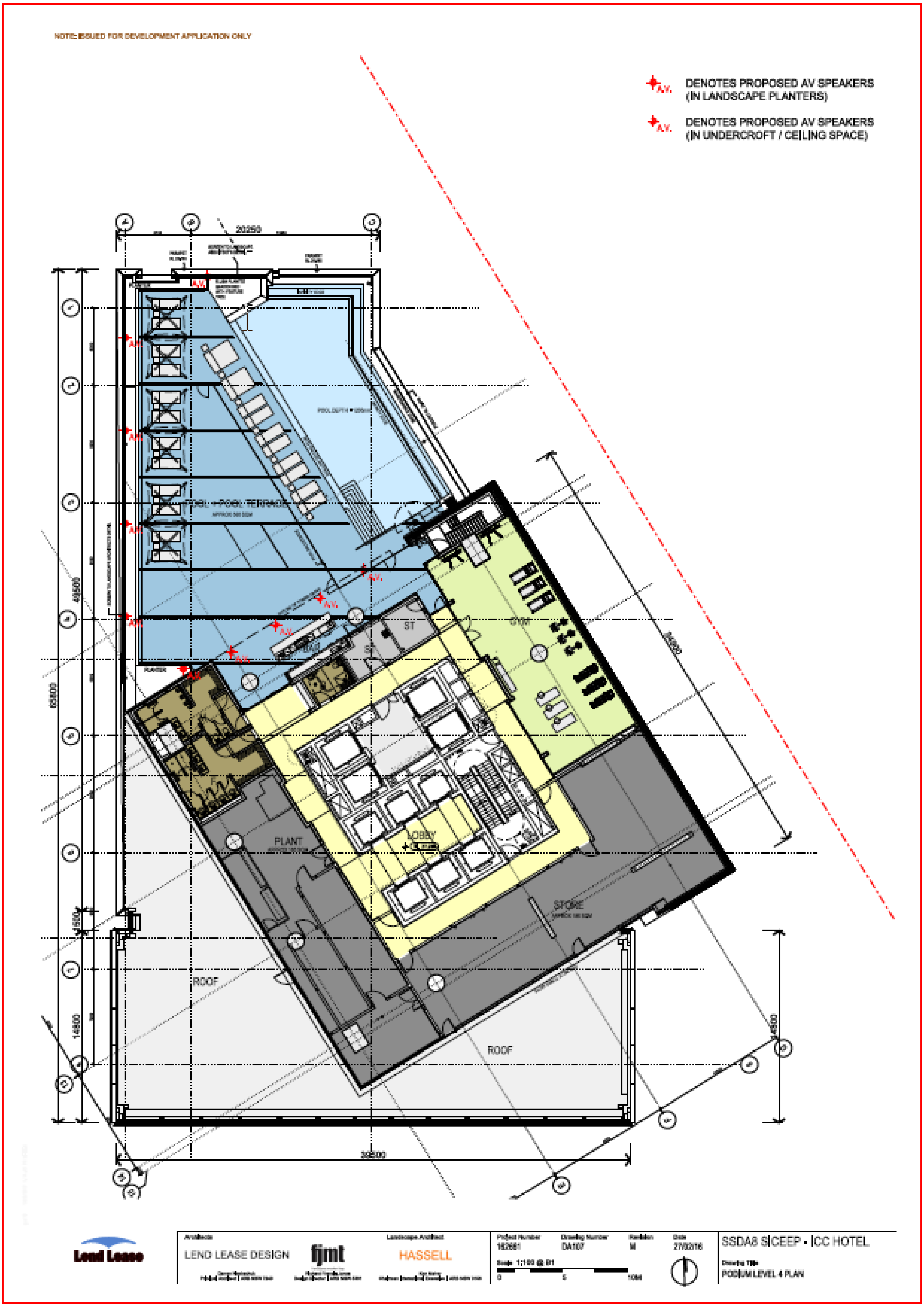
Noise emissions have been predicted and assessed against the projects required Conditions of Consent for the Level 4 pool within the International Convention Centre Hotel (ICC Hotel).

Subject to the implementation of the acoustic mitigation in Section 7 of this report being adopted there is no unacceptable noise impact associated with the proposed pool including the speakers to the external area of the pool and compliance with the project requirements will be achieved as detailed in Section 7.

Yours faithfully,

Acoustic Logic Consultancy Pty Ltd
Ben White

APPENDIX A – LEVEL 4 FLOOR PLAN


NOTE: ISSUED FOR DEVELOPMENT APPLICATION ONLY
DENOTES PROPOSED AV SPEAKERS (IN LANDSCAPE PLANTERS)
DENOTES PROPOSED AV SPEAKERS (IN UNDERCROFT / CEILING SPACE)
POOL + POOL TERRACE
GYM
LOBBY
PLANT
STORE
ROOF
ROOF
20250
39500
LEND LEASE DESIGN
fjmt
HASSELL
SSDA8 SICEEP - ICC HOTEL
PODIUM LEVEL 4 PLAN

APPENDIX B - SYDNEY INTERNATIONAL CONVENTION, EXHIBITION AND ENTERTAINMENT PRECINCT (SICEEP) HOTEL PROJECT APPLICATION NOISE AND VIBRATION REPORT

ACOUSTICS AND AIR

SYDNEY INTERNATIONAL CONVENTION, EXHIBITION AND ENTERTAINMENT PRECINCT (SICEEP)

HOTEL PROJECT APPLICATION
NOISE AND VIBRATION REPORT

REPORT NO. 12322
VERSION B

AUGUST 2013

PREPARED FOR

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DOCUMENT CONTROL

Version	Status	Date	Prepared By	Reviewed By
B	Final	26 August 2013	Brian Clarke	JW

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GLOSSARY OF ACOUSTIC TERMS

Most environments are affected by environmental noise which continuously varies, largely as a result of road traffic. To describe the overall noise environment, a number of noise descriptors have been developed and these involve statistical and other analysis of the varying noise over sampling periods, typically taken as 15 minutes. These descriptors, which are demonstrated in the graph below, are here defined.

Maximum Noise Level (L_{Amax}) – The maximum noise level over a sample period is the maximum level, measured on fast response, during the sample period.

L_{A1} – The L_{A1} level is the noise level which is exceeded for 1% of the sample period. During the sample period, the noise level is below the L_{A1} level for 99% of the time.

L_{A10} – The L_{A10} level is the noise level which is exceeded for 10% of the sample period. During the sample period, the noise level is below the L_{A10} level for 90% of the time. The L_{A10} is a common noise descriptor for environmental noise and road traffic noise.

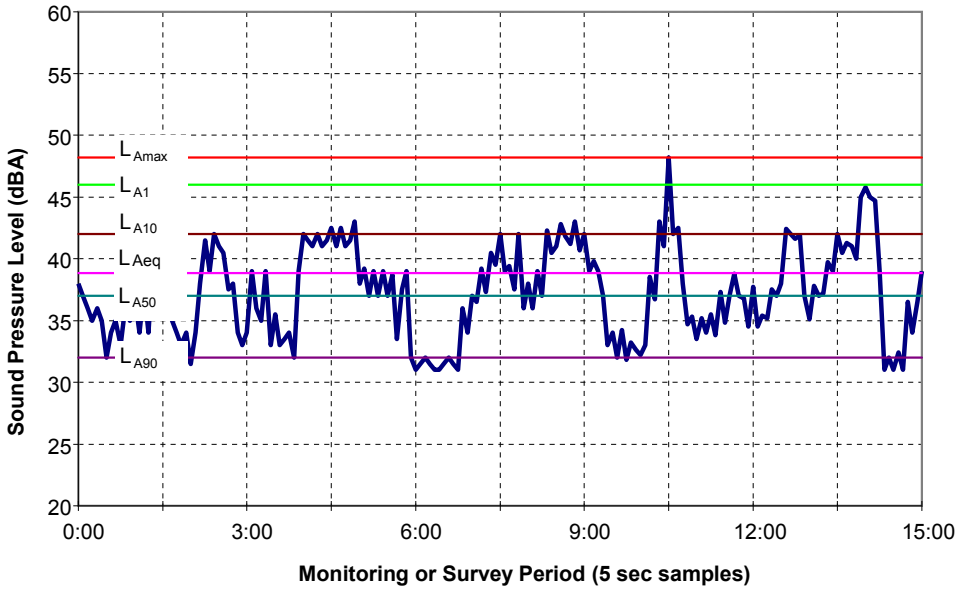
L_{A90} – The L_{A90} level is the noise level which is exceeded for 90% of the sample period. During the sample period, the noise level is below the L_{A90} level for 10% of the time. This measure is commonly referred to as the background noise level.

L_{Aeq} – The equivalent continuous sound level (L_{Aeq}) is the energy average of the varying noise over the sample period and is equivalent to the level of a constant noise which contains the same energy as the varying noise environment. This measure is also a common measure of environmental noise and road traffic noise.

ABL – The Assessment Background Level is the single figure background level representing each assessment period (daytime, evening and night time) for each day. It is determined by calculating the 10^{th} percentile (lowest 10^{th} percent) background level (L_{A90}) for each period.

RBL – The Rating Background Level for each period is the median value of the ABL values for the period over all of the days measured. There is therefore an RBL value for each period – daytime, evening and night time.

Typical Graph of Sound Pressure Level vs Time



1 INTRODUCTION

This report supports a State Significant Development Application (SSDA) submitted to the Minister for Planning and Infrastructure pursuant to Part 4 of the Environmental Planning and Assessment Act 1979 (EP&A Act).

The Application (referred to as SSDA6) seeks approval for construction of the International Convention Centre (ICC) Hotel component of the Sydney International Convention, Exhibition and Entertainment Precinct (SICEEP) at Darling Harbour.

This SSDA follows SSDA1, which seeks approval for the core convention, exhibition and entertainment facilities of the SICEEP Project; SSDA2, a staged application that sets out a Concept Proposal for a new mixed use neighbourhood at Darling Harbour known as 'The Haymarket'; and a number of detailed proposals (SSDA3, SSDA4, and SSDA5) for use of development plots within The Haymarket. SSDAs 1 and 2 were submitted to the Department of Planning and Infrastructure (DoPI) in March 2013, and the SSDAs 3-5 were submitted in May 2013.

The ICC Hotel forms part of the SICEEP Project, which will deliver Australia's global city with new world class convention, exhibition and entertainment facilities and support the NSW Government's goal to "make NSW number one again".

Wilkinson Murray Pty Ltd has been engaged by Lend Lease to prepare a Development specific Noise and Vibration Report to support the application be submitted to the NSW Department of Planning. The scope of this assessment address the Director General's Requirements (DGR's) which relate to noise and vibration specifically:

- Identify the main noise and vibration generating sources and activities at all stages of construction (including demolition), and any noise sources during operation. Outline measures to minimise and mitigate the potential noise impacts to the surrounding area.

Relevant Policies and Guidelines:

- NSW Industrial Noise Policy (EPA, 2000)
- Interim Construction Noise Guideline (DECC, 2009)
- Assessing Vibration: A Technical Guideline (DEC, 2006)
- Environmental Criteria for Road Traffic noise (EPA, 1999)

The following sections of this assessment detail the methodology, assessment criteria, results and acoustical recommendations.

1.1 Overview of Proposed Development

The proposal relates to a SSDA for the ICC Hotel component of the SICEEP Project. The hotel is located at the northern end of the precinct and comprises a single building with up to 650 keys. The hotel is being developed by Lend Lease and is consistent with Darling Harbour Live's Preferred Precinct Plan.

More specifically, this SSDA seeks approval for the following components of the development:

- Demolition of existing site improvements;
- Associated tree removal and replanting;
- Construction and use of a single hotel tower providing for up to 656 keys and including guest facilities, restaurant and ballroom;
- Public domain improvements including integration with existing / proposed works; and
- Extension, realignment and augmentation of physical infrastructure / utilities as required.

1.2 Background

The NSW Government considers that a precinct-wide renewal and expansion of the existing convention, exhibition and entertainment centre facilities at Darling Harbour is required, and is committed to Sydney reclaiming its position on centre stage for hosting world-class events with the creation of the Sydney International Convention, Exhibition and Entertainment Precinct.

Following an extensive and rigorous Expressions of Interest and Request for Proposals process, a consortium comprising AEG Ogden, Lend Lease, Capella Capital and Spotless was announced by the NSW Government in December 2012 as the preferred proponent to transform Darling Harbour and create SICEEP.

Key features of the Preferred Precinct Plan include:

- Delivering world-class convention, exhibition and entertainment facilities, including:
    - Up to 40,000m^2 exhibition space;
    - Over 8,000m^2 of meeting rooms space, across 40 rooms;
    - Overall convention space capacity for more than 12,000 people;
    - A ballroom capable of accommodating 2,000 people; and
    - A premium, red-carpet entertainment facility with a capacity of 8,000 persons.
- Providing a hotel complex at the northern end of the precinct, immediately adjacent to the new International Convention Centre.
- A vibrant and authentic new neighbourhood at the southern end of the precinct, called 'The Haymarket', including apartments, student accommodation, community facilities, shops, cafes and restaurants.
- Renewed and upgraded public domain that has been increased by a hectare, including an outdoor event space for up to 27,000 people at an expanded Tumbalong Park.
- Improved pedestrian connections linking to the proposed Goods Line (formerly Ultimo Pedestrian Network) drawing people between Central, Chinatown and Cockle Bay Wharf as well as east-west between Ultimo/Pyrmont and the City.

1.3 Site Description

The SICEEP Site is located within Darling Harbour. Darling Harbour is a 60 hectare waterfront precinct on the south-western edge of the Sydney Central Business District that provides a mix of functions including recreational, tourist, entertainment and business.

With an area of approximately 20 hectares, the SICEEP Site is generally bound by the Light Rail Line to the west, Harbourside shopping centre and Cockle Bay to the north, Darling Quarter, the Chinese Garden and Harbour Street to the east, and Hay Street to the south. The SICEEP Site has been divided into three redevelopment areas – Bayside, Darling Central and The Haymarket.

The ICC Hotel Site (refer to Figure 1.1):

- is located within the northern end of the Bayside precinct;
- is bound by Harbourside Shopping Centre to the north and east, the International Convention Centre to the south and Darling Drive to the west; and
- occupies an area of approximately 3,730m^2.

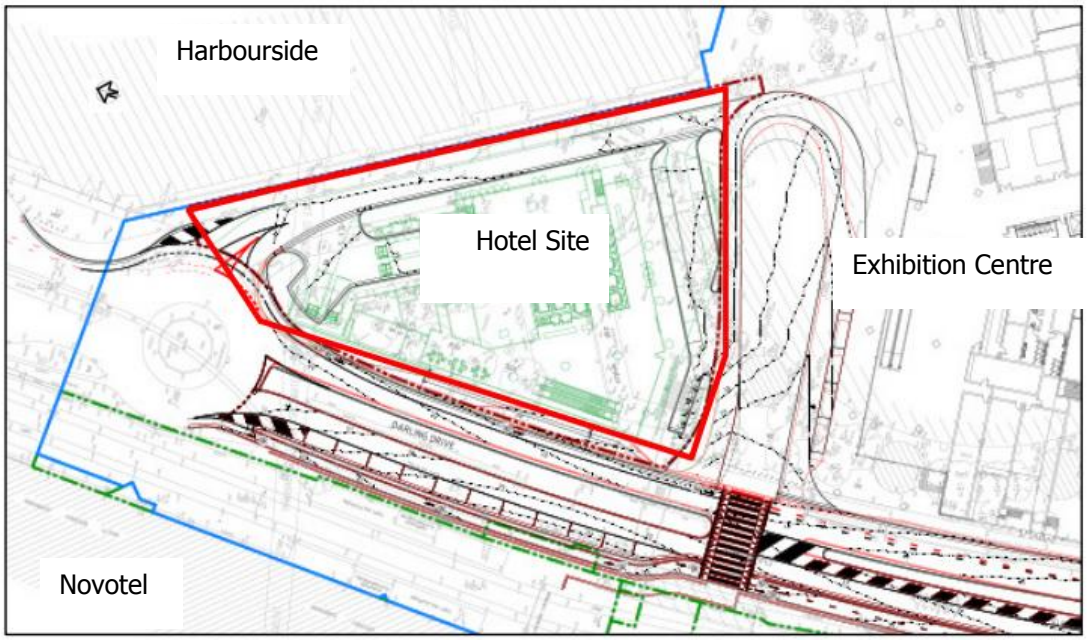
Figure 1.1 Aerial Photograph of the SICEEP Site and Redevelopment Areas

Surrounding receivers have been identified as:

- The Novotel Hotel to the West of the site at a distance approximately 40 metres,
- Harbourside Retail Precinct to the East of the site at a distance approximately 15 metres,
- Existing Convention Centre (to be replaced) at a distance of approximately 30 metres.
- Goldsbrough Apartments (243 Pyrmont Street) at a distance of approximately 150 metres

The layout of the proposed development is shown in Figure 2-2.

Figure 2-2 Proposed ICC Hotel Site



1.4 Planning Approvals Strategy

The SICEEP Project will result in the lodgement of numerous SSDAs for the various components of the redevelopment project. SSDAs have already been lodged for the PPP component of the SICEEP Project (comprising the convention centre, exhibition centre, entertainment facility and ancillary commercial premises and associated public domain upgrades), the Stage 1 Concept Proposal for The Haymarket, and the Stage 2 detailed proposals for three of the development plots within The Haymarket. Future applications will be lodged for the remaining development plots within The Haymarket Site.

This Application relates to a SSDA6 for the ICC Hotel component of the SICEEP Project and is consistent with Darling Harbour Live's Preferred Precinct Plan.

2 EXISTING NOISE ENVIRONMENT

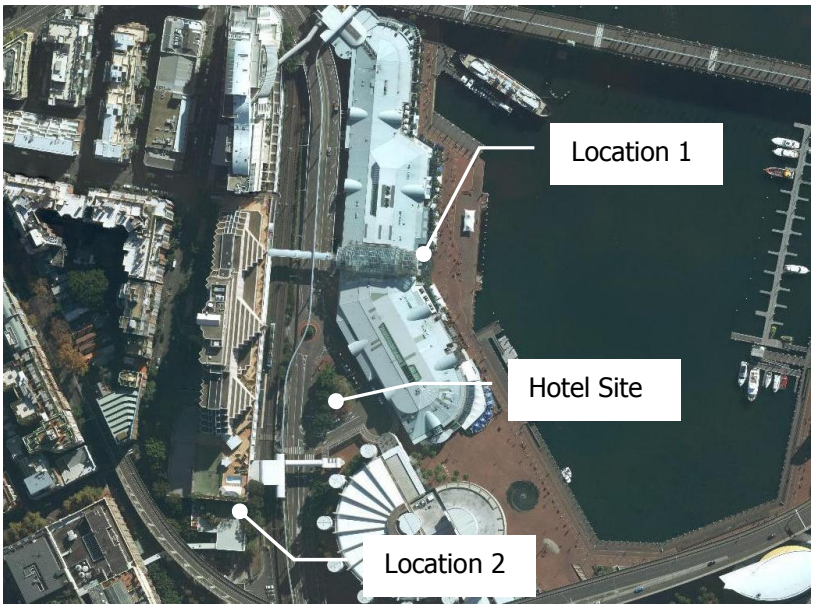
In order to quantify the existing noise environment, long-term ambient noise levels were monitored at around the site. These measurements were conducted by Wilkinson Murray and AECOM for the PPP application as follows:

Table 2-1 Supplementary Long-Term Noise Monitoring Locations

Location	Location	Monitoring Period	Company
1	Harbourside (Darling Harbour)	3 August to 10 August 2012	Wilkinson Murray
2	Southern Terrace of Novotel Sydney at Darling Harbour	25 January to 31 January 2013	AECOM

Figure 3.1 show these monitoring locations.

Figure 3.1 Site Monitoring Locations



The loggers determine L_{A1}, L_{A10}, L_{A90} and L_{Aeq} levels of the ambient noise. L_{A1}, L_{A10} and L_{A90} are the levels exceeded for 1%, 10% and 90% of the sample time respectively (see Glossary for definitions). The L_{A1} is indicative of maximum noise levels due to individual noise events such as the occasional pass-by of a heavy vehicle. The L_{A90} level is normally taken as the background noise level during the relevant period.

Detailed results for each monitoring location are shown in graphical form in Appendix A. The graphs show measured values of L_{Aeq}, L_{A90}, L_{A10} and L_{A1} for each 15-minute monitoring period

The results of noise measurements were processed in accordance with the procedures of the

NSW DEC's Industrial Noise Policy. The results are detailed in Table 3.1.

Table 3-1 Measured Noise Levels-dBA

	Period					
	Day (07:00-18:00)		**Evening (18:00-22:00)**		**Night(22:00-07:00)**	
Descriptor	L_{Aeq}	RBL	L_{Aeq}	RBL	L_{Aeq}	RBL
Location 1	*66*	61	71	62	*64*	51
Location 2	*67*	58	67	59	*62*	52

Noise levels in the area are consistent with an "urban" noise environment whereby "city hum', harbour and traffic noise is present.

In addition daytime traffic noise levels were measured at the Novotel site by AECOM whereby a noise levels of 68 dBA ($L_{Aeq\ period}$) was determined.

3 NOISE AND VIBRATION CRITERIA

3.1 Construction Noise Criteria

Site specific construction noise and vibration criteria are based on the following EPA guidelines, being:

- *Interim Construction Noise Guideline*; and,
- *Assessing Vibration: A Technical Guideline*.

3.1.1 Construction Noise Criteria

The EPA released the "*Interim Construction Noise Guideline*" *(ICNG)* in July 2009. The guideline provides construction management levels that assist in assessing the impact of construction noise on surrounding receivers. The guidelines are presented Table 3-1 and summarised below.

For residences, the standard daytime construction noise management level is that the $L_{Aeq,15min}$ construction noise level emanating from the site should not exceed the background noise by more than 10dBA at surrounding receivers. This is for standard hours as defined by the *ICNG* which are:

- Monday to Friday 7.00am to 6.00pm; and
- Saturday 8.00am to 1.00pm.

Outside the standard hours, the management level is based on the background + 5dBA.

Table 3-1 Construction Noise Goals at Residences using Quantitative Assessment

Time of Day	Management Level $L_{Aeq,(15min)}$	How to Apply
Recommended Standard Hours: Monday to Friday 7am to 6pm Saturday 8am to 1pm No work on Sundays or Public Holidays	Noise affected RBL + 10dBA	The noise affected level represents the point above which there may be some community reaction to noise. Where the predicted or measured $L_{Aeq,(15min)}$ is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to minimise noise. The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.

Time of Day	Management Level $L_{Aeq,(15min)}$	How to Apply
	Highly noise affected 75dBA	The highly noise affected level represents the point above which there may be strong community reaction to noise. Where noise is above this level, the proponent should consider very carefully if there is any other feasible and reasonable way to reduce noise to below this level. If no quieter work method is feasible and reasonable, and the works proceed, the proponent should communicate with the impacted residents by clearly explaining the duration and noise level of the works, and by describing any respite periods that will be provided.
Outside recommended standard hours	Noise affected RBL + 5 dB	A strong justification would typically be required for works outside the recommended standard hours. The proponent should apply all feasible and reasonable work practices to meet the noise affected level. Where all feasible and reasonable practices have been applied and noise is more than 5dB(A) above the noise affected level, the proponent should negotiate with the community.

In addition, the following $L_{Aeq,15\ min}$ construction noise management levels are recommended for other receivers and areas.

- Offices, retail outlets: external $L_{Aeq,15\ min}$ 70dBA

Based on the above, Table 3-2 presents the applicable site specific construction noise management levels at surrounding receivers.

Table 3-2 Site Specific Construction Noise Management Levels

Location	Construction Noise Management Level, L_{Aeq} – dBA				Maximum Construction Noise Level, L_{Aeq} – dBA
	Day	Evening	Night	Saturday* (extended)	
1 – Habourside	70 (at all times)				
2 –Novotel / Goldsbrough Apartments	68	65	57	61	75
All Commercial Properties	70 (at all times)				

* Based on a Saturday 26 January 2013 Daytime RBL plus 5 dBA.

3.2 Vibration Criteria

Human Comfort and Building Damage construction vibration criteria that have been established and are summarised in the following sections.

3.2.1 Human Comfort Vibration Criteria

Table 3-3 details guidance on preferred values for continuous vibration.

Table 3-3 Criteria for Exposure to Continuous Vibration

Place	Time	Peak Particle Velocity (mm/s)	
		Preferred	Maximum
Residences	Daytime	0.28	0.56
Offices	Day or night time	0.56	1.1

In the case of intermittent vibration, which is caused by plant such as rock breakers or sheet piling, the criteria are expressed as a Vibration Dose Value (VDV) which is presented in Table 3-4.

Table 3-4 Acceptable Vibration Dose Values for Intermittent Vibration ($m/s^{1.75}$)

Location	Daytime		Night Time	
	Preferred Value	Maximum Value	Preferred Value	Maximum Value
Residences	0.20	0.40	0.13	0.26

Calculation of VDV requires knowledge of the number of events in the relevant time period.

3.2.2 Building Damage

The recommended limits (guide values from BS7385) for transient vibration to ensure minimal risk of cosmetic damage to residential and industrial buildings are presented in Table 3-5.

Table 3-5 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	50mm/s at 4 Hz and above	N/A
Unreinforced or light framed structures Residential or light commercial type buildings	15mm/s at 4 Hz increasing to 20mm/s at 15 Hz	20mm/s at 15 Hz increasing to 50mm/s at 40 Hz and above

In addition to the British Standard, for the case of nearby heritage buildings, guidance for structural damage is derived from the German Standard DIN 4150 – 3 *"Structural Vibration Part 3 – Effects of Vibration on Structures".* Table 3-6 details the recommendations for heritage buildings.

Table 3-6 DIN 4150 recommended vibration level for Heritage Buildings

Frequency Range of Predominant Pulse	1-10 Hz	10 to 15 Hz	40 to 50 Hz
Peak component particle velocity	3 mm/s	3 to 8 mm/s	8-10 mm/s

3.3 Operational Noise Criteria

The *NSW Industrial Noise Policy (INP)* recommends two criteria, "Intrusiveness" and "Amenity", both of which are relevant for the assessment of noise. In most situations, one of these is more stringent than the other and dominates the noise assessment. The criteria are based on the L_{Aeq} descriptor, which is explained in the glossary.

3.3.1 Intrusiveness Noise Criterion

The intrusiveness criterion requires that the L_{Aeq} noise level from the source being assessed, when measured over 15 minutes, should not exceed the Rating Background Noise Level (RBL) by more than 5dBA. The RBL (as presented in Table 3-1 for each long term monitoring site) represents the 'background' noise in the area, and is determined from measurement of L_{A90} noise levels, in the absence of noise from the source. The definition of L_{A90} and the procedure for calculating the RBL is presented in the glossary.

It should be noted that an intrusiveness criterion applies for residential receivers only.

3.3.2 Amenity Noise Criterion

The amenity noise criterion sets a limit on the total noise level from *all industrial noise sources* affecting a receiver. Different criteria apply for different types of receiver (e.g. residence, school classroom); different areas (e.g. rural, suburban); and different time periods, namely daytime (7.00am-6.00pm), evening (6.00pm-10.00pm) and night time (10.00pm-7.00am).

The noise level to be compared with this criterion is the L_{Aeq} noise level, measured over the time period in question, due to all industrial noise sources, but excluding non-industrial sources such as transportation.

Where a new noise source is proposed in an area with negligible existing industrial noise, the amenity criterion for that source may be taken as being equal to the overall amenity criterion. However, if there is significant existing industrial noise, the criterion for any new source must be set at a lower value. If existing industrial noise already exceeds the relevant amenity criterion, noise from any new source must be set well below the overall criterion to ensure that any increase in noise levels is negligible. Methods for determining a source-specific amenity criterion where there is existing industrial noise are set out in the *INP.*

3.3.3 Determination of Site Specific Noise Criteria

For this assessment, the Hotel residential receivers were considered as 'urban' in line with the *INP*. Given our observations on and around site, noise at all locations is dominated by general traffic, urban hum, and other sources that are not classified as industrial. As such, we have assumed that the $L_{Aeq,\ period}$ from industrial noise is more than 10dB below the designated amenity criterion during any time period. Therefore, no correction to the amenity criteria is warranted.

Table 3-7 presents the criteria for the nearest residential receivers being the Novotel Hotel and Goldsbrough Apartments. This was calculated by adding 5dB to the RBL of the nearest long term monitoring location, as discussed in Section 3.3.1 above.

Table 3-7 Noise Criteria at Novotel Hotel and Goldsbrough Apartments

Criterion	Period		
	Daytime 7-6pm	**Evening 6-10pm**	**Night Time 10pm-7am**
Intrusive - $L_{Aeq,15min}$ (dBA)	63	64	57
Amenity - $L_{Aeq,period}$ (dBA)	**60**	**50**	**45**

Intrusiveness noise criteria are expressed in terms of $L_{Aeq,15min}$, whereas amenity criteria are in terms of $L_{Aeq,Period}$, which is generally lower than $L_{Aeq,15min}$ due to variability in noise emission from a noise source. However, in the case of noise emissions from continuously-operating mechanical plant this difference is small, and in this report it will be conservatively assumed that $L_{Aeq,Period}$ noise levels will be the same as $L_{Aeq,15min}$.

On this basis, the amenity criteria highlighted above are generally more stringent than the intrusiveness criteria and have been adopted as project specific noise criteria for this project.

In the case of commercial premises when in use an amenity criterion of 65 -70 dBA has been established.

3.4 Noise Criteria for Road Traffic

It is acknowledged that the DGRs specify that the Environmental Criteria for Road Traffic Noise (EPA, 1999) (ECRTN) to be used for the assessment of road traffic noise associated with the SICEEP Project. However, WM advises that the ECRTN document has been superseded by the EPA's NSW Road Noise Policy (RNP) in 2011.

Therefore, noise from traffic movements to and from the SICEEP site including truck and car movements will be assessed using the RNP.

Therefore criteria for assessment of road traffic noise are set out in the NSW Government's *NSW Road Noise Policy (RNP)*. Table 4-8 sets out the assessment criteria for residences to be applied to particular types of project, road category and land use.

The roads likely to be affected by additional traffic from the Hotel are best described as "Freeway/arterial/sub-arterial roads", and hence the criteria for item 3 above are applicable and

will be adopted in this report.

In summary the noise level goals at the residential receivers, for this project, based on the *RNP* are:

- $L_{Aeq,15hr}$ day 60 dBA.
- $L_{Aeq,9hr}$ night 55 dBA;

Table 4-8 Traffic noise criteria extracted from the NSW *RNP*

Road category	Type of project/land use	Assessment criteria – dB(A)	
		Day (7 a.m.–10 p.m.)	Night (10 p.m.–7 a.m.)
Freeway/ arterial/ sub-arterial roads	1. Existing residences affected by noise from **new** freeway/arterial/sub-arterial road corridors	$L_{Aeq,\ (15\ hour)}$ 55 (external)	$L_{Aeq,\ (9\ hour)}$ 50 (external)
	2. Existing residences affected by noise from **redevelopment** of existing freeway/arterial/sub-arterial roads 3. Existing residences affected by **additional traffic** on existing freeways/arterial/sub-arterial roads generated by land use developments	$L_{Aeq,\ (15\ hour)}$ 60 (external)	$L_{Aeq,\ (9\ hour)}$ 55 (external)
Local roads	4. Existing residences affected by noise from **new** local road corridors 5. Existing residences affected by noise from **redevelopment** of existing local roads 6. Existing residences affected by **additional traffic** on existing local roads generated by land use developments	$L_{Aeq,\ (1\ hour)}$ 55 (external)	$L_{Aeq,\ (1\ hour)}$ 50 (external)

In addition where the above criteria are already exceeded as a result of existing traffic the policy notes:

For existing residences and other sensitive land uses affected by additional traffic on existing roads generated by land use developments, any increase in the total traffic noise level should be limited to 2 dB above that of the corresponding 'no build option'.

As traffic noise levels at the Novotel (the nearest residential receiver) already exceed the levels in Table 4-8 the 2 dB criterion is applicable.

4 CONSTRUCTION NOISE

4.1 Construction Methodology

The basic construction planning methodology for this project will be constructed in the following elements:-

- Bulk Excavation for the basement
- Piling to the suspended ground slab
- Concrete structure (40 levels)
- Curtain Wall facade system
- Roof Plant Room
- Curtain Wall

The basic construction planning sequence for this project will be constructed in the following elements:-

Stage 1 Programmed Works - (Initial Enabling Works to the Site)

- Site Establishment
- Services relocation/ removal

Stage 2 Programmed Works – (Construction)

- Civil Works / Piling (assumed cased bored piles or continuous flight auger (CFA) piles socketed into bedrock).
- Bulk excavation
- Structure
- Facade
- Essential Services / Substation
- Building Fit Out
- Commissioning
- External Works
- Handover / PC

Stage 1 - Initial Enabling Works to the Site

Once the compound has been secured existing services will be removed and or relocated outside the building footprint.

This work will be carried out by excavators, over a period of 2- 3 months.

Stage 2 – Construction Works – Hotel

Following the relocation and removal of services the piling to the perimeter shoring wall will commence along with the piling for the suspended ground floor structure to the north of the site.

Once the retention system has been completed the basement excavation will commence. This will be carried out using a rock break and saw to cut and remove the rock. There will be a number of trucks movements during the day to remove the rock from the site.

Following bulk excavation completion the ground floor and basement structure will progress by utilising the tower crane to lift material to the floors.

Once the jump form reaches a certain height, a concrete pump will be adopted to place the concrete above the jump form.

As the structure progresses the curtain wall panels will be lifted by the tower crane to the floors and handles/installed

Finishes to the inside of the Hotel will progress following the installation of the curtain wall.

The Landscape surrounding the Hotel site will be completed in sequence with the Public Domain works to Harbourside Place.

The materials handling will be executed form Darling Drive entering the site from the north via the slip lane between the Hotel and Harbourside and leaving the site from the south back onto Darling Drive.

Within the structure of the building, crawler cranes will erect the external sides to the podium.

4.1.1 Construction Hours

The proposed normal construction hours are between 7.00am and 6.00pm Monday – Friday and between 7.00am and 5.00pm on Saturdays. No work, with the exception of emergency work, will be undertaken on Sundays or Public Holidays.

It is noted that the proposed hours for Saturdays are outside DEC's standard hours of construction being 8.00am and 1.00pm. However, this extended period of construction hours will enable the major noise and vibration generating activities to be carried out in a more efficient manner, thereby shortening the period over which sensitive receptors will be exposed.

4.1.2 Hoardings / Site Fences

A class B hoarding will be erected to the western elevation along Darling Drive to the already established hoarding provided by the ICC.

4.1.3 Equipment Sound Power Levels

Sound Power Levels (SWLs) for typical construction plant are identified in Table 4-1. These SWLs have been measured at other similar construction sites. The table gives both Sound Power Level and Sound Pressure Levels (SPL) at 7m for the equipment. Sound Power Level is independent of measurement position.

Table 4-1 Typical Construction Plant Sound Levels – dBA

Plant	Sound Power Level	Sound Pressure Level at 7m
Excavator	108	83
Mobile Crane	104	79
Rockbreaker	120	95
Concrete Truck	109	84
Angle Grinder	109	84
Concrete Pump – 120 mm diameter / 50 bar	112	87
Sheet Metal Forming (Grinding, Hammer)	105	80
Concrete Saw	116	91
Ground Water Pump	106	81
Site Cranes	108	83
Dump Truck	108	83
Hammer Hydraulic	122	97
Auger Vibro Pile	110	85
Bored Pile Rig	112	87
Compressor	100	75
Bobcat	103	78
Hand Tools	90	65
Jackhammer	105	80

4.2 Construction Noise Assessment

Assessment of likely noise at surrounding commercial and residential receivers has been assessed for the general construction of the Hotel building.

- equipment sound level emissions and location (with corrections applied where applicable) ;
- screening effects from buildings;
- receiver locations;
- ground topography; and
- noise attenuation due to geometric spreading;

Predictions have been conducted for a number of construction scenarios. The four scenarios considered are summarised in

Table 4-2.

Table 4-2 Construction Scenarios for Hotel

Scenario	Description	Works
A	Site Establishment	3 Excavator and 2 trucks on site
B	Excavation	2 rockbreakers and 2 truck movements are assumed to operate in 15-minutes.
C	Building Construction	This scenario includes concreting and lifting. 2 concrete pumps, 2 forklifts, 4 compressors, 2 cranes, a boom truck and lift are assumed to operate in 15-minutes. Also concrete trucks and normal delivery trucks assumed to be 3 movements in 15-minutes.
D	Facade	Forklift and power tools assumed. 2 truck movements in 15-minutes assumed.

The predictions assume a "typical worst case" scenario whereby all plant running continuously. As such, the predictions represent likely noise levels that would occur during intensive periods of construction. Therefore, the presented noise levels can be considered in the upper range of noise levels that can be expected at surrounding receivers when the various construction scenarios occur.

4.3 Predicted Construction Noise Levels

Predicted construction noise levels at surrounding receivers are presented in Tables 4-3 to 4-7

Table 4-3 Predicted Construction Noise Levels for Site Establishment - dBA

Location	Predicted	Day / Saturday		
	Noise Day	NML	Exceedance	Compliance
	dBA	dBA	dBA	
Novotel	70	68 / 61	2/9	No
Goldsbrough Apartments	58	68 / 61	0	Yes
Harbourside	75	70 / 70	0	No
Exhibition	75	70/ 70	0	No

Table 4-4 Predicted Construction Noise Levels for Excavation- dBA

Location	Predicted	Day		
	Noise Day	NML	Exceedance	Compliance
	dBA	dBA	dBA	
Novotel	77	68 / 61	9 / 16	No
Goldsbrough Apartments	65	68 / 61	0/4	Yes / No
Harbourside	77	70 / 70	7	No
Exhibition	77	70/ 70	7	No

Table 4-5 Predicted Construction Noise Levels for Building Construction- dBA

Location	Predicted	Day		
	Noise Day	NML	Exceedance	Compliance
	dBA	dBA	dBA	
Novotel	70	68 / 61	2/9	No
Goldsbrough Apartments	58	68 / 61	0	Yes
Harbourside	70	70 / 70	0	Yes
Exhibition	70	70/ 70	0	Yes

Table 4-6 Predicted Construction Noise Levels for Façade Works- dBA

Location	Predicted	Day		
	Noise Day	NML	Exceedance	Compliance
	dBA	dBA	dBA	
Novotel	60	68 / 61	0	Yes
Goldsbrough Apartments	48	68 / 61	0	Yes
Harbourside	65	70 / 70	0	Yes
Exhibition	65	70/ 70	0	Yes

It is noted that exceedance of Noise Management Levels is predicted at surrounding receivers during establishment and excavation stages. In the case of commercial receivers the exceedances are not large and are typical for construction activities in the city where the site is in close proximity to other receivers.

In the case of the Novotel it is noted that this facade of Hotel suites consists of fixed glazing which will result in further noise reduction of construction noise levels thereby lessening any impact at these receivers.

Construction noise levels at Goldsbrough Apartments are predicted to below noise management level for all stages with the exception of excavation works on Saturdays. In this case a level 4 dBA above the construction NML is predicted. This magnitude of exceedance is not considered excessive or atypical of construction noise in the city area.

None the less, best practice management of noise and vibration should be incorporated into the construction environmental management plan. These measures should include;

The following project specific mitigation measures are recommended:

- localised treatment such as barriers around fixed plant,
- avoiding the use of vibratory rollers, where feasible.

In addition, the following measures are included in the Noise and Vibration Management Plan.

- *Plant Noise Audit* – Noise emission levels of all critical items of mobile plant and

equipment should be checked for compliance with noise limits appropriate to those items prior to the equipment going into regular service. To this end, testing should be established with the contractor.

- *Operator Instruction* – Operators should be trained in order to raise their awareness of potential noise problems and to increase their use of techniques to minimise noise emission.
- *Equipment Selection* – All fixed plant at the work sites should be appropriately selected, and where necessary, fitted with silencers, acoustical enclosures and other noise attenuation measures in order to ensure that the total noise emission from each work site complies with EPA guidelines.
- *Site Noise Planning* – Where practical, the layout and positioning of noise-producing plant and activities on each work site should be optimised to minimise noise emission levels.
- Use rocksaws and rippers where feasible.
- Install a hoarding / noise barrier between the site and street frontages. This should be a minimum 17mm thick structural or equivalent panel in the hoarding zone.

The adoption of the above measures and application of the procedures in the Project Noise and Vibration Plan are aimed at working towards achieving the noise management levels established at surrounding receivers.

4.4 Cumulative Construction Noise Impact.

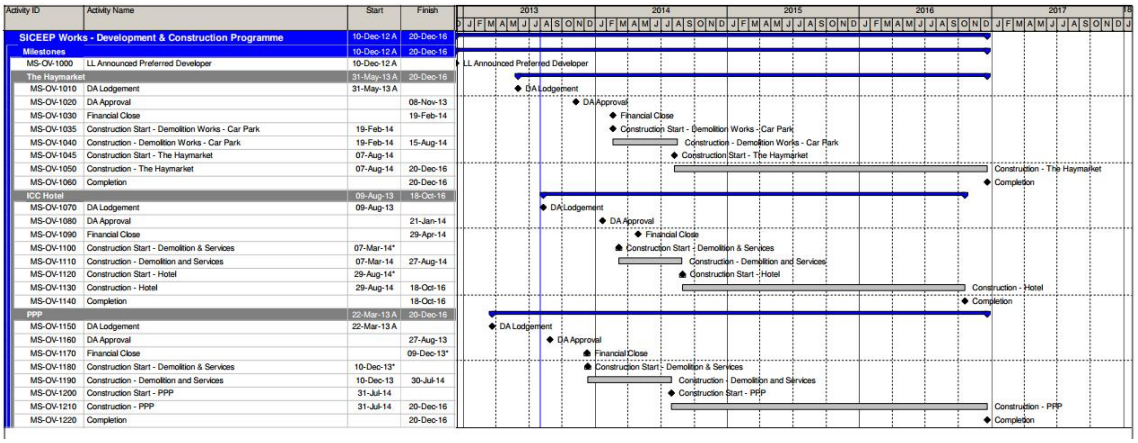
The EPA has requested the assessment must be prepared in accordance with the guidelines referenced in the project DGRs, and also include:

- Assessment of the noise impacts associated with construction on other components of the SICEEP project that may be completed and occupied whilst construction works are undertaken.
- Include assessment of cumulative impacts of construction of different elements of the SICEEP project concurrently on external and internal sensitive receivers.

In relation to the above issues an indicative construction program has been prepared showing the construction of the Hotel and other elements of the SCIEEP as detailed in Figure 4-1.

It is noted that the excavation and construction of the Hotel will start after the start of works for The Haymarket and PPP sites. In addition the completion of the Hotel is programmed to occur before the completion of these projects. Therefore the construction of the Hotel will not impact on other components of the SICEEP project that may be completed and occupied.

Figure 4-1 Indicative Construction of SCIEEP Works



A review and calculation of the potential cumulative construction noise impact with the Hotel, PPP and Haymarket during construction has been conducted based on the noise predictions contained in the following reports:

- Acoustic Logic Consultancy report titled "Sydney International Convention Centre Demolition, Excavation and Construction Noise" - reference 20130328.1/0606A/R0/TA dated 6/6/2013. .
- Renzo Tonin and Associates Sydney International Convention, Exhibition and Entertainment Precinct (SICEEP) The Haymarket - Stage 2 State Significant Development Application North West Plot - reference TG191-01F02 (rev 8) dated23 May 2013

It is noted that the latter report has not predicted construction noise levels to the identified receivers around the Hotel site. This is likely to be due to the distance between the Hotel site and the Haymarket area where any noise levels from construction in the Haymarket will not be acoustically significant at receivers around the Hotel site. Therefore the combination of noise from the PPP and the Hotel sites will represent the cumulative construction noise at surrounding receivers.

The Acoustic Logic assessment reports noise levels from individual plant operating on site, thereby illustrating "typical worst case" noise levels at receivers. These "worst case" predictions have been added to the excavation stage of the hotel to determine likely cumulative noise levels at identified receivers.

Table 4-4 Predicted Cumulative Construction Noise Levels for Excavation- dBA

Location	Prediction Noise Level dBA			NML
	Hotel Site	PPP Site	Total	dBA
Novotel	77	74*	79	**68 / 61**
Goldsbrough	65	72	73	**68 / 61**
Harbourside	77	76	80	**70 / 70**

* Based on an internal noise level of 39 dBA plus 35 dBA for facade reduction applied by Acoustic Logic Assessment.

Based on the above predictions noise levels from construction on combined sites will increase predicted noise levels in the order of 1-2 dBA which can be classified as barely perceptible. Further if an allowance of 35 dBA is made for noise reduction across the facade of the Novotel then maximum internal noise levels from construction would be in the order 44 dBA. This level of noise in a hotel suite is not considered excessive or unmanageable in the hours of proposed construction.

It should be noted that these noise levels are "worst case" cumulative noise levels whereby lower construction noise levels can be expected once excavation works have been completed.

Therefore based on these findings no additional noise management measures are warranted as a result of predicted cumulative noise.

4.5 Construction Vibration Assessment

Operation of vibratory rollers, boring rigs, rockbreakers and the like generate ground vibration that has the potential to transmit to nearby buildings.

Table 4-3 sets out the typical ground vibration levels at various distances from rock breakers operating in hard sandstone, along with vibratory rollers which are employed on road works.

Table 4-3 Construction Equipment PPV Vibration Levels (mm/s) versus Distance

Operation	PPV Vibration Level (mm/s) at given Distance					
	5 m	10 m	20 m	30 m	40 m	50 m
Vibratory Roller (Moving) 15t	4.5	3.5	1.9	1.0	0.6	0.4
Heavy Rock Breaker (e.g. 1500kg)	4.5	1.3	0.4	0.2	0.15	0.02
Medium Rock Breaker (e.g. 600kg)	0.2	0.06	0.02	0.01	-	-

Two potential vibration sources associated with works are;

- Rockbreakers – Whilst not planned for normal work rockbreakers may be used for occasional removal of rock at the bottom of the road excavation area; and
- Vibratory Rollers – Used to compact the road.

A review of the site plant and surrounding receivers indicates that the minimum distance between the vibration generating activities and surrounding buildings, including heritage buildings, will be in the order of 10 -20 metres. Therefore indicative maximum vibration levels for the above construction activities are;

- Heavy Rockbreaking 0.4 to 1.3 mm/s.
- Medium Rockbreakers 0.02 to 0.06 mm/s.
- Vibratory Rollers 1.9 to 3.5 mm/s.

At these levels of vibration, the established maximum human comfort vibration criterion of 0.56mm/s will be exceeded if vibratory or heavy rolling occurs. Therefore, the following measures are recommended:

- The use of non-vibratory compaction techniques is recommended in this area if feasible; and
- The use of smaller rockbreakers in the Darling Drive area should be considered.

It is recommended that trial testing of vibration levels be conducted where equipment identified as having the potential to exceed the human comfort criteria is proposed.

Structural damage vibration criteria in commercial, heritage and residential buildings are much higher than human comfort criteria, and predicted vibration levels are within these criteria under all circumstances.

4.6 Construction Traffic

The following information is provided by the traffic consultant, Hyder.

> *Construction traffic to and from the development site will be subject to constraints imposed by the current traffic network. Advice received from the RMS at various meetings is that increased traffic to Darling Drive and surrounding road network would be best suited to non-peak hour times as such we will ensure that our bulk deliveries will be coordinated to these times.*
>
> *It is noted, however, that the construction vehicle movements will not exceed the current vehicular movements that have been monitored, from the existing convention centre, exhibition centre, multi deck car park and entertainment centre into the surrounding road network.*
>
> *The truck movements anticipated will be spread evenly throughout the construction programme. During the course o the development we anticipate vehicle movements for such trades as Demolition, Civil, Piling, Detail Excavation, Structure, Facade, Internal Finishes & Public Domain works.*

Based on the programme and volume of materials required, it is estimated that approximately 3-4 trucks per hour will access the site for the duration of the development. This equates to approximately 33 - 44 trucks per day.

Calculated resultant traffic noise levels from 44 trucks at the facade of the Novotel in the day period are 60 dBA. This is well below the measured traffic daytime traffic noise levels measured by AECOM of 68 dBA. Therefore trucks associated with the hotel construction will result in an increase of traffic noise levels of less that 1 dB. Therefore noise from construction traffic will comply with RMS traffic noise objectives of not increasing existing noise levels by more than 2 dB.

5 OPERATIONAL NOISE EMISSION FROM THE DEVELOPMENT

5.1 Operational Noise Sources

The operational noise sources associated with the development are considered to be:

- Mechanical plant and equipment, including rooftop generators;
- Activity associated with restaurants, cafes and other retail uses, including patrons, music and functions; and
- Traffic generated by the proposed development onto the existing road network.

This section of the report addresses noise emission associated with these sources at the nearest noise-sensitive receivers in accordance with the DGRs and relevant noise requirements.

Where necessary, noise mitigation and/or management measures will be identified.

5.2 Mechanical Plant Noise

Mechanical plant such as exhausts, air-conditioning and emergency generations within the development should be assessed at the time of detailed design and selection, having regard to nearby residential and commercial properties surrounding the development, and to future development within the Northern precinct.

Any noise emissions from building services associated with the Hotel shall be acoustically treated, where necessary, to comply with established site specific noise criteria.

It is expected that the associated plant and equipment will be located within dedicated plant rooms in the building and at roof level, therefore reducing noise emission from the site to surrounding areas. Whilst discharge and intake may need to be ducted to external locations, sufficient scope is considered to be provided for any necessary acoustic treatment along these paths.

Acoustic assessment of mechanical services equipment will need to be undertaken during the detail design and equipment selection phase of the development to ensure that they will not either singularly or in total emit noise levels which exceed the noise limits.

5.3 Function, Restaurants and Retail Operations

The nearest sensitive receivers with respect to the Hotel would be rooms of the Novotel. This site will be acoustically shielded by the facade of the new Hotel itself and noise levels from any uses will be lower than the existing acoustic environment of the area.

Other areas which may generate some noise include the use of the loading dock and hotel entry. However given the location of these areas, distance to nearby receivers and ambient noise levels the noise associated with these activities will be acoustically insignificant at any surrounding receivers.

5.4 Operational Traffic

A review of the traffic noise generated by the entire SICEEP site was conducted by AECOM which is presented in the report titled "*Sydney International Convention, Exhibition and Entertainment Precinct Environmental Noise and Vibration Impact Assessment for SSDA1" Document No. 60263715.AC.RPT.01.04 - 18 March 2013.*

In the report and assessment of operational noise determined that the 2 dB increase objective was applicable to the whole site. The assessment by AECOM determined that compliance with RMS traffic noise objective for total traffic generated by the entire SICEEP development.

The following table extract is from the AECOM report shows overall projected peak hour traffic increase in Darling Street, which is the road of interest in relation to the hotel.

Table 32 Summary of traffic flow increase in the pm peak periods (vehicles/hr)

Location	Existing	Development + Existing	Net increase	Percentage increase	Increase in noise level, dB(A)
Darling Drive					
North of Site Access	1146	1961	815	71%	2.3
South of Site Access	1142	1957	815	71%	2.3
North of Pier St	1217	1874	657	54%	1.9
South of Pier St	674	1046	372	55%	1.9
North of Monorail line	674	1046	372	55%	1.9
South of Monorail line	693	1011	318	46%	1.6

A review of the Hyder traffic report for the Hotel indicates that maximum traffic flows generated by traffic on Darling Drive will be 98 vehicle movements of the total net increase of 372 movements north of the monorail line. Therefore the net increase in traffic noise by the hotel in isolation will be even less than the 1.9 dB indicated in the AECOM whole of site assessment.

6 CONCLUSION

An acoustic assessment has been conducted for the Development Application for the proposed Hotel development at Darling Drive, Pyrmont.

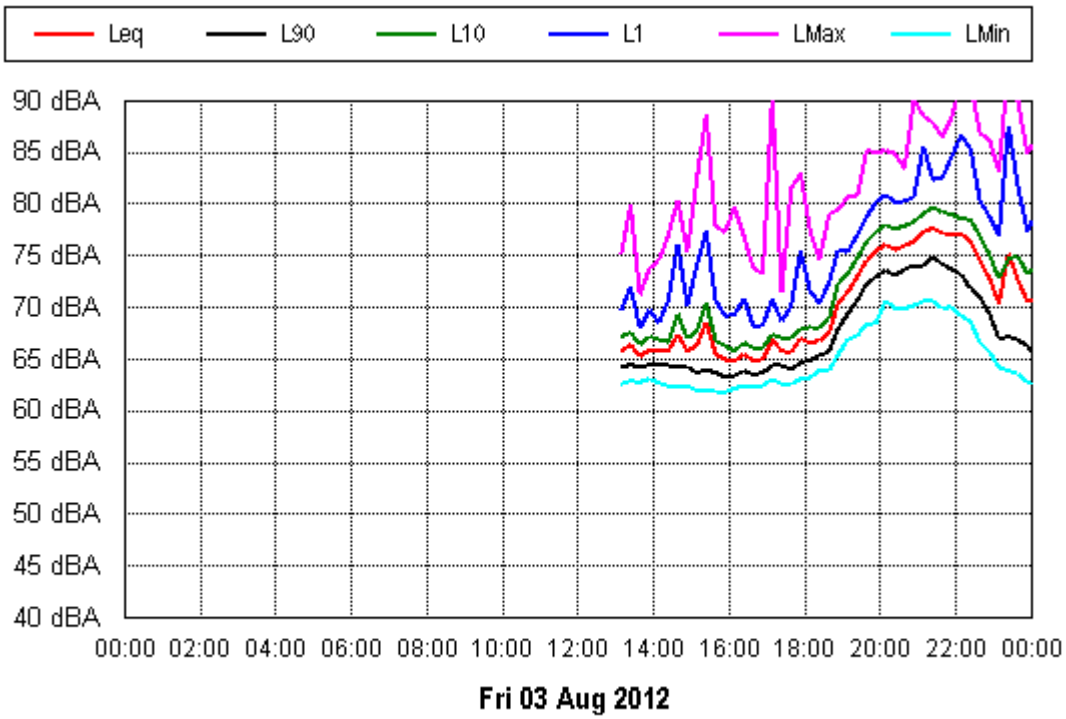
The following findings have been established:

- Construction noise and vibration levels have been predicted at surrounding receivers. Noise and vibration levels are considered to be manageable and measures and procedures have been recommended to manage emissions from the site. It is envisaged that these will be adopted in the site environmental management plan.
- Site specific noise emission criteria have been established for areas surrounding the site. It is noted that mechanical services and plant have not been selected, however it is envisaged that standard engineering noise control can be implemented at design stage to meet established noise criteria. A detailed review of noise emissions should be conducted prior to issue of a Construction Certificate.
- Operational and Construction Traffic noise will meet established noise objectives.

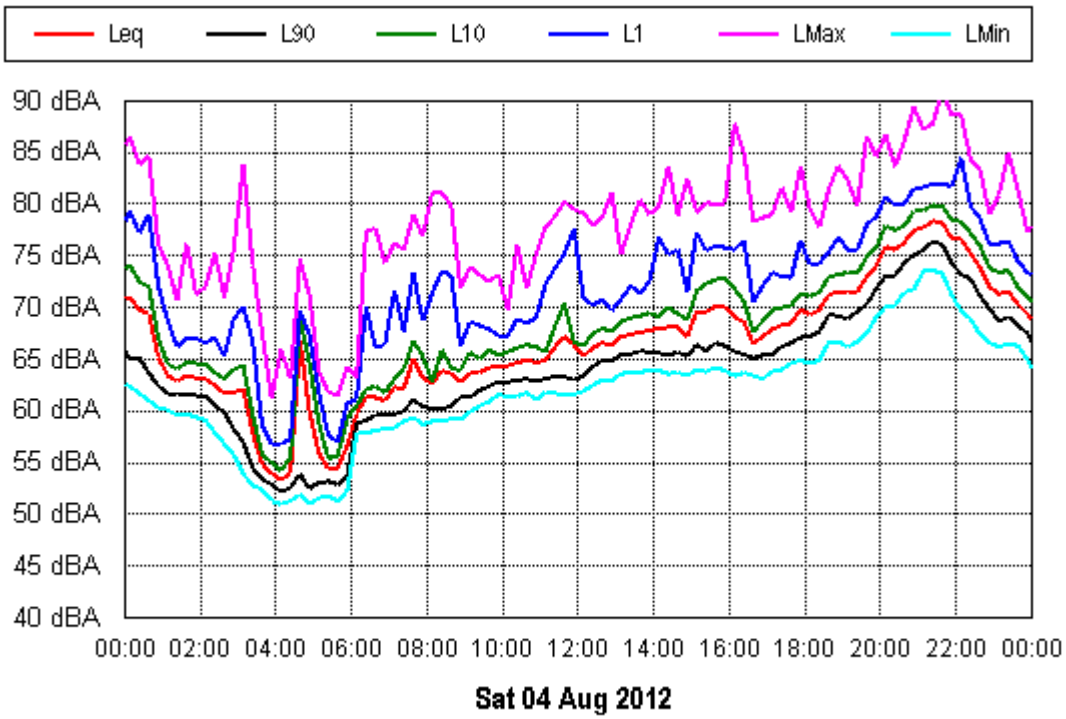
APPENDIX A

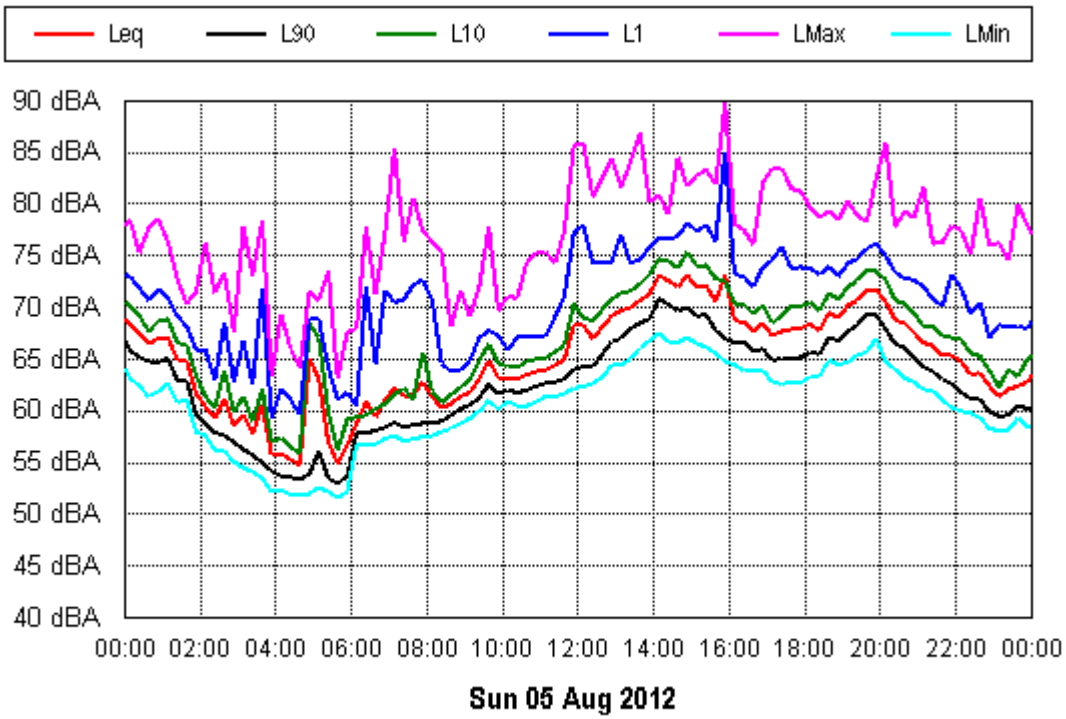
NOISE MEASUREMENT RESULTS

Location: Harbourside



Location: Harbourside





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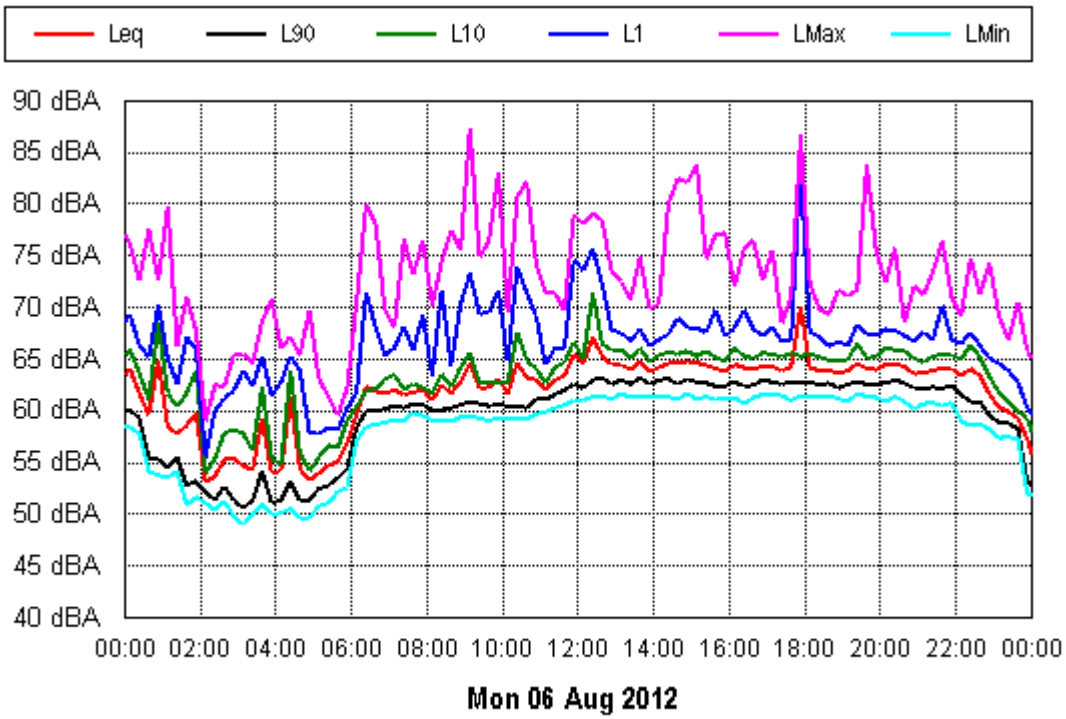

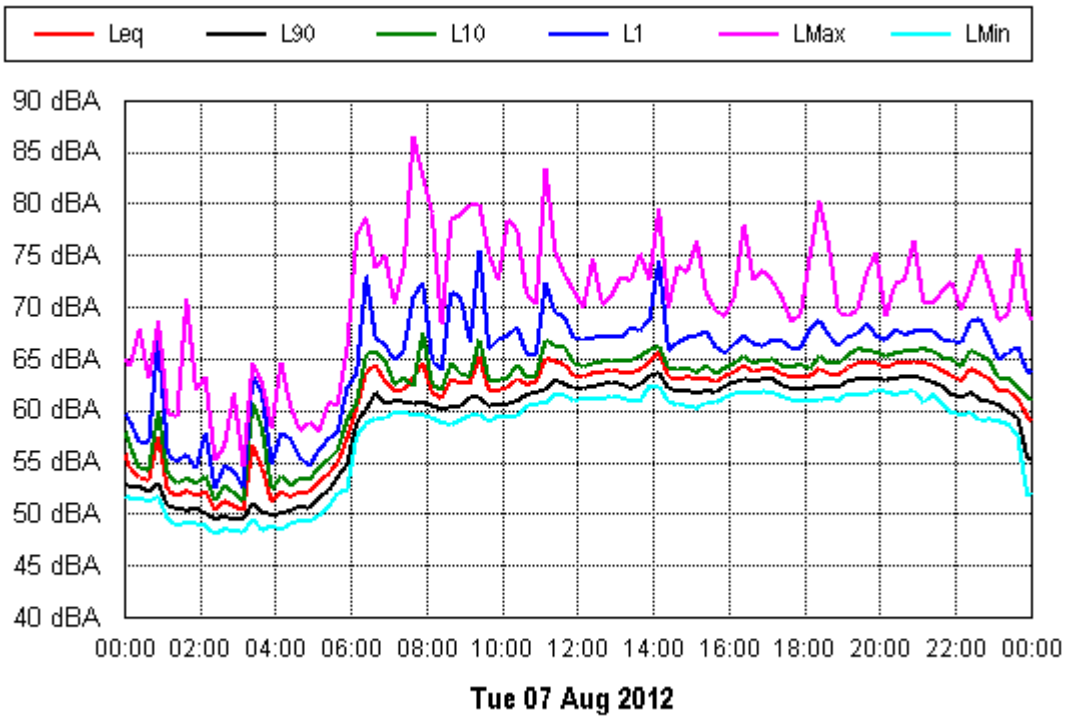

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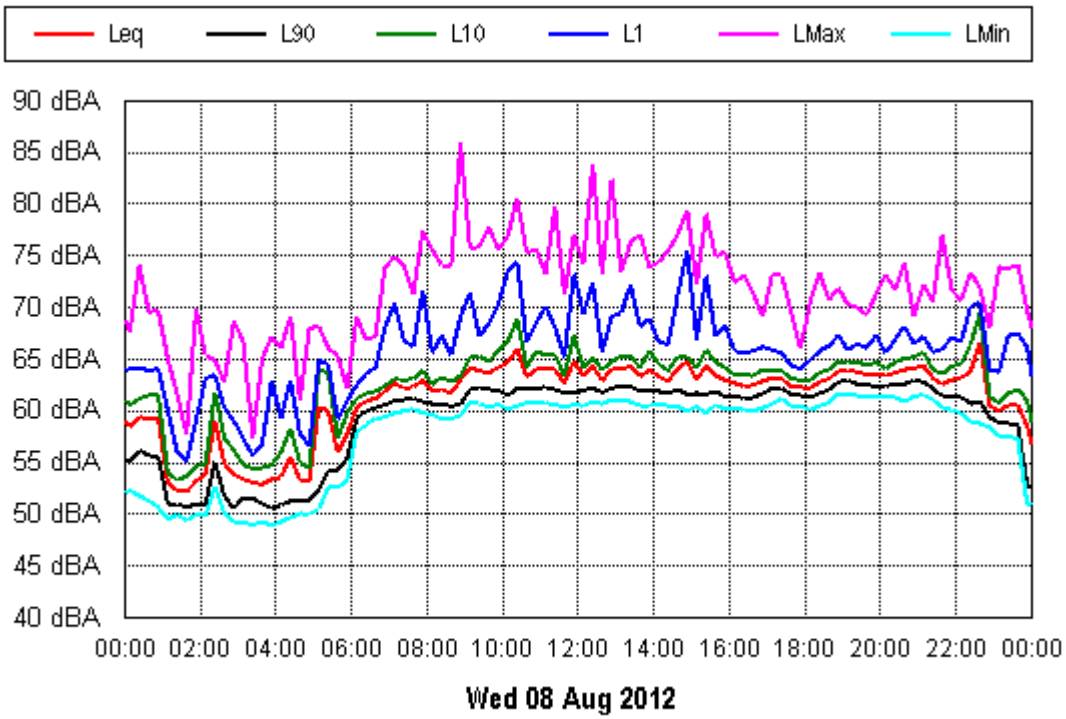
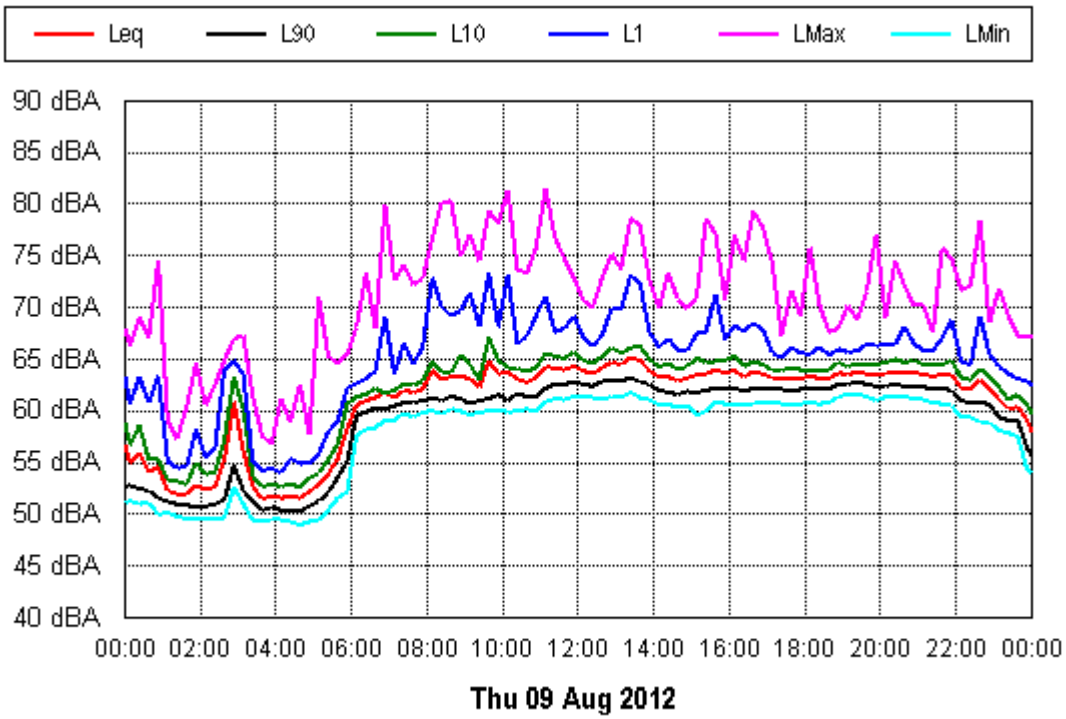
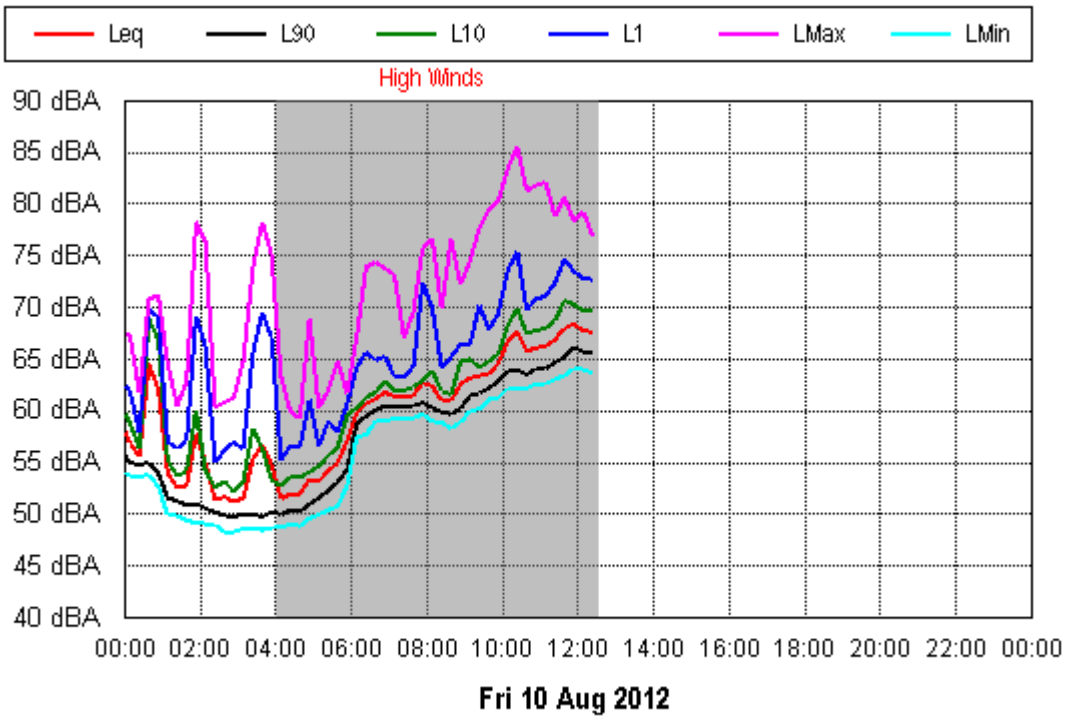
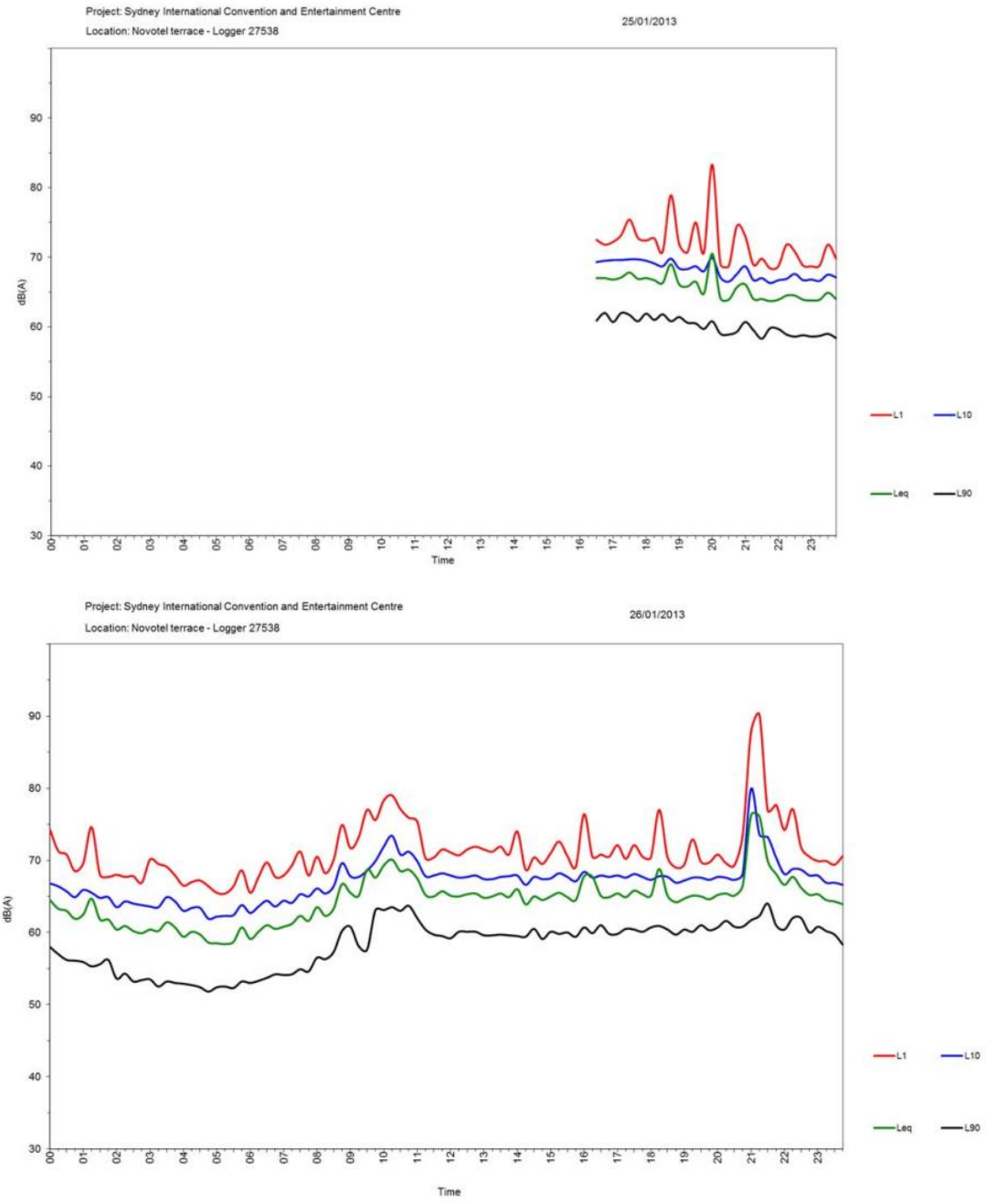


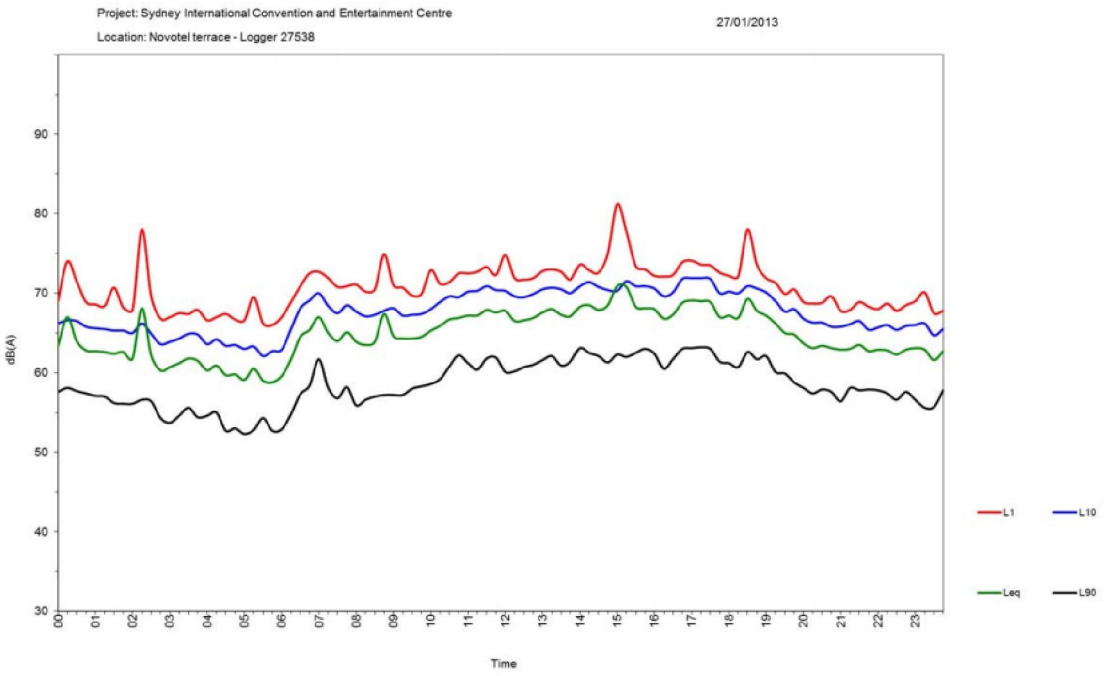


Location: Harbourside



Location 2 – Novotel Terrace from AECOM report




Project: Sydney International Convention and Entertainment Centre
Location: Novotel terrace - Logger 27538
27/01/2013
dB(A)
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Time
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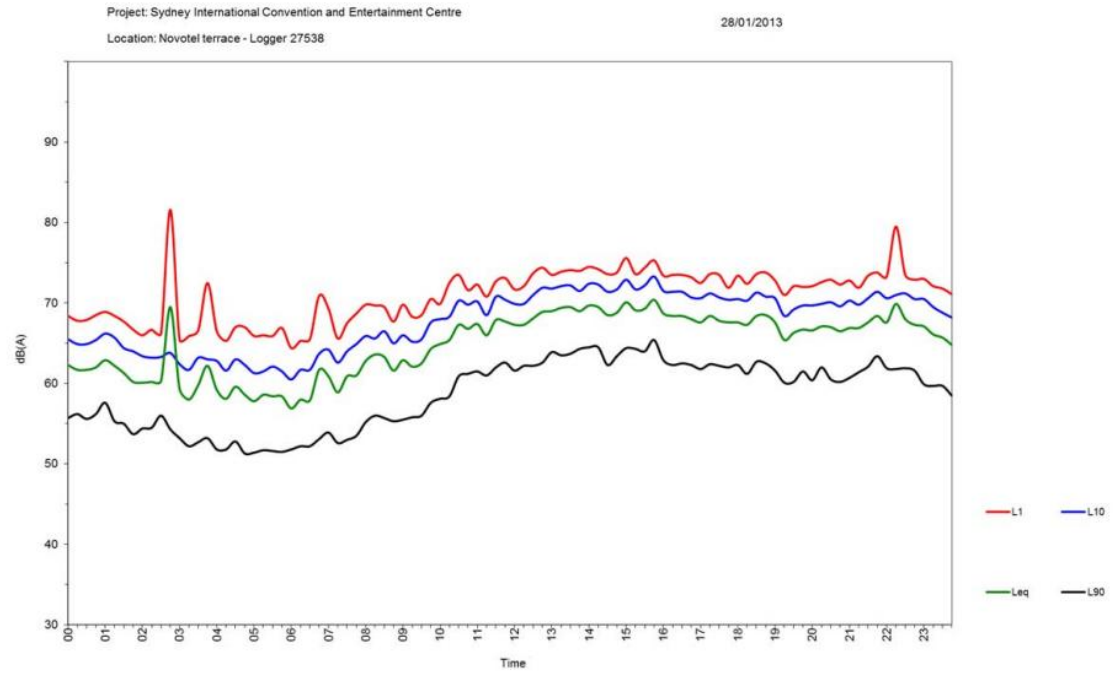
Project: Sydney International Convention and Entertainment Centre
Location: Novotel terrace - Logger 27538
28/01/2013
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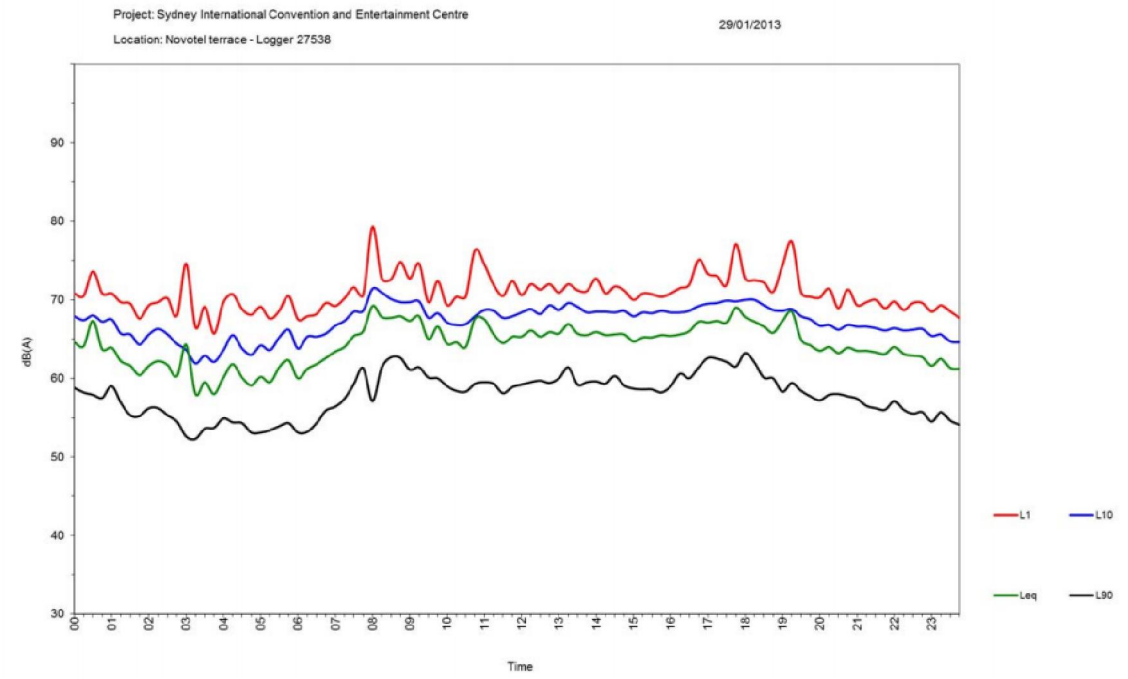
Project: Sydney International Convention and Entertainment Centre
Location: Novotel terrace - Logger 27538
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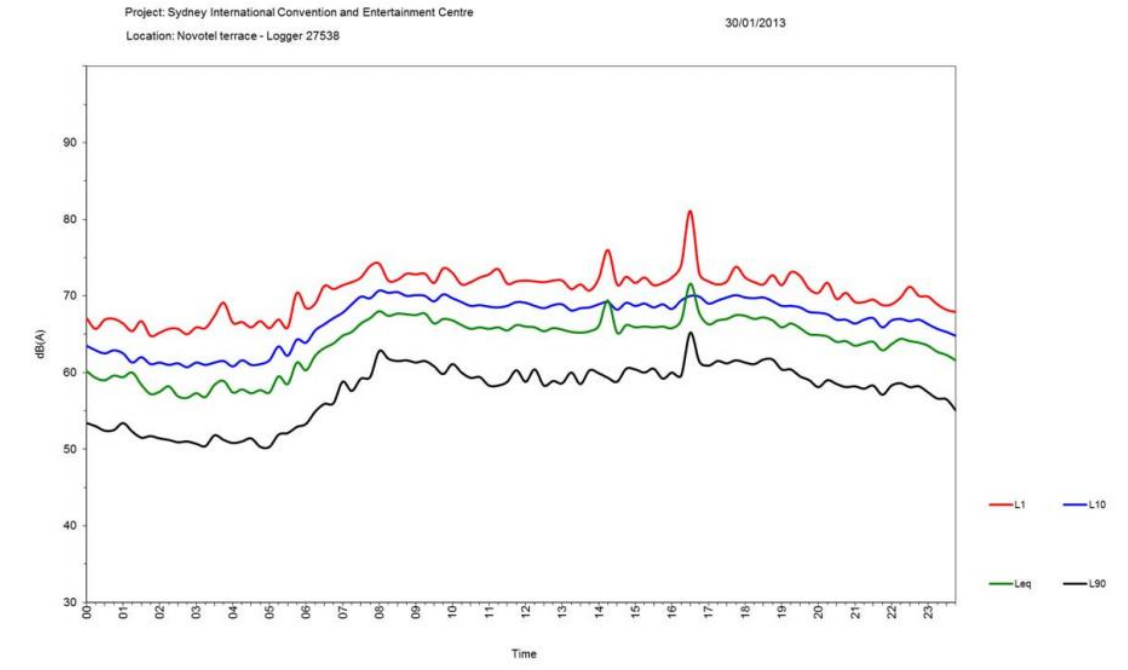
Project: Sydney International Convention and Entertainment Centre
Location: Novotel terrace - Logger 27538
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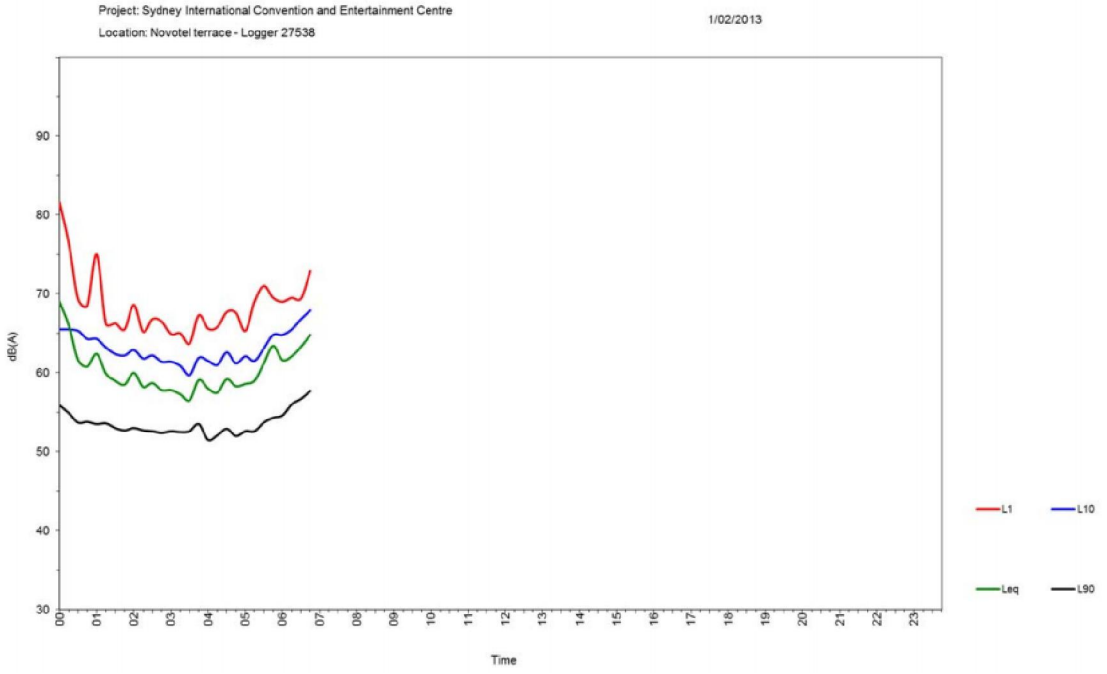
Project: Sydney International Convention and Entertainment Centre
Location: Novotel terrace - Logger 27538
1/02/2013
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